





Comprehensive Drainage Plan
Oklahoma & South Basins
Conceptual Design Report

October 2025



Sponsor: City of Greeley Colorado

Consultant: Matrix

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October 17, 2025

Mr. Aaron Stines, PE
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2835 W. 10th St.
Greeley, CO 80631

RE: Comprehensive Drainage Plan Oklahoma & South Basins
Agreement No. FW23-08-073-4
Final Submittal

Dear Mr. Stines:

Matrix Design Group, Inc., is pleased to submit the enclosed final *Concept Design Report* for the Oklahoma & South Basins. The analysis in this report follows the previously submitted *Alternatives Analysis Report* and *Baseline Hydrology Report*. We have addressed the City of Greeley comments on the *Concept Design Report Draft,* received August 20, 2025, and incorporated revisions into the attached document. Responses to comments for each project phase are included in Appendix A of the report.

Along with the complete Concept Design Report document, we are transmitting the following project files (listed by folder):

1. CUHP [Baseline & Concept Design]
    - Contains hydrologic models for the WQ, 2-yr, 5-yr, 10-yr, 25-yr, 50-yr, 100-yr, and 500-yr storm events under both existing and proposed conditions.
2. SWMM [Baseline & Concept Design]
    - Includes detailed hydraulic models for the WQ, 2-yr, 5-yr, 10-yr, 25-yr, 50-yr, 100-yr, and 500-yr storm events. Note that the “Interface Files” in SWMM models will need to be repointed to the appropriate CUHP output files (in subfolder 01) since SWMM does not preserve relative file paths.
3. Cost Estimate Workbooks [Concept Design]
    - Features MHFD cost estimation spreadsheets for each drainageway.
4. Field Photos
    - Includes three KMZ files compatible with Google Earth, representing the separate GOS, GO, and GOR field efforts with geolocated field photos.
5. GIS [Baseline, Alternative, and Concept]
    - Provides the relevant spatial datasets from all phases of the project. This includes:
        - GOM_2025.gdb: A single geodatabase that contains the datasets depicted in the *Concept Design Report.* Basefiles such as boundaries, contours, land use, wells, reaches, geology, wetlands, roads, and railroads are saved in the parent directory, and datasets used to make the figures specific to each project phase are saved in their respective folder.
        - Nearmap: The high-quality aerial imagery used in the background of the figures
        - XXX_Field_Observations.gdb: Three geodatabases that include the field observation notes and geolocated photos for each of the GOS, GO, and GOR project phases.

The report format and submittal are intended to follow the requirements of the *City of Greeley Master Plan Procedures / Preparation Guide* (2001), but there have also been efforts to include similar information to what would normally comprise a Mile High Flood District Major Drainageway Planning study. The City of Greeley Master Plan Template Checklist for this report is attached.

The *Concept Design Report* provides a description of the watershed, updated hydrologic and hydraulic modeling, updated flows and velocities and detailed recommendations revolving around Low Impact Development (LID) practices. With historical rain events and flood occurring more frequently, the importance of stabilizing drainageways to reduce flood hazards, improving water quality, and reduce aggradation and degradation from channel instability becomes more important with the increase of urban development.

We appreciate the opportunity to provide an evaluation of the proposed improvements and recommendations for management of these drainageways. Reducing the city’s risk of long-term urbanized flooding is essential in protecting the health and safety of the public and in providing a higher quality of life for its residents.

Sincerely,

Matrix Design Group, Inc.

Drew Beck, PE
Officer In Charge

Benjamin Liu, PE
Project Manager

EXECUTIVE SUMMARY

This study creates a master plan framework for two drainage basins: the Oklahoma & South Basins. Recommendations are provided on how the City of Greeley and the Town of Windsor can protect their water quality and preserve floodplains and natural channels to reduce future flood risks. Conceptual drainage improvements, LID practices, and expected costs are included to help guide capital planning. Two public meetings were held during the study.

Updated hydrologic information on both existing and future conditions in the Oklahoma Basins was collected and synthesized. Three hydrologic models were developed:

1. Baseline Hydrology for existing conditions;
2. Baseline Hydrology for future full-developed conditions;
3. Master Plan Hydrology with future runoff reduction (to match undeveloped release rates).

It was decided to split the two basins into their main contributing major drainageways due to the large size of the watersheds. Major drainageways have been defined as natural runoff collection reaches that include more than 130 acres of contributing area. The South Basin is comprised of a single Major Drainageway 100. The Oklahoma Basin is comprised of Major Drainageway 200, 300, 500, 600, 700, 800, 900, 1000, 1100, 1200 and 1300. Each Major Drainageway was further divided into smaller subbasins for hydrologic calculations.

Using the Colorado Urban Hydrograph Procedure (CUHP), runoff was calculated for the 2-year, 5-year, 10-year, 25-year, 50-year, and 100-year storm events in both existing conditions and future conditions. Results from this study were compared to peak flows documented in the *Town of Windsor Master Drainage Plan (2003)*: some 100-year results were higher and some lower, reflecting different land use assumptions.

The Environmental Protection Agency Storm Water Management Model (EPA SWMM) was used to combine and route hydrographs created from CUHP. Runoff peak flows and volumes for existing and future conditions were calculated. Routed results showed that future conditions peak flows will be significantly higher than existing conditions peak flows, which has the potential to cause hazardous flooding and major damage to structures. Field observations and survey indicated that existing culverts and channels along these drainageways are not capable of dealing with future conditions floods.

An alternative analysis with four broad alternatives was created by the Matrix team to provide recommendations that the City of Greeley could use in preparation for future development. The four alternatives are:

1. No Action: Showing what structures and reaches are likely to fail and which are likely to be stable without any capital improvements.
2. Detention: Showing the results of proposed regional detention basins to reduce runoff.
3. Channel improvements: Showing the results of proposed channel improvements to improve the stability of the reaches.
4. Low Impact Development: Showing the results of widespread, distributed Low Impact Development practices (LID) to reduce runoff.

Various combinations of these broad alternatives were developed and tested for each major drainageway's unique needs. The options were scored in eight criteria: constructability, maintenance, meeting multiple objectives, water quality, public safety, habitat and environment, aesthetics, and criteria compliance. In general, the alternatives that featured runoff reduction such as detention and LID scored higher than other alternatives in aggregate.

After evaluating the various alternatives, the City of Greeley selected Option 4: LID for Major Drainageway 100, 200, 300, 500, 600, 700, 800, 1000, 1200, and 1300. Option 1: No Action was selected for drainageway 900 and Option 2: Detention was selected for 1100. Note that Option 4 focuses on green infrastructure but also includes detention and channel improvements to meet the study goals. This alternative was developed into the Conceptual Design/Master Plan improvements. Three main goals were identified during the creation of the Master Plan:

Goal #1 – Implement LID effectively;

Goal #2 – Implement stormwater detention effectively;

Goal #3 – Implement channel improvements effectively.

For Goal #1, all new developments within the study area should implement LID practices that intercept and treat runoff from new impervious surfaces. Depending on the desired function, use, and aesthetics, multiple types of LID could be used. LID elements that are regionally accepted and recommended for use within the Oklahoma Basins are shown in the table below:

Lid Types	
Vegetated buffer	Green roof
Vegetated swale	Green alley
Curb cut / No-Curb	Permeable pavement
Trench drain	Greenway corridor
Bioretention - rain garden	Sand filter
Bioretention - porous landscape design	Tree filter
Rain barrel	Retention ponds/constructed wetland ponds

LIDs have minor impacts on peak flows during large storm events. For Goal #2, both regional flood detention facilities and sub-regional Excess Urban Runoff Volume (EURV) basins are proposed to reduce the peak flows and volumes for future land use conditions. Tables summarizing the required volume and surface areas of these ponds are shown below:

Flood Control Pond No.	Volume (ac-ft)	Area (ac)
D134	5.4	1.1
D150	4.0	0.8
D245	10.3	1.8
D263	6.6	1.1
D510	7.5	1.3
D618	6.8	1.3
D814	2.4	0.6
D_FC_711	6.5	1.3
D_FC_823	20.0	5.0
D_FC_838	17.3	3.3
D_FC_842	2.4	0.6
D_FC_1050	79.8	8.8

EURV Basin No.	Volume (ac-ft)	Area (ac)
D121	6.2	4.0
D134	11.2	6.0
D146	1.1	0.6
D150	7.2	4.2
D225	6.3	4.1
D236	2.1	1.2
D244	5.9	3.5
D245	18.8	10.9
D256	5.0	3.2
D263	9.8	5.0
D510	12.8	7.6
D614	6.6	4.2
D618	14.2	7.1
D_EURV_711	2.4	0.6
D_EURV_820	5.5	1.3
D_EURV_830	5.6	1.5
D_EURV_840	5.4	3.1
D_EURV_842	14.3	9.5
D_EURV_844	9.4	2.3
D_EURV_1208	2.0	0.5
D_EURV_1264	0.3	0.1
D_EURV_1382	0.9	0.3
D_EURV_1392	14.8	3.7
D_EURV_1395	9.5	2.4
D_EURV_1316	1.2	0.3

These detention facilities, together with distributed LID, reduce future peak flows and volumes across the watersheds to similar levels as pre-development conditions. A comparison of the 100-year peak flows at each Major Drainageway outfall is provided below:

Major Drainageway	Drainage Area (ac)	Existing Conditions Q_{100}	Future Conditions Do Nothing Q_{100}	Future Conditions Concept Design Q_{100}
100	755	1,049	1,460	995
200	1,058	1,401	2,273	1,209
300	157	258	270	267
500	292	378	609	335
600	363	521	945	479
700	90	160	172	111
800	696	1,039	2,072	306
800	446	527	728	728
1000	7,181	9,020	11,827	4,357
1100	854	1,031	1,511	546
1200	1,042	1,340	1,415	741
1300	1,712	2,356	2,697	1,023

For Goal #3, it is important to remember that channel improvements can range from small to large scale designs. Instead of focusing solely on the conveyance channel, proposed stream corridors must be designed to promote and incorporate natural system processes. The future Major Drainageways should feature multiple stages to serve multiple storm events, similar to existing natural channels. Each Major Drainageway was split up into reaches of similar character, with reaches generally numbered from downstream to upstream (e.g. Major Drainageway 600 is made up of Reaches 600, 614, and 618). The length and top width of the proposed stream corridors are presented in the table below:

Reach	Reach Length (ft)	Top Width (ft)
100	3,379	146
118	3,960	99
134	1,478	109
142	2,059	101
150	1,637	101
200	2,640	172
224	3,274	80
232	3,432	214
239	422	167
241	1,056	127
244	3,379	119
260	3,749	67
300	2,746	59
500	3,485	60
600	3,749	114
614	1,795	88
618	2,006	123
700	2,429	163
800	2,746	82
829	3,538	258
843	2,957	146
900	2,376	119
1000	1,531	148
1010	2,218	232
1024	4,963	229
1088	3,590	180
1100	3,643	117
1140	3,326	59
1148	3,485	32
1200	1,742	59
1216	5,755	123
1232	2,482	50
1240	4,805	52
1256	1,742	26
1300	2,165	112
1316	1,320	126
1340	2,112	93

Existing drainageway crossings occur at roadways and railroads. Each crossing location was examined, and culvert calculations performed to determine the existing performance. The concept culverts in the table below were sized to safely convey 100-year flows, but note that final designs should follow geomorphic practices where multiple barrels include floodplain relief culverts that are higher than the primary low-flow culvert:

Structure Number	Concept Design Q_{100} (cfs)	Structure Size/Type
101	995	2 -14'x4' CBC
102	995	Keep Existing
103	249	6'x4' CBC
104	210	6'x3' CBC
201	1,209	2 - 11'x4' CBC
202	157	6'x3' CBC
203	157	48" RCP
301	267	8'x3' CBC
501	335	8'x3' CBC
601	479	8'x5' CBC
602	479	8'x4' CBC
603	234	7'x3' CBC
702	111	48" RCP
704	170	2 - 48" RCP
801	284	2 - 9'x4' CBC
804	299	6'x5' CBC
805	283	8'x3' CBC
807	311	12'x4' CBC
808	292	12'x4' CBC
809	528	10'x4' CBC
1001	4,354	Keep Existing
1002	3,508	3 - 11'x9' CBC
1003	1,848	2 - 12'x9' CBC
1004	1,708	2 - 10'x7' CBC
1005	1,644	2 - 10'x7' CBC
1103	271	Keep Existing
1203	497	Keep Existing
1204	326	Keep Existing
1205	326	Keep Existing
1206	292	Keep Existing
1207	268	Keep Existing
1208	159	Keep Existing
1301	958	3 - 10'x4' CBC

Estimated Master Plan costs were calculated using the MHFD UD-MP worksheets. These calculations reflect the expected costs for the City of Greeley, additional distributed costs such as LID are expected to be borne by developers or metro districts. Summaries of each major drainageway are provided below.

Major Drainageway 100 within the South Basin is split into five reaches comprising two significant tributaries and the main stem. There are four culverts; only three need improvements. The capital cost for the Master Plan improvements is estimated to be $5,190,906 while the cost of maintenance and operation for 50 years is estimated at $1,821,550.

Major Drainageway 200 within the Oklahoma Basin is split into seven reaches comprising three significant tributaries and the main stem. There are three culverts that need improvements. The capital cost for the Master Plan improvements is estimated to be $5,422,958 while the cost of maintenance and operation for 50 years is estimated to be $2,705,800.

Major Drainageway 500 within the Oklahoma Basin also consists of only one reach. While hydraulic analysis shows that the existing channel conditions are stable, channel improvements will be necessary with new development. There is one culvert that needs improvements. The capital cost for the Master Plan improvements is estimated to be $1,712,212 while the cost of maintenance and operation for 50 years is estimated to be $158,350.

Major Drainageway 600 within the Oklahoma Basin is split into three reaches. While hydraulic analysis shows that the existing channel conditions are stable, channel improvements will be necessary with new development. There are three culverts that need improvements. The capital cost for the Master Plan improvements is estimated to be $2,793,040 while the cost of maintenance and operation for 50 years is estimated to be $644,100.

Major Drainageway 700 within the Oklahoma Basin only comprises one reach. While hydraulic analysis shows that the existing channel conditions are stable, channel improvements will be necessary with new development. There are two culverts that need improvements. The capital cost for the Master Plan improvements is estimated to be $1,254,194 while the cost of maintenance and operation for 50 years is estimated to be $230,300.

Major Drainageway 800 within the Oklahoma Basin comprises of three reaches. While hydraulic analysis shows that the existing channel conditions are mostly stable, channel improvements will be necessary with new development. There are six culverts that need improvements. The capital cost for the Master Plan improvements is estimated to be $13,701,663 while the cost of maintenance and operation for 50 years is estimated to be $1,712,550.

Major Drainageway 1000 within the Oklahoma Basin comprises of four reaches. While hydraulic analysis shows that the existing channel conditions are mostly stable, channel improvements will be necessary with new development. There are four culverts that need improvements and one existing bridge that can remain. The capital cost for the Master Plan improvements is estimated to be $31,851,100 while the cost of maintenance and operation for 50 years is estimated to be $4,245,750.

Major Drainageway 1100 within the Oklahoma Basin comprises of three reaches. While hydraulic analysis shows that the existing channel conditions are mostly stable, channel improvements will be necessary with new development. There are no culverts that need improvements. The capital cost for the Master Plan improvements is estimated to be $1,249,849 while the cost of maintenance and operation for 50 years is estimated to be $654,250.

Major Drainageway 1200 within the Oklahoma Basin comprises of five reaches. While hydraulic analysis shows that the existing channel conditions are mostly stable, channel improvements will be necessary with new development. There are no culverts that need improvements. The capital cost for the Master Plan improvements is estimated to be $824,792 while the cost of maintenance and operation for 50 years is estimated to be $2,250,800.

Major Drainageway 1300 within the Oklahoma Basin comprises of three reaches. While hydraulic analysis shows that the existing channel conditions are mostly stable, channel improvements will be necessary with new development. There is one culvert that needs improvements. The capital cost for the Master Plan improvements is estimated to be $7,164,992 while the cost of maintenance and operation for 50 years is estimated to be $11,684,650.

Total costs for the Oklahoma and South Basins Master Plan are estimated to be $97,273,806. Continuous maintenance of the proposed drainage infrastructure is required to protect the city and will ultimately result in reduced costs compared to major reconstruction efforts. Maintenance should be done regularly and on an as-needed basis, especially after significant flood events or growth of invasive species. See the summary table below for a breakdown of expected costs along each major drainageway:

Major Drainage way	Acquisition Capital Cost	Crossing Improvement Capital Cost	Channel Improvement Capital Cost	Regional Detention Capital Cost	Total Capital Cost [a]	50 Year O&M Capital Costs	Total Cost [b]
100	$561,114	$850,519	$989,376	$875,526	$5,190,906	$1,821,550	$7,012,456
200	$584,575	$862,523	$369,744	$1,605,494	$5,422,958	$2,705,800	$8,128,758
500	$25,416	$259,953	-	$729,370	$1,712,212	$158,350	$1,870,562
600	$134,902	$716,614	$192,000	$650,412	$2,793,040	$644,100	$3,437,140
700	$25,416	$86,365	$40,740	$593,585	$1,254,194	$230,300	$1,484,494
800	$207,241	$2,133,112	$78,540	$5,702,964	$13,701,663	$1,712,550	$15,414,213
1000	$1,133,958	$1,864,764	$7,389,412	$7,056,352	$31,851,100	$4,245,750	$36,096,850
1100	$117,306	-	$11,964	$336,000	$1,249,849	$654,250	$1,904,099
1200	$31,282	-	$221,856	$3,190	$824,792	$2,250,800	$3,075,592
1300	$99,710	$224,045	-	$3,919,815	$7,164,992	$11,684,650	$18,849,642
Study Total	$2,920,920	$6,997,895	$9,293,632	$21,472,708	$71,165,706	$26,108,100	$97,273,806

a.Total capital cost also includes mobilization, stormwater management/erosion control, engineering, legal/administration, construction management, and contingency estimates.

b.Total cost includes capital cost plus operations and maintenance cost over 50 years.

To conclude, Matrix recommends the following general actions for the City of Greeley:

1. Prioritize Detention and LID (runoff reduction) improvements, as both will have significant impacts on downstream channel stability and flood risk, reducing the scope of required channel improvements. LID BMPs can serve double duty to reduce runoff and capture pollutants.
2. Widespread implementation of EURV basins will result in a system that mimics the flow duration and frequencies of an undeveloped natural system.
3. Design and construct geomorphically stable channels within the proposed stream management corridors. This can be achieved through multistage cross sections and appropriate channel profiles.

TABLE OF CONTENTS

CHAPTER 1 - PRELIMINARIES 1
1.1 Authorization 1
1.2 Purpose and Scope 1
1.3 Planning Process 1
1.4 Mapping and Surveys 2
1.5 Acknowledgements 2
CHAPTER 2 - THE WHY 4
2.1 Overview 4
2.1.1 Project Area 4
2.1.2 Relevant Information from Past Plans 5
2.2 Plan Horizon 9
2.3 Existing Conditions 9
2.3.1 Reach Description 9
2.3.2 Existing Crossings 28
2.3.3 Land Use 28
2.3.4 Flood History 28
2.3.5 Environmental Assessment 28
2.4 Future Trends 35
2.4.1 Near-Term Developments 35
CHAPTER 3 - THE WHAT 36
3.1 Hydrologic Analysis 36
3.1.1 Overview 36
3.1.2 Design Rainfall 36
3.1.3 Basin Delineations 37
3.1.4 Basin Imperviousness 37
3.1.5 Detention 40
3.1.6 Hydrograph Routing 40
3.1.7 Sensitivity Analyses 40
3.1.8 Previous Studies 41
3.1.9 Results of Analysis 41
3.2 Hydraulic Analysis 45
3.2.1 Evaluation of Existing Facilities 45
3.2.2 Flood Hazards 45
3.2.3 Previous Analyses 46
3.3 Alternatives Analysis 50
3.3.1 Action Plan 50
3.3.2 Policy Recommendations 50
3.3.3 Alternatives Criteria 50
3.3.4 Alternatives Modeling 50
3.3.5 Alternative Costs 61
3.3.6 Alternative Plans 64
3.3.7 Result of Analysis 68
3.4 Community Indicators 72
3.4.1 Funding 72
CHAPTER 4 - THE HOW 73
4.1 Plan Development Overview 73
4.1.1 Mitigation of Flood Hazards 73
4.1.2 General Recommendations 73
4.2 Master Plan Description 73
4.2.1 Vision Statement, Goals, and Objectives 74
4.2.2 Concept Design Description 75
4.2.3 Metrics 86
4.2.4 Major Drainageway 100 87
4.2.5 Major Drainageway 200 88
4.2.6 Major Drainageway 300 89
4.2.7 Major Drainageway 500 90
4.2.8 Major Drainageway 600 91
4.2.9 Major Drainageway 700 92
4.2.10 Major Drainageway 800 93
4.2.11 Major Drainageway 900 94
4.2.12 Major Drainageway 1000 95
4.2.13 Major Drainageway 1100 96
4.2.14 Major Drainageway 1200 97
4.2.15 Major Drainageway 1300 98
4.3 Prioritizing and Phasing 99
4.4 Water Quality Impacts 99
4.5 Operations and Maintenance 99
4.6 Environmental and Safety Assessment 99
REFERENCES 100

LIST OF FIGURES

Figure 2-1 Vicinity Map 4
Figure 2-2 Study Area Map 6
Figure 2-3 Reach Map 7
Figure 2-4 Elevation Data Coverage 8
Figure 2-5 Reach 100 9
Figure 2-6 Reach 118 9
Figure 2-7 Reach 134 10
Figure 2-8 Reach 142 10
Figure 2-9 Reach 150 10
Figure 2-10 Reach 200 11
Figure 2-11 Reach 232 11
Figure 2-12 Reach 239 12
Figure 2-13 Reach 241 12
Figure 2-14 Reach 260 12
Figure 2-15 Reach 224 12
Figure 2-16 Reach 244 13
Figure 2-17 Reach 500 13
Figure 2-18 Reach 600 14
Figure 2-19 Reach 614 14
Figure 2-20 Reach 618 Existing Detention Basin 14
Figure 2-21 Reach 700 14
Figure 2-22 Reach 700 15
Figure 2-23 Reach 700 15
Figure 2-24 Reach 800 15
Figure 2-25 Reach 800 15
Figure 2-26 Reach 800 16
Figure 2-27 Reach 829 16
Figure 2-28 Reach 829 16
Figure 2-29 Reach 829 17
Figure 2-30 Reach 829 17
Figure 2-31 Reach 843 17
Figure 2-32 Reach 843 17
Figure 2-33 Reach 900 18
Figure 2-34 Reach 1000 Downstream Segment 18
Figure 2-35 Reach 1000 Eroded Banks 19
Figure 2-36 Reach 1000 Upstream Segment 19
Figure 2-37 Reach 1024 Downstream Segment 19
Figure 2-38 Reach 1024 Cut Banks 20
Figure 2-39 Reach 1024 Upstream Segment 20
Figure 2-40 Reach 1088 Downstream Segment 20
Figure 2-41 Reach 1088 Upstream Segment 20
Figure 2-42 Reach 1100 Wet Pond 21
Figure 2-43 Reach 1100 21
Figure 2-44 Reach 1140 Downstream Detention 22
Figure 2-45 Reach 1140 Middle Wet Pond 22
Figure 2-46 Reach 1140 22
Figure 2-47 Reach 1148 Detention Basin 23
Figure 2-48 Reach 1148 23
Figure 2-49 Reach 1200 23
Figure 2-50 Reach 1200 Detention Basin 23
Figure 2-51 Reach 1216 24
Figure 2-52 Reach 1240 Reservoir 24
Figure 2-53 Reach 1240 24
Figure 2-54 Reach 1256 25
Figure 2-55 Reach 1232 at Confluence 25
Figure 2-56 Reach 1232 Middle Segment 25
Figure 2-57 Reach 1232 Upstream Segment 26
Figure 2-58 Reach 1300 26
Figure 2-59 Reach 1316 26
Figure 2-60 Reach 1316 Wet Pond 27
Figure 2-61 Reach 1340 27
Figure 2-62 Reach 1340 Upstream End 27
Figure 2-63 Existing Structures Map GOS 30
Figure 2-64 Existing Structures Map GO 31
Figure 2-65 Existing Structures Map GOR 32
Figure 2-66 Public Owned Land 33
Figure 2-67 Parks and Open Space 34
Figure 3-1 Impervious Surfaces 39
Figure 3-2 Conveyance Roughness Sensitivity Analyis 40
Figure 3-3 Field Assessment Map GOS 47

LIST OF FIGURES CONT.

Figure 3-4 Field Assessment Map GO 48
Figure 3-5 Field Assessment Map GOR 49
Figure 3-6 Typical Channel Cross Section 54
Figure 4-1 LID Single Family Residential Example 76
Figure 4-2 LID Street Right of Way Example 76
Figure 4-3 LID Vegetation Example 77
Figure 4-4 Offline basin elements 81
Figure 4-5 Online basin elements 82
Figure 4-6 Master Plan Channel Typical 84

LIST OF TABLES

Table 1-1 Project Participants and Affiliations 3
Table 2-1 Major Crossing Structure Inventory 29
Table 3-1 Storm Duration and Area Adjustment for CUHP Modeling 36
Table 3-2 GOS Point Rainfall Depths (inch) 36
Table 3-3 GO & GOR Point Rainfall Depths (inch) 36
Table 3-4 Design Storm Distribution of 1-hour Rainfall 37
Table 3-5 Subbasin Characteristics 37
Table 3-6 Future Land Use Impervious Summary 38
Table 3-7 Typical Depression Losses for Various Land Covers 38
Table 3-8 Hydrologic Soil Group Distribution 38
Table 3-9 Manning's Roughness Coefficients for SWMM 40
Table 3-10 Previous Studies Hydrology Comparison 42
Table 3-11 Peak Flows at Key Locations 43
Table 3-12 Runoff Volume at Key Locations 44
Table 3-13 Manning's n-Values 45
Table 3-14 Alternative Options Descriptions 51
Table 3-15 Detention Basin Summary 51
Table 3-16 LID Detention Basin Summary 53
Table 3-17 100-Year Channel Velocities 55
Table 3-18 100-Year Channel Discharges 56
Table 3-19 Proposed Channel Geometry 57
Table 3-20 Proposed Crossing Structures 58
Table 3-21 Special Unit Cost 61
Table 3-22 Weld County Land Sales Data for Project Area 61
Table 3-23 Alternative Plan Cost Estimate Summary 63
Table 3-24 Potential Drainage Issues and Opportunities GOS 65
Table 3-25 Potential Drainage Issues and Opportunities GO 66
Table 3-26 Potential Drainage Issues and Opportunities GOR 67
Table 3-27 Alternatives Evaluation Matrix 70
Table 3-28 Recommended Plan Cost Estimate 71
Table 4-1 Master Plan Cost Estimate Summary 74
Table 4-2 Master Plan Peak Flows Summary 75
Table 4-3 LID Suitability by Land Use 78
Table 4-4 Master Plan Detention Summary (100-yr Event Results) 79
Table 4-5 Existing Detention Summary 80
Table 4-6 Master Plan Channel Improvements Summary 83
Table 4-7 Master Plan Crossing Improvements Summary 85
Table 4-8 Major Drainageway 100 Cost Estimate 87
Table 4-9 Major Drainageway 200 Cost Estimate 88
Table 4-10 Major Drainageway 500 Cost Estimate 90
Table 4-11 Major Drainageway 600 Cost Estimate 91
Table 4-12 Major Drainageway 700 Cost Estimate 92
Table 4-13 Major Drainageway 800 Cost Estimate 93
Table 4-14 Major Drainageway 1000 Cost Estimate 95
Table 4-15 Major Drainageway 1100 Cost Estimate 96
Table 4-16 Major Drainageway 1200 Cost Estimate 97
Table 4-17 Major Drainageway 1300 Cost Estimate 98

LIST OF APPENDICES

Appendix A Project Correspondence
A-1 Meeting Notes
A-2 Public Meetings
A-3 City Comments

Appendix B Hydrologic Analysis
B-1 Hydrology Interactive Map
B-2 Storm Hydrographs for Key Design Points
B-3 Design Rainfall Distribution Tables
B-4 Multiple CUHP and SWMM Scenarios
B-5 Existing and Future Land Use
B-6 100-Year Existing CUHP Input Parameters
B-7 100-Year Existing CUHP Output
B-8 100-Year Future CUHP Input Parameters
B-9 100-Year Future CUHP Output
B-10 Peak Discharges
B-11 Peak Volumes
B-12 100-Year Future SWMM Input
B-13 100-Year Existing SWMM Output
B-14 100-Year Future SWMM Output

Appendix C Hydraulic Analysis
C-1 Existing Conditions (GOS)
C-2 Existing Conditions (GO)
C-3 Existing Conditions (GOR)

Appendix D Wetland and Riparian Inventory
D-1 Potential Wetland and Riparian Zones Map
D-2 Oil and Gas Wells Map
D-3 Geologic Map

Appendix E Alternatives Analysis
E-1 Alternatives Map
E-2 MHFD Detention Workbooks
E-3 HY-8 Culvert Sizing
E-4 SWMM Inputs/Outputs Option 1: Do Nothing
E-5 CUHP - Option 4 LID
E-6 Alternatives Results Summary
E-7 MHFD Cost Estimate Workbooks
E-8 Watershed Development Area Data
E-9 REM Analysis

Appendix F Conceptual Design Information
F-1 Master Plan CUHP
F-2 Master Plan Detention
F-3 Master Plan SWMM Input
F-4 Master Plan SWMM Output
F-5 Master Plan Hydrology Summary
F-6 Master Plan HY-8 Culverts
F-7 Master Plan Cost Estimate

Appendix G Master Plan Maps
G-1 Major Drainageway 100 (GOS)
G-2 Major Drainageway 200, 300 (GOS)
G-3 Major Drainageway 500, 600, 800 (GOS)
G-4 Major Drainageway 700, 800 (GO)
G-5 Major Drainageway 900, 1000, 1100, 1200, 1300 (GOR)

Appendix H Funding Sources

CHAPTER 1 - PRELIMINARIES

1.1 Authorization

Matrix Design Group, Inc. (Matrix) contracted with the City of Greeley (Greeley) to complete the Oklahoma Master Basin Study, also known as an update to the Comprehensive Drainage Plan (CDP) for the Oklahoma & South Basins. This project is solely sponsored by Greeley. The Agreement for this project (Agreement No. FW23-08-073-4) was executed April 16, 2024.

1.2 Purpose and Scope

This study provides the framework for the Oklahoma and South Basin to:

- Protect water quality from degradation due to urbanization,
- Define and preserve floodplains from encroachment prior to development,
- Preserve natural channel function, character and habitat,
- Master plan and budget drainageway improvements, and
- Program regional detention facilities, with a preference for full-spectrum detention where possible.

This study applies updated mapping and land use projections, conducts field stream assessments, develops alternative drainageway planning concepts, and prepares a concept design of facilities for implementation.

The Oklahoma and South watershed is largely undeveloped at this time. The impact of future development on the watersheds without mitigation is expected to significantly increase the frequency and severity of stormwater runoff over existing levels. This increase in runoff will not only provide an increased threat of flooding and structural damages in the future, but also have significant negative impacts on water quality and stream stability. Alternatives have been developed to offset the impacts of future development by focusing on reducing flood magnitudes, increasing conveyance capacities, removing pollutants from the runoff, and stabilizing the stream against erosion.

This report is provided to update hydrologic information for existing and future conditions in the Oklahoma and South Basins. The hydrologic information documented in this study can be used by Greeley as a guideline for future developments within the watersheds and provide the basis for agreements of controlled hydrology at jurisdictional boundaries.

Tasks to define existing and future drainage conditions hydrology, and evaluate proposed drainage improvement concepts include:

1. Meet regularly with the sponsors to obtain background information, present preliminary study findings, and discuss results of the planning tasks.
2. Contact agencies and/or individuals that have knowledge or specific interest in the study area.
3. Collect existing information, including previous Master Drainage Plans (MDPs) or site-specific drainage studies for proposed development.
4. Obtain GIS information from project sponsors, such as future land use mapping.
5. Inventory and compile information on the existing drainage system, including high-level geomorphic stream assessments.
6. Prepare hydrologic analyses for existing and future development watershed conditions. Determine subbasin boundaries and parameters in accordance with Greeley and Mile High Flood District (MHFD) criteria. Develop existing and future (fully developed) conditions hydrologic models using CUHP 2005, version 2.0.1 and EPA SWMM 5.2, version 5.2.4. Compile this information in an interim Baseline Hydrology Report for review by project sponsors.
7. Conduct hydraulic analyses along the major drainageway to ascertain capacities of existing structures, determine location of flood hazards, and analyze hydraulic impacts of future peak discharges.
8. Develop drainageway improvement alternatives that address future drainage impacts.
9. Evaluate alternatives based on criteria, estimated construction costs, potential flood risk reduction, and planning constraints, and recommend alternatives for each reach of the drainageways. Compile this information in an interim Alternatives Analysis Report for review by project sponsors.
10. Sponsor acceptance of the selected alternative via a Selected Plan.
11. Prepare a Concept Design Report which further evaluates the feasibility of the selected improvements. Include detailed cost estimates of concept design improvements.

There are no existing regulatory floodplains within the Study Area. The major problems identified in the Oklahoma & South Basins are due to the expected significant increase in flows under future conditions without mitigation. Alternatives to protect the community include reducing the future flood hazard areas with a policy of floodplain protection and maintenance, flood insurance, structural drainage improvements or Low Impact Development practices to reduce flood magnitudes, and local protection measures.

A major component of this plan is to increase the capacity of transportation crossings along the major drainageways of Oklahoma & South Basins to 100-year capacity. Most of the major highway crossings in the lower portion of the watersheds are undersized for a major flood event, even under existing land use development conditions. Flooding problems are known to exist in the lower portion of the watersheds at the Great Western Railway embankment and State Highway 257. The existing culverts become full of debris and unable to convey more than the low flow condition. Backwater upstream of the embankments where existing culverts reach capacity could flood nearby properties.

1.3 Planning Process

It was initially decided to complete the CDP in three separate phases due to funding constraints. The first of these was the 2022 *Comprehensive Drainage Plan for Oklahoma & South Basins* (GOS). A kickoff meeting with the City of Greeley took place on March 30, 2022. Progress meetings were held once or twice per month (as needed) to update sponsors on the project status. Online public meetings were conducted on June 29, 2022, and November 16, 2022.

Following the completion of the first report, the second report, 2024 *Comprehensive Drainage Plan Oklahoma Basins 700 & 800* (GO) was developed. A kickoff meeting with the City of Greeley was held on

January 31, 2024. Progress meetings were held once or twice per month (as needed) to update sponsors on the project status. Public workshops were not included in that study.

The final phase includes an analysis of the remaining (primarily north of the Oklahoma Drainageway) area within the Oklahoma Basin (GOR) and includes compiling all three phases into this single report. A kickoff meeting with the City of Greeley took place on October 25, 2024. Progress meetings were held once per month (as needed) to update sponsors on the project status. Meeting minutes are included in Appendix A.

Updated hydrology documented in this report represents an updated analysis of the study area using the most current version of CUHP, and version 5.2 of EPA SWMM since the CUHP multiple runs functionality does not always work with the latest version of SWMM (5.2.4). The analysis examined existing, proposed, and planned developments in the study area.

Hydrologic mapping and modeling were performed from scratch for this study since detailed studies did not exist for the Oklahoma & South Basins. The basin delineations were based upon 1-foot contour mapping. Subbasins were further subdivided to calculate peak flows at critical locations or that were larger than 130 acres. The Oklahoma & South Basins were modeled using a 2-hour rainfall storm, with no area corrections, per criteria.

Three hydrologic models were produced for this study:

1. Baseline hydrology for existing conditions,
2. Baseline hydrology for future fully-developed conditions,
3. Master Planned hydrology with future regional detention to the extent possible to match historic (undeveloped) release rates.

1.4 Mapping and Surveys

Mapping information for this project was provided by several agencies. Where multiple data sources existed, attempts were made to use the best available data. The following describes the various mapping components and their sources.

Topographic Contours

GOS used a one-meter, LiDAR-derived topographic contour data collected in the fall of 2018, and was used to delineate drainage basin boundaries. The Colorado Water Conservation Board (CWCB), the Federal Emergency Management Agency (FEMA), and the United States Geological Survey (USGS) partnered to provide this data as part of the Colorado Hazard Mapping (CHAMP) program.

GO used a one-meter, LiDAR-derived topographic contour data collected in 2013, and was used to delineate drainage basin boundaries. This was produced by the United States Geological Survey (USGS).

GOR used a two-foot, LiDAR-derived topographic contour data collected in 2023, and was used to delineate drainage basin boundaries. This was produced by the city of Windsor in 2023.

Aerial Photography

Color aerial ortho-photography from 2018 and 2024 was available for the study area through Nearmap. The majority of the watershed was captured in half-foot pixel resolution.

Hydrologic Soil Groups

Soils information was obtained from the U.S. Department of Agriculture (USDA) Natural Resources Conversation Service (NRCS) Soil Survey Geographic Database (SSURGO) accessed December 2024.

Base Mapping

Base mapping information including street centerlines, storm drainage infrastructure, parcels, existing land use, zoning, and jurisdictional boundaries were provided by Greeley and Windsor. Future land use was digitized from figures published in the *City of Greeley 2060 Comprehensive Plan* and *2016 Windsor Comprehensive Plan*. Section 2.3.3 of this report provides a more detailed discussion of existing land use data sources. Linear water features were obtained from the National Hydrography Dataset.

Coordinate System and Datum

All GIS mapping and data for this study were developed using the Colorado State Plane, North Zone coordinate system in U.S. feet. The horizontal datum is NAD83 HARN and the vertical datum is NAVD88.

Survey information

Matrix completed three field surveys of existing roadway crossings in May 2022, April 2024, and November 2024.

1.5 Acknowledgements

A Technical Advisory Committee (TAC) made up of the project sponsors provided guidance during the study process. The TAC met regularly during the course of the project study. Representatives who were directly involved with this study are listed below:

Table 1-1 Project Participants and Affiliations

Name	Representing	Role
Aaron Stines	City of Greeley	Project Manager
Karen Reynolds	City of Greeley	Stormwater Manager
Brian Hathaway	City of Greeley	Water Quality and Regulations Manager
Brian Fischer	City of Greeley	Previous Project Manager
Andrew Fisher	City of Greeley	Previous Project Manager
Drew Beck	Matrix Design Group	Officer in Charge
Ben Liu	Matrix Design Group	Project Manager
Megan Sawyer	Matrix Design Group	Quality Control
Sabastian Ortega	Matrix Design Group	Project Engineer
Ellie Garza	Matrix Design Group	Landscape Architect
Chris Martin	Matrix Design Group	GIS Manager
Nastaran Khodaei	Matrix Design Group	GIS Analyst
Sarah Beckingham	Matrix Design Group	GIS Analyst
Seth Legan	Matrix Design Group	GIS Analyst
Ryan DeGroot	Matrix Design Group	Project Engineer

CHAPTER 2 - THE WHY

2.1 Overview

2.1.1 Project Area

The total project area is 12.40 square miles, with the Oklahoma Basin comprising 11.22 square miles and the South Basin comprising 1.18 square miles. This study includes the entirety of both the Oklahoma Basin and South Basin upstream of State Highway (SH) 257. The South Basin is entirely within the City of Greeley and the Long Range Expected Growth Area (LREGA), but much of the Oklahoma Basin lies within the Town of Windsor and unincorporated Weld County. Figure 2-1 shows a vicinity map of the watersheds and the nearby municipalities.

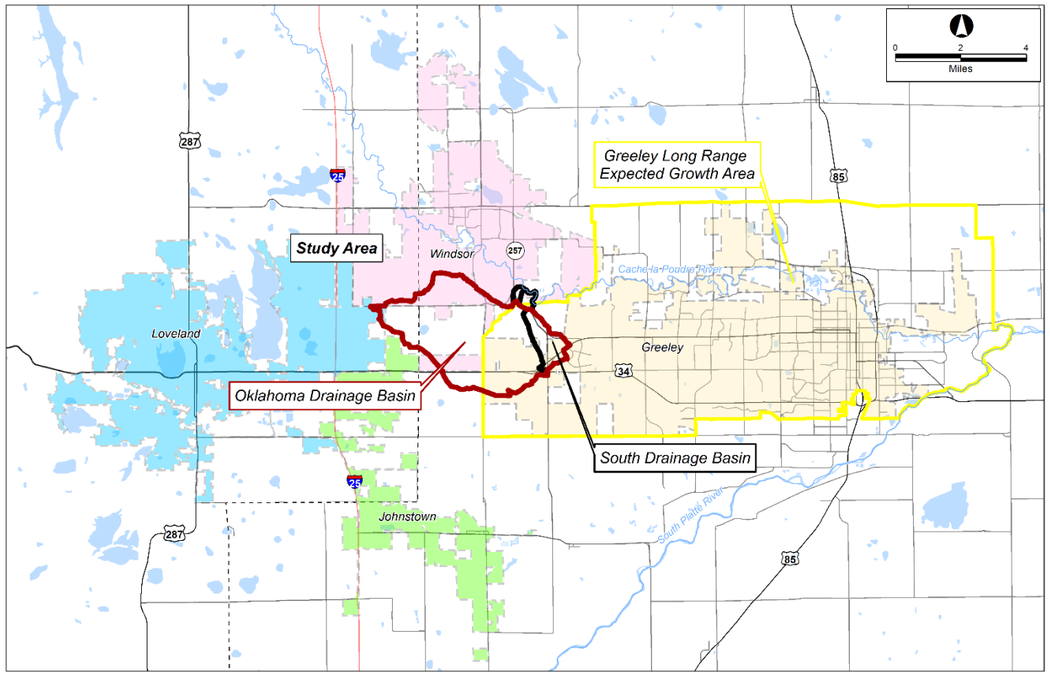


Figure 2-1 Vicinity Map

General topography of the watersheds slopes from high ground in the west and south towards the Cache la Poudre River in the northeast. Both watersheds have an average slope of approximately 2 percent. All elevations are in the vertical datum NAVD88. The highest point of the South Basin is the interchange of United States (US) Highway 34 and SH-257 at an elevation of 5035 feet above sea level; and the lowest point is the South Drainageway immediately downstream of SH-257 at an elevation of 4780 feet above sea level. The highest elevation of the Oklahoma Basin is 5060 feet above sea level; and the lowest point is the Oklahoma Drainageway at the SH-257 bridge at an elevation of 4755 feet above sea level.

As shown in Figure 2-2, this study was completed in three distinct phases (noted as study areas in the figure). The following acronyms are used as shorthand when describing each phase. GOS, short for Greeley Oklahoma South, was the first phase completed in 2023 and included the portions of the Oklahoma and South Basins that are within Greeley's LREGA. In conjunction with an intersection improvement project at US-34 and Weld County Road (WCR) 17, GO, short for Greeley Oklahoma, was the second phase completed in 2024 and included only Major Drainageways 700 and 800 of the Oklahoma Basin. GOR, short for Greeley Oklahoma Remaining, was the final phase and includes the remaining portion of the Oklahoma Basin. The abbreviation GOM, short for Greeley Oklahoma Master (Basin), is used to signify that the entire study area is being discussed.

Major Drainageways have been defined as reaches that include more than 130 acres of contributing area and serve as regional pathways for storm runoff. Figure 2-3 shows the major drainageways of this study. Reaches within each major drainageway are numbered from downstream to upstream. The South Basin includes the main drainageway, identified as 100, and one tributary, named 142. The Oklahoma Basin includes the Oklahoma Drainageway, identified as 1000, and 10 significant tributaries. Tributaries 200, 300, 500, 600, 700, 800, and 900 drain areas south of the Oklahoma Drainageway, and tributaries 1100, 1200, and 1300 drain areas north of the Oklahoma Drainageway. The largest tributary systems have smaller but significant tributaries of their own: Major Drainageways 224 and 244 are tributary to 200, and major drainageway 1232 is tributary to 1200.

The study area encompasses multiple city boundaries, resulting in the use of elevation data from various years. For the 2023 GOS study area, the most recent available elevation data was from 2018. The 2024 GO Study Area relied primarily on 2013 elevation data, as it was the most up-to-date available for that region. The GOR study area presented a mix of data sources, with the majority using 2023 elevation data, while some portions were limited to 2013 data. Figure 2-4 shows how the different elevation data sets are spread across the study area.

Much of the study area is undeveloped. The flatter upstream areas have historically been used for agriculture, and there are a limited number of homesteads within the study area. Plans for mixed-use developments are currently progressing for the areas south of US-34 and along the WCR-17 corridor. The areas within the Town of Windsor have largely been developed, with residential neighborhoods north of the Oklahoma Drainageway and business/industrial parks northwest of the US-34 and WCR-17 intersection. Within the LREGA, the areas immediately around the drainageways have remained natural. Field assessments indicate that the drainageways in the project area are generally stable under the existing flow regimes. However, many of these drainageways have likely experienced local instabilities, resulting in steeper banks that shift laterally and headcuts that propagate an incised drainageway upstream. Per the Colorado Oil and Gas Conservation Commission (COGCC), there are 311 oil and gas wells listed with the study area. Most of those are inactive sites, but there are several active energy extraction operations within the Oklahoma Basin. A map of the wells within the study area is included as Figure D-2 in Appendix D.

2.1.2 Relevant Information from Past Plans

Both watersheds were previously included in the Town of Windsor's growth management boundary, and the *Town of Windsor Master Drainage Plan* was completed in 2003. That previous study was performed at a much larger scale than this current study, with subbasin areas exceeding 1000 acres in the hydrologic models. The recommended master plan improvements focused on improvements to crossing structures along the South Drainageway and Oklahoma Drainageway at SH-257, the Great Western Railroad (GWR), and WCR-17. They also recommended formalizing a regional detention pond immediately west of WCR-17 along the main Oklahoma Drainageway.

LARIMER COUNTY

Town of Windsor

E Crossroads Blvd

Overall Study Area
12.40 sq mi

City of Loveland

Unincorporated
Larimer County

GOR Study Area 2025
6.73 sq mi

Unincorporated
Weld County

Cache la Poudre River

Oklahoma Drainageway

South Drainageway

GOS Study Area 2023
4.35 sq mi

City of
Greeley

0 ½ 1
Miles

BUS
34

Oklahoma Drainage Basin
11.22 sq mi

South Drainage Basin
1.18 sq mi

Town of Johnstown

Great Western Railway

GO Study Area 2024
1.32 sq mi

34

257

WELD COUNTY

17

Legend

- Study Reaches
- River/Creek/Ditch
- Railroad
- Study Area
- Major Drainage Basin
- Town of Windsor
- City of Greeley
- Town of Johnstown
- City of Loveland
- County Boundary
- Greeley LREGA

No.	DATE	DESCRIPTION	APPR.

Matrix
Excellence by Design

designed by: SL
drawn by: SL
checked by: BL
project no.: 24.906.009
date: 07/10/2025

City of Greeley Colorado

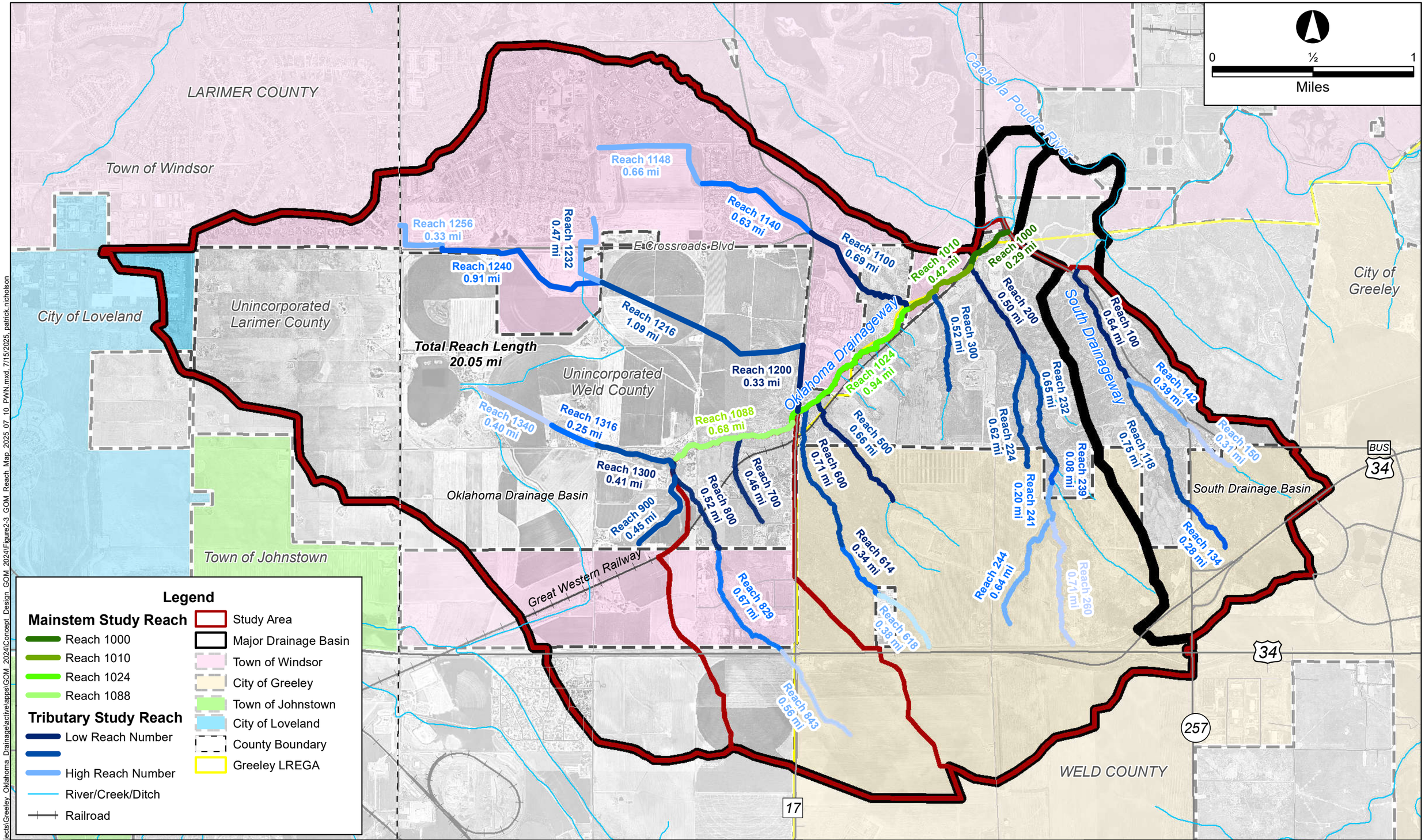
CITY OF GREELEY

COMPREHENSIVE DRAINAGE PLAN
OKLAHOMA & SOUTH BASINS

STUDY AREA MAP

FIGURE
2-2

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Legend

Mainstem Study Reach
- Reach 1000
- Reach 1010
- Reach 1024
- Reach 1088

Tributary Study Reach
- Low Reach Number
- High Reach Number
- River/Creek/Ditch
- Railroad

- Study Area
- Major Drainage Basin
- Town of Windsor
- City of Greeley
- Town of Johnstown
- City of Loveland
- County Boundary
- Greeley LREGA

No.	DATE	DESCRIPTION	APPR.

Matrix Excellence by Design

designed by: SL
drawn by: SL
checked by: BL
project no.: 24.906.009
date: 07/10/2025

City of Greeley

CITY OF GREELEY

COMPREHENSIVE DRAINAGE PLAN
OKLAHOMA & SOUTH BASINS

REACH MAP

FIGURE
2-3

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LARIMER COUNTY

Town of Windsor, Two-Feet Resolution Digital Elevation Model (DEM) - 2023

Town of Windsor

City of Loveland

Unincorporated Larimer County

U.S. Geological Survey, One-Meter Resolution Digital Elevation Model (DEM) produced through the 3D Elevation Program (3DEP) - 2013

Town of Johnstown

E Crossroads Blvd

GOR Study Area 2025

Unincorporated Weld County

Great Western Railway

GO Study Area 2024

Cache la Poudre River

U.S. Geological Survey, One-Meter Resolution Digital Elevation Model (DEM) produced through the 3D Elevation Program (3DEP) - 2018

Oklahoma Drainageway

South Drainageway

GOS Study Area 2023

City of Greeley

BUS 34

34

257

17

WELD COUNTY

0 ½ 1 Miles

Legend

- 2023 DEM
- 2018 DEM
- 2013 DEM
- Study Reaches
- River/Creek/Ditch
- Railroad
- Study
- Major Drainage Basin
- Town of Windsor
- City of Greeley
- Town of Johnstown
- City of Loveland
- County Boundary
- Greeley LREGA

No.	DATE	DESCRIPTION	APPR.

Matrix Excellence by Design

designed by: SL
drawn by: SL
checked by: BL
project no.: 24.906.009
date: 07/10/2025

City of Greeley Colorado

CITY OF GREELEY

COMPREHENSIVE DRAINAGE PLAN
OKLAHOMA & SOUTH BASINS

ELEVATION DATA COVERAGE

FIGURE
2-4

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2.2 Plan Horizon

This report follows the master plan developed and refined with the *Imagine Greeley process.* Future conditions for the hydrologic models reflect the anticipated land use shown in the *City of Greeley 2060 Comprehensive Plan*, which was adopted in 2018, and the *2024 Town of Windsor Comprehensive Plan,* which represented a 10 to 20-year development road map.

2.3 Existing Conditions

2.3.1 Reach Description

Each major drainageway has been subdivided into reaches for analysis purposes based on stream characteristics, flow changes, or existing constraining features such as roadways or crossings. This resulted in 36 study reaches with a total approximate length of 20 miles. Figure 2-3 shows these reaches with respective reach lengths, watershed boundaries, and current jurisdictional limits. All existing study reaches are in either a natural state or constructed open channel. Most study reaches are ephemeral with no base flows, but the Oklahoma Drainageway appears to have base flows throughout the year. Figure D-1 in Appendix D shows the potential wetlands and riparian zones within the study area. The following narrative provides a description of each reach.

Major Drainageway 100: South Basin Primary Tributary

Major Drainageway 100 is the main drainageway for the South Basin, covering approximately 9,300 feet (Sta. 0+00 – 92+64) from the existing culvert crossing of the private road immediately downstream of the northern SH-257 culvert crossing to a short distance upstream of the eastern SH-257 culvert crossing. The downstream portion of this reach, located within the Shur View property, has a defined valley shape with established wetland and shrub riparian zones and may be an important wildlife corridor.

For the purposes of hydraulic analysis, major drainageway 100 was divided into three reaches based on stream characteristics, flow changes, or existing constraining features such as roadways or crossings. Reach 100 starts at crossing structure 101 on the private road (Sta. 0+00) and ends at the confluence with the Secondary Tributary at station 38+25. The channel throughout Reach 100 is broad with moderate side slopes. Vegetation consists primarily of native grasses with some tree clusters as seen in Figure 2-5.

Reach 118 starts at station 38+25 and ends just before SH-257 at station 77+80. The channel becomes more defined with relatively steep banks and healthy vegetation is present throughout the Reach 118 as shown in Figure 2-6. Reach 134 starts at crossing structure 104 (Sta. 77+80) and extends upstream to station 92+64. Reach 134 is best described as a broad plain with no defined flow path as seen in Figure 2-7.



Figure 2-5 Reach 100



Figure 2-6 Reach 118



Figure 2-7 Reach 134



Figure 2-8 Reach 142

Tributary 142: South Basin Secondary Tributary

Tributary 142 is a secondary drainageway, covering approximately 3,700 feet from the confluence with Reach 100 to a short distance upstream of the SH-257 culvert crossing, station 0+00 to 36+80. This reach has a defined channel shape with established wetland and shrub riparian zones and may be an important wildlife corridor. For the purposes of hydraulic analysis Tributary 142 was divided into two reaches, Reach 142 and Reach 150. Reach 142 starts at station 0+00 at the confluence with Reach 100 and extends upstream to SH-257 at station 20+56. The channel throughout the reach is confined with some steep or tall banks but is stable and healthy vegetation is present, see Figure 2-8.

Reach 150 starts at crossing 103, station 20+56, and extends upstream to station 36+80. Reach 150 has thick riparian vegetation with some Cottonwoods and the channel is more confined than Reach 142. See Figure 2-9 for typical conditions in Reach 150.



Figure 2-9 Reach 150

Major Drainageway 200: Oklahoma Basin Primary Tributary

Major Drainageway 200 is the easternmost drainageway within the Oklahoma Basin, covering approximately 11,300 feet (Sta. 0+00 – 113+12) from the confluence with the Oklahoma Drainageway to immediately downstream of the US-34 culverts. This reach has an incised channel with limited wetland zones in the bottom of the channel. Major drainageway 200 was divided into five reaches, described from downstream to upstream below.

Reach 200 starts at station 0+00 near crossing 201 and extends upstream to the confluence with Reach 224 at station 26+60. The channel in this reach is confined with a wide bottom. Field observations noted signs of instability throughout the reach including headcuts, minor bank scour, and bank erosion. Most of these observations were made at tributaries or outfalls rather than on the main channel. Vegetation found in this reach is mostly native grass. Figure 2-10 shows typical channel conditions for Reach 200.

Reach 232 starts at the confluence with Reach 224 at station 26+60 and extends upstream to station 60+77 where flows from subbasin 236 and subbasin 240 enter the main drainageway. The channel in this reach is confined and mostly vegetated with grasses, see Figure 2-11.

Reach 239 starts at station 60+77 and ends at station 64+89 where subbasin 256 enters the drainageway. This reach is similar to Reach 232 but is slightly narrower. Figure 2-12 shows typical reach conditions.

Reach 241 starts at station 64+89 and ends at the confluence with Reach 244, station 75+46. Field observations indicate this reach is stable and has good vegetation and trees present. Figure 2-13 shows an example of typical reach conditions.

Reach 260 starts at station 75+46 at the confluence with Reach 244 and extends upstream to station 113+12 near US-34. Field observations indicate the channel is stable. The channel in Reach 260 is in a narrow and confined valley with steep sides. Healthy vegetation is present throughout the reach and field observations indicate the channel is stable. Figure 2-14 shows typical channel conditions.

Reach 224: Oklahoma Basin Secondary Tributary

Reach 224 is a secondary drainageway, covering approximately 3,200 feet from the confluence with Reach 200 at station 0+00 upstream to station 32+49. This reach has an incised channel without any identified wetland or riparian zones, see Figure 2-15.

Reach 244: Oklahoma Basin Secondary Tributary

Reach 244 is a secondary drainageway, covering approximately 3,400 feet from the confluence with Reach 260 at station 0+00 upstream to a short distance downstream end of the US-34 culvert, station 34+01. This reach has an incised channel without any identified wetland or riparian zones. Figure 2-16 shows typical reach conditions.



Figure 2-10 Reach 200



Figure 2-11 Reach 232

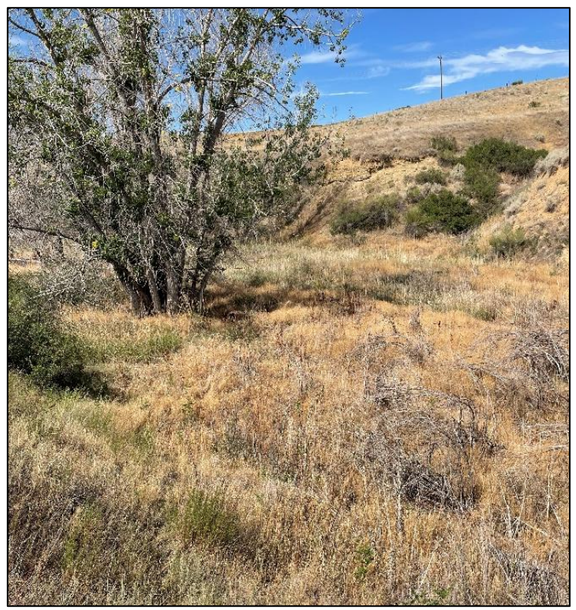


Figure 2-12 Reach 239



Figure 2-13 Reach 241



Figure 2-14 Reach 260



Figure 2-15 Reach 224



Figure 2-16 Reach 244

Reach 300: Oklahoma Basin Primary Tributary

Reach 300 is the second major drainageway from the east within the Oklahoma Basin, covering approximately 2,700 feet (Sta. 0+00 – 27+30) from the confluence with the Oklahoma Drainageway upstream towards the south. Near the downstream end is an existing GWR culvert crossing. This reach has an incised channel with limited wetland zones in the bottom of the channel.

Reach 500: Oklahoma Basin Primary Tributary

Reach 500 is the third major drainageway from the east within the Oklahoma Basin, covering approximately 3,500 feet (Sta. 0+00 – 34+68) from the confluence with the Oklahoma Drainageway upstream towards the southeast. Near the downstream end is an existing GWR culvert crossing. This reach has a broad channel bottom with tall banks. There is localized bank erosion in some areas, but most banks are stable. Vegetation is mainly native grasses as seen in Figure 2-17.



Figure 2-17 Reach 500

Major Drainageway 600: Oklahoma Basin Primary Tributary

Major Drainageway 600 is the fourth major drainageway from the east within the Oklahoma Basin, covering approximately 6,900 feet from the confluence with the Oklahoma Drainageway to a short distance downstream of the US-34 culverts. Near the downstream end are the existing WCR-17, GWR, and private driveway culvert crossings. Major drainageway 600 was divided into three reaches for analysis purposes based on stream characteristics, flow changes, or existing constraining features such as roadways or crossings.

Reach 600 starts at station 0+00 near WCR-17 and extends upstream to station 37+25. The channel in this reach is wide and shallow and vegetation consists of mostly native grasses. Figure 2-18 shows the typical channel conditions.

Reach 614 starts at station 37+25 and ends at station 54+96. The channel here is narrower than Reach 600 but still broad and shallow. The channel is mostly vegetated with native grass as seen in Figure 2-19.

Reach 618 starts at station 54+96 and ends at station 74+88 near US-34. There is an existing salvage yard with a detention pond built in the channel, see Figure 2-20. The channel becomes poorly defined upstream of the salvage yard.



Figure 2-18 Reach 600



Figure 2-19 Reach 614



Figure 2-20 Reach 618 Existing Detention Basin

Reach 700: Oklahoma Basin Primary Tributary

Reach 700 is the only defined reach for Major Drainageway 700, which is the first tributary west of WCR-17. It covers approximately 2,400 feet (Sta. 0+00 – 24+00), extending from the Oklahoma Drainageway south to Gratitude Lane. This drainageway is generally poorly defined, although the short section between WCR-60 and the Great Western Railway appears to feature a constructed ditch and small storage area as seen in Figure 2-21 and Figure 2-22. Immediately upstream of the Great Western Railway there is a small constructed embankment across the drainageway (Figure 2-22), and farther upstream a fenced off area covered in bushes and trees, seen in Figure 2-23.



Figure 2-21 Reach 700



Figure 2-22 Reach 700



Figure 2-23 Reach 700

Reach 800: Oklahoma Basin Primary Tributary

Major Drainageway 800, which is the second tributary west of WCR-17, contains three reaches. Reach 800 is the downstream-most reach, extending approximately 2,800 feet (Sta. 0+00 – 28+00) from the Oklahoma Drainageway south to the existing Town of Windsor boundary. The confluence of Reach 800 and the Oklahoma Drainageway is a constructed wet pond as seen in Figure 2-24. This pond also collects runoff from another Major Drainageway 900 to the west. Large portions of Reach 800 are covered with wetland vegetation, seen in Figure 2-25. There is an existing stagnant pond/wetland area immediately upstream of Gratitude Lane, shown in Figure 2-26. Nearby property owners mentioned that this used to be a more significant wet pond with clean (flowing) water.



Figure 2-24 Reach 800



Figure 2-25 Reach 800



Figure 2-26 Reach 800



Figure 2-27 Reach 829

Reach 829: Oklahoma Basin Primary Tributary

Reach 829 is the middle reach of Major Drainageway 800, comprising the portion within the existing Town of Windsor limits. Reach 829 extends approximately 3,500 feet (Sta. 28+00 – 63+00) from the Windsor boundary southeast to US-34. The downstream portion of Reach 829 is a large constructed detention basin for the Southgate development. As shown in Figure 2-27, this detention basin appears to have received a fair amount of sedimentation since construction and is currently full of reedy vegetation. Between the constructed detention basin and Southgate Drive, the existing drainageway does not appear to be stable, the channel profile and alignment appear to be changing due to erosive water forces as shown in Figure 2-28.

The section between Southgate Drive and the Kia access road features a small rectangular concrete low-flow channel and three drop structures that extend across the floodplain (Figure 2-29). This existing low-flow channel is overgrown and damaged. Upstream of the Kia access road, an existing 48-in RCP storm drain conveys smaller flows, with overflows traveling over the grassed surface. This 48-in RCP connects to another rectangular concrete low-flow channel, seen in Figure 2-30, that extends to US-34. Portions of this concrete are failing due to channel bed movement.



Figure 2-28 Reach 829



Figure 2-29 Reach 829



Figure 2-30 Reach 829

Reach 843: Oklahoma Basin Primary Tributary

Reach 843 is the upstream-most reach of Major Drainageway 800, extending approximately 2,900 feet (Sta. 63+00 – 92+00) from US-34 southeast to existing farming fields. Between the US-34 and WCR-17 culverts, the drainageway has a poorly defined earthen low-flow channel with large portions covered in vegetation, seen in Figure 2-31. Upstream of WCR-17, there is very little channel definition through the actively farmed fields (and limited wetland zones) as shown in Figure 2-32.



Figure 2-31 Reach 843



Figure 2-32 Reach 843

Reach 900: Oklahoma Basin Primary Tributary

Reach 900 is the only defined reach for Major Drainageway 900, extending from the Great Western Railway northeast to the constructed wet pond at the confluence of Reaches 800 and 900 (Figure 2-24). This drainageway is a naturally-formed valley with defined floodplain banks. As shown in Figure 2-33, the broad channel generally contains dense wetland vegetation with the occasional small tree or bush, and grasses in the upland banks. This drainage basin extends south of US-34 but there were no observed channel features in the actively farmed land until downstream of the railway embankment.



Figure 2-33 Reach 900

Major Drainageway 1000: Oklahoma Basin Mainstem

Major Drainageway 1000 is the mainstem conveyance path for the Oklahoma Basin, collecting runoff from the various tributaries and conveying storm water northeast to the confluence with the Cache la Poudre River. The mainstem had flowing water during each of the four field visits completed for this study, suggesting that there is perennial baseflow. Major Drainageway 1000 is split into four reaches, described from downstream to upstream below.

Reach 1000 is the downstream-most reach, extending from the study boundary at SH-257 southwest to the confluence with Major Drainageway 200, which is located a short distance downstream of the Great Western Railway. Reach 1000 contains two distinct segments. As shown in Figure 2-34, the downstream segment of Reach 1000 is relatively narrow and confined, with the channel incised more than five feet below the surrounding lands. The valley bottom is heavily vegetated with both mature trees, shrubs, and natural grass. There was also large debris such as rocks and concrete pieces within the channel. Some of the exposed banks were nearly vertical, such as the one shown in Figure 2-35, suggesting that this reach is not stable.

The upstream segment of Reach 1000 is less confined. As shown in Figure 2-36, this upstream segment has mildly sloped banks and the vegetation is dominated by dense grasses. The low-flow channel is not well-established and likely moves around laterally within the broader valley.



Figure 2-34 Reach 1000 Downstream Segment



Figure 2-35 Reach 1000 Eroded Banks



Figure 2-36 Reach 1000 Upstream Segment

Reach 1010: Oklahoma Basin Mainstem

Reach 1010 extends from the confluence with Major Drainageway 200 southwest to the confluence with Major Drainageway 1100. We were not permitted access to this reach, but based on aerial analysis it appears to be similar in character to Reach 1024, with a relatively large naturally-formed valley and a meandering low-flow channel. Vegetation along the bottom of the channel is notably greener and denser due to ready access to water.

Reach 1024: Oklahoma Basin Mainstem

Reach 1024 extends from the confluence with Major Drainageway 1100 southwest to the confluence with Major Drainageway 600, which is located just west of WCR-17. Reach 1024 contains two segments. The downstream segment, which comprises most of Reach 1024, features a relatively large naturally-formed valley with a meandering low-flow channel. As shown in Figure 2-37, vegetation is primarily grasses with a clear riparian zone along the channel bottom and dryland grasses higher up the banks. The valley also contains more isolated patches of wetland zones and trees. The low-flow channel does not appear to be fixed in place, resulting in periodic exposed vertical banks along the southeast side of the channel, such as the cut bank shown in Figure 2-38. The upstream segment of Reach 1024 would likely look like the downstream segment, except the manmade influences of the WCR-17 embankment and nearby rural homesites have introduced some terrain controls. As shown in Figure 2-39, this upstream segment is well-vegetated but more constrained and contains some vertical banks.



Figure 2-37 Reach 1024 Downstream Segment



Figure 2-38 Reach 1024 Cut Banks



Figure 2-39 Reach 1024 Upstream Segment

Reach 1088: Oklahoma Basin Mainstem

Reach 1088 extends from the confluence with Major Drainageway 600 west to the confluence of Major Drainageways 800, 900, and 1100. These three tributaries combine in a constructed wet pond that is located a short distance west of Brookside Dr. This wet pond is the upstream end of the mainstem Oklahoma Drainageway. The wet pond appears to hold water throughout the year but does not appear to be designed as a storm detention facility, and is not included within this study's hydrograph routing models.

Reach 1088 contains two segments. The downstream segment, which comprises most of Reach 1024, features a relatively large naturally-formed valley with a meandering low-flow channel. The vegetation is primarily grasses with a clear riparian zone along the channel bottom and dryland grasses higher up the banks. The valley also contains more isolated patches of wetland zones and trees. As shown in Figure 2-40, the low-flow channel does not appear to be stable, resulting in exposed vertical banks along the south side of the channel. The shorter upstream segment, which is located between Brookside Dr. and the wet pond, features a broad constructed valley with mild side slopes. As seen in Figure 2-41, the vegetation is primarily mowed grass with some wetland areas in the channel bottom. There is a boulder drop structure at the outlet of the wet pond.



Figure 2-40 Reach 1088 Downstream Segment



Figure 2-41 Reach 1088 Upstream Segment

Reach 1100: Oklahoma Basin Primary Tributary

Major Drainageway 1100, which is the downstream-most tributary on the north side of the Oklahoma Drainageway, contains three reaches. Reach 1100 is the downstream-most reach, extending from the Oklahoma Drainageway northwest to WCR-17. As shown in Figure 2-42, there is an existing wet pond existing in the middle of this reach. No information could be found for this wet pond so it is not included in this study's hydrograph routing models. The character of the drainageway upstream and downstream of the pond are similar, featuring a naturally-formed valley with defined floodplain banks. As shown in Figure 2-43, the broad channel bottom is consistently vegetated, but species vary and include reeds, grasses, and mature stands of Cottonwood trees. Aerial photographs suggest there has historically been a meandering low-flow channel, but this low-flow channel is not always visible on the ground today.



Figure 2-42 Reach 1100 Wet Pond



Figure 2-43 Reach 1100

Reach 1140: Oklahoma Basin Primary Tributary

Reach 1140 is the middle reach of Major Drainageway 1100, extending from WCR-17 northwest through the Pelican Farms residential neighborhood. As shown in Figure 2-44, the downstream portion of Reach 1140 comprises a large inline detention basin located directly northwest of the Crossroads Blvd. and 7th St. traffic circle. Vegetation in this part of the reach appears to be primarily natural grasses. The middle portion of Reach 1140, located immediately downstream of Grain Bin (roadway), features wetter conditions and includes a small wet pond and reedy vegetation, as seen in Figure 2-45. The upstream portion of the reach falls within the Pelican Farms neighborhood – as shown in Figure 2-46 it features a small concrete low-flow channel with mowed grass. Sedimentation was observed along many stretches of this reach, obscuring the concrete low-flow channel. The upstream end of Reach 1140 ends at the outlet of a detention pond that is located west of the pedestrian path that runs along the western edge of the Pelican Farms neighborhood.



Figure 2-44 Reach 1140 Downstream Detention



Figure 2-45 Reach 1140 Middle Wet Pond



Figure 2-46 Reach 1140

Reach 1148: Oklahoma Basin Primary Tributary

Reach 1148 is the upstream-most reach of Major Drainageway 1100, extending from the pedestrian path that runs along the western edge of the Pelican Farms neighborhood northwest to the approximate alignment of WCR-15 at the edge of the Rain Dance development. Reach 1148 comprises two segments: the downstream end runs south to north and is dominated by an inline detention basin. As shown in Figure 2-47, this broad, rectangular detention basin is vegetated with natural grasses but appears to receive regular mowing. This detention basin appeared to have a concrete trickle channel that was covered in fine sediment. The upstream segment of Reach 1148 runs east to west and features a trapezoidal channel section with natural grasses, shown in Figure 2-48. When visited in 2024, this segment contained 14 boulder check dams (only extending across the bottom of the channel). It was not clear whether these check dams were intended to be permanent or served a temporary erosion control purpose for upstream construction and/or adjacent oil and gas operations.

Upstream of Reach 1148, the drainageway continues with another inline detention basin and smaller open channels. It was not included as a study reach since it appears to serve more of a local drainage purpose instead of regional.



Figure 2-47 Reach 1148 Detention Basin



Figure 2-48 Reach 1148

Reach 1200: Oklahoma Basin Primary Tributary

Major Drainageway 1200, which is the second major tributary on the north side of the Oklahoma Drainageway, contains five reaches. This major drainageway has been heavily modified by manmade modifications, and practically none of the natural drainageway is present in existing conditions. Reach 1200 is the downstream-most reach – although the natural flowpath likely drained from west to east, WCR-17 now blocks most flows and the existing reach extends from the confluence with the Oklahoma Drainageway north along the west side of the highway. As shown in Figure 2-49, this reach is a constructed roadside ditch; it likely has a small concrete bottom but the concrete was not visible due to sediment. The ditch ends at a small detention basin located a short distance south of Brilliant Dr., which is also full of sediment as seen in Figure 2-50, then piped to the confluence. This detention basin is not modeled in Baseline Hydrology hydrograph routing since it is small in size and proper function is not being maintained.



Figure 2-49 Reach 1200



Figure 2-50 Reach 1200 Detention Basin

Reach 1216: Oklahoma Basin Primary Tributary

Reach 1216 is the longest reach of Major Drainageway 1200, extending from WCR-17 west to WCR-15. As shown in Figure 2-51, this reach travels through actively farmed lands and there is not a clearly defined drainage channel in existing conditions. For the purpose of modeling and alternatives development, Reach 1216 has been defined as the most probable surface flowpath, typically along slight swales.



Figure 2-51 Reach 1216

Reach 1240: Oklahoma Basin Primary Tributary

Reach 1240 extends from WCR-15 west to the culvert crossing of Crossroads Blvd., which is located approximately ¼ mile east of Colorado Blvd. Until recently, this reach traveled through agricultural lands, but this area is under active construction and now comprises two distinct segments. Although not reflected in topographic sources yet, our 2024 field visit showed that the downstream segment will soon be a large reservoir. As shown in Figure 2-52, the outlet structure is already in place and the reservoir is holding water. The reservoir appears to have two primary infalls, one from the northeast and the other from the northwest.

The northwest infall was selected to continue the primary tributary designation since it drains a larger contributing area, with the second segment of Reach 1240 extending from the northwest corner of the reservoir along the south side of Crossroads Blvd. Note that this reach features a concrete flume immediately upstream of the reservoir, indicating that the reservoir receives irrigation flows in addition to storm runoff. As shown in Figure 2-53, the majority of Reach 1240 is a large constructed roadside ditch with an observed riparian zone at the bottom and dryland grass along the banks. There was a tall grass embankment on the south side of this Reach in 2024, but it was not clear whether this was a permanent feature or could change when the area to the south is developed.



Figure 2-52 Reach 1240 Reservoir



Figure 2-53 Reach 1240

Reach 1256: Oklahoma Basin Primary Tributary

Reach 1256 is the upstream-most reach of Major Drainageway 1200, extending from the culvert crossing of Crossroads Blvd. northwest to Colorado Blvd. As shown in Figure 2-54, this reach is currently a constructed ditch along the north side of Crossroads Blvd., then turns a right angle and follows along the east side of Colorado Blvd. The ditch vegetation is natural grasses, and multiple instances of rill erosion in the banks were observed in 2024. Our field visit also found a real estate sign that indicated a retail/commercial site called Pickers Corner would soon be developed at this location, so it likely that Reach 1256 could change in the near future.



Figure 2-54 Reach 1256

Reach 1232: Oklahoma Basin Secondary Tributary

Reach 1232 represents the other tributary area to the reservoir in Reach 1240, extending from the northeast corner of the reservoir north into the RainDance residential neighborhoods. This reach comprises three segments. The downstream segment extends from the confluence at the reservoir north to Crossroads Blvd. As shown in Figure 2-55, this segment is relatively steep and features a concrete flume, indicating that the reservoir receives irrigation flows in addition to storm runoff. The middle segment is a large trapezoidal constructed ditch along the north side of Crossroads Blvd. This segment has multiple rock check dams, and dense riparian vegetation in the channel bottom with mowed dryland grass in the upper banks as seen in Figure 2-56. The upstream segment extends north along the east edge of the RainDance development, collecting runoff from multiple pipe outfalls. As shown in Figure 2-57, this segment is a trapezoidal constructed ditch with grass vegetation.



Figure 2-55 Reach 1232 at Confluence



Figure 2-56 Reach 1232 Middle Segment



Figure 2-57 Reach 1232 Upstream Segment

Reach 1300: Oklahoma Basin Primary Tributary

Major Drainageway 1300, which is the upstream-most major tributary on the north side of the Oklahoma Drainageway, contains three reaches. Reach 1300 is the downstream-most reach, extending from the wet pond confluence with Major Drainageways 800 and 900 west to WCR-15. Note this is the only reach within Major Drainageway 1300 that does not appear to have been heavily modified by manmade terrain modifications. As seen in Figure 2-58, Reach 1300 has a broad channel bottom that is dominated by wetland vegetation, with small floodplain banks that have dryland grass. This reach appears to be relatively stable in existing conditions, although a defined low-flow channel was not observed.



Figure 2-58 Reach 1300

Reach 1316: Oklahoma Basin Primary Tributary

Reach 1316 is the middle reach, extending from WCR-15 west-northwest approximately 2,200 feet. As shown in Figure 2-59, this reach does not have a well-defined channel bottom and wetland vegetation dominates the relatively flat areas. There is a single homestead in the middle part of Reach 1316 with wet ponds immediately upstream and downstream of the developed buildings. The flowpath was not clear within this private property, but there are likely piped flows with excess surface runoff going around the north side of the developed (driveways and mowed turf grass) land. As shown in Figure 2-60, there is wetland vegetation surrounding the upstream wet pond.



Figure 2-59 Reach 1316



Figure 2-60 Reach 1316 Wet Pond

Reach 1340: Oklahoma Basin Primary Tributary

Reach 1340 is the upstream-most defined reach of Major Drainageway 1300, extending northwest to the outlet of the Oklahoma Reservoir. As shown in Figure 2-61, this reach travels through actively farmed lands and there is not a clearly defined drainage channel (or signs of erosion) in existing conditions. The Oklahoma Reservoir, also sometimes marked as Big Cul Reservoir or Oklahoma Lake, appears to intercept and hold all upstream storm runoff during normal conditions. As shown in Figure 2-62, there is a small concrete ditch immediately east of the reservoir that appears to serve as an outlet. This appears to be an irrigation tailwater ditch, and during large storm events would likely allows flows to overtop and travel over the farmland.



Figure 2-61 Reach 1340



Figure 2-62 Reach 1340 Upstream End

2.3.2 Existing Crossings

Table 2-1 provides an inventory of the existing crossing structures, and Figure 2-63, Figure 2-64, and Figure 2-65 show the locations of the existing crossing structures. These figures have been separated by respective project phase (GOS, GO, and GOR) due to space constraints.

2.3.3 Land Use

Existing vegetation within the study area consists of native grasses, various agricultural crops (and fallow land), lawn or landscaped grasses within developed areas, and very limited trees and wetlands. Existing land use within the study area is varied with rural, commercial, industrial, and residential uses throughout the study area, with the more intensive uses such as car dealerships, business parks, and college complexes located within the Town of Windsor along US-34 and WCR-17. The modern residential land uses that feature greater density are generally located within the Town of Windsor north of Crossroads Blvd, while the older residential properties within the City of Greeley or unincorporated Weld and Larimer Counties usually feature single homes on very large lots.

The paved thoroughfares of US-34, SH-257, WCR-17, Colorado Blvd., and Crossroads Blvd. pass through the study area, with US-34 in particular including an alternate business route and ramps that take up significant land. The City of Greeley recently acquired the 975-acre Shur View property for open space, renamed to Arroyos del Sol, which is located in the northeast section of the study area. Existing land use was compiled in ArcGIS by combining parcel, roadway, and land use data from Greeley and Windsor with aerial imagery. Publicly owned land, including the Arroyos del Sol open space, is shown in Figure 2-66. Existing parks and open space areas are shown in Figure 2-67.

2.3.4 Flood History

No stream gage information was found for the study area. Many portions of the Oklahoma and South Basins are undeveloped or historical farm uses, where infiltration is rapid, therefore past heavy rainfall has not caused major flood damages in recent history. As the watersheds develop further, future runoff will be significantly increased above past flood events if mitigation measures such as runoff reducing practices or regional detention are not implemented.

2.3.5 Environmental Assessment

The *2060 Comprehensive Plan* included an environmental investigation to determine areas of ecological significance. No study reach was identified as ecologically significant.

Table 2-1 Major Crossing Structure Inventory

Study Area	Structure Number	Reach Number	Drainage Basin	Location	Crossing Type	Structure Description	Structure Station	Existing Structure Size/Type	Approximate Length (LF)	Existing Estimated Capacity (Future Flow)	Existing Capacity (CFS)
GOS	101	100	South	Farm Road	Private Road	Culvert	0+00	2 - 48" CMP	40	5-Year	275
	102	100	South	SH-257	Roadway	Culvert	2+15	2 - 10'x6' CBC	60	100-Year	1,389
	103	142	South	SH-257	Roadway	Culvert	58+81	1 - 48" RCP	295	10-Year	160
	104	134	South	SH-257	Roadway	Culvert	77+81	1 - 36" CMP	127	< 2-Year	72
	201	200	Oklahoma	Farm Road	Private Road	Culvert	2+13	1-24" CMP, 2-16" CMP, 1-36"CMP	35	< 2-Year	58
	202	260	Oklahoma	Farm Road	Private Road	Culvert	107+68	1 - 12" CMP	60	< 2-Year	4
	203	260	Oklahoma	US-34	Roadway	Culvert	113+12	1 - 36" RCP	327	25-Year	119
	301	300	Oklahoma	Great Western Railway	Railroad	Culvert	2+44	1 - 36" CMP	36	10-Year	85
	501	500	Oklahoma	Great Western Railway	Railroad	Culvert	3+25	1 -40"x36" CBC	86	5-Year	131
	601	600	Oklahoma	Great Western Railway	Railroad	Culvert	3+92	1 - 24" RCP	120	< 2-Year	85
	602	600	Oklahoma	Farm Road	Private Road	Culvert	5+54	1 - 24"x40" Elliptical CMP	41	< 2-Year	95
	603	614	Oklahoma	Junk Yard detention	Embankment	Culvert	53+56	1 - 24" HDPE	80	< 2-Year	39
GO	702	700	Oklahoma	Great Western Railway	Railroad	Culvert	8+00	1-24" CMP	97	10-Year	47
	704	700	Oklahoma	Windsong Rd	Roadway	Culvert	16+00	1-30" CMP	89	5-Year	37
	801	843	Oklahoma	CR-17	Roadway	Culvert	5+00	1-48" CMP	74	< 2-Year	138
	804	800	Oklahoma	Great Western Railway	Railroad	Culvert	17+00	1-5'x6.3' CBC	90	< 2-Year	98
	805	800	Oklahoma	Private Land	Dirt Road	Culvert	19+00	1 -24" CMP	62	< 2-Year	25
	807	829	Oklahoma	Southgate Dr	Roadway	Culvert	15+00	2- 12'x5' CBC	80	50-Year	1,247
	808	829	Oklahoma	Private Land	Fencing	Culvert	30+00	1-48" RCP	527	< 2-Year	150
	809	843	Oklahoma	US-34	Roadway	Culvert	1+00	1-48" RCP	304	< 2-Year	176
GOR	1001	1000	Oklahoma	SH-257	Roadway	Bridge	0+00	60' Span Bridge[A]	34	10-Year	5,000[A]
	1002	1010	Oklahoma	Great Western Railway	Railroad	Culvert	4+30	1-12'x9' Arch CMP[A]	123	<2-Year	754
	1003	1024	Oklahoma	CR-17	Roadway	Culvert	45+90	1-5.5'x8.5' CBC	113	2-Year	1,166
	1004	1088	Oklahoma	Private Land	Dirt Road	Culvert	28+20	2-7'x5' CBC	43	5-Year	1,175
	1005	1088	Oklahoma	CR-60	Dirt Road	Culvert	32+30	1-72" CMP[B]	49	2-Year	577
	1103	1140	Oklahoma	Grain Bin Drive	Roadway	Culvert	22+20	2-68"x43" Elliptical RCP	193	10-Year	337
	1203	1232	Oklahoma	Crossroads Blvd	Roadway	Culvert	13+00	3-66" RCP	217	>100-Year[C]	970[C]
	1204	1240	Oklahoma	Construction Access Road	Dirt Road	Culvert	25+00	1-78" Steel[D]	90	>100-Year	426
	1205	1240	Oklahoma	Oil & Gas Pad Access	Roadway	Culvert	26+50	2-54" RCP	66	>100-Year	406
	1206	1240	Oklahoma	Construction Access Road	Roadway	Culvert	32+50	2-54" RCP	61	>100-Year	377
	1207	1256	Oklahoma	Crossroads Blvd	Roadway	Culvert	0+00	2-60" RCP[E]	208	>100-Year	552
	1208	1256	Oklahoma	Iron Wheel Drive	Roadway	Culvert	14+50	1-66" RCP	100	>100-Year	199
	1301	1316	Oklahoma	CR-15	Roadway	Culvert	0+00	1-30" CMP[B]	48	< 2-Year	22

[A]Source: *Town of Windsor Master Drainage Plan,*dated October 3, 2003, prepared by Anderson Consulting Engineers, Inc.
[B]Size and material assumed.
[C]Source: *Final Drainage Report for Raindance Subdivision, Filing One*, dated June 9, 2017, prepared by TST, Inc. Consulting Engineers.
[D]Source: *Construction Plans for Raindance Non-Pot Pump Station #2*, dated January 12, 2024, prepared by TST, Inc. Consulting Engineers.
[E]Source: *Construction Plans for Raindance Major Infrastructure Addendum 1*, dated December 21, 2020, prepared by TST, Inc. Consulting Engineers.

LARIMER COUNTY

Town of Windsor

Unincorporated Larimer County

Unincorporated Weld County

City of Loveland

Town of Johnstown

City of Greeley

WELD COUNTY

E Crossroads Blvd

Great Western Railway

Oklahoma Drainage Basin

Oklahoma Drainageway

South Drainageway

Cache la Poudre River

South Drainage Basin

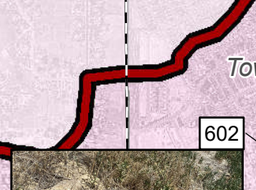
BUS 34

34

257

17

0 ½ 1
Miles


501


102


101


103


104


602


603


202


203

201

301

601

Legend

Existing Structures

- Culvert
- Detention
- Study Reaches
- River/Creek/Ditch
- Railroad

- Study Area
- Major Drainage Basin
- Town of Windsor
- City of Greeley
- Town of Johnstown
- City of Loveland
- County Boundary
- Greeley LREGA

No.	DATE	DESCRIPTION	APPR.

Matrix Excellence by Design

designed by: SL
drawn by: SL
checked by: BL
project no.: 24.906.009
date: 07/09/2025

City of Greeley

CITY OF GREELEY

COMPREHENSIVE DRAINAGE PLAN
OKLAHOMA & SOUTH BASINS

EXISTING STRUCTURES - GOS

FIGURE
2-63

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LARIMER COUNTY

Town of Windsor

Cache la Poudre River

0 ½ 1
Miles

804

805

806

807

808

809

801

702

704

E Crossroads Blvd

Oklahoma Drainage Basin

Oklahoma Drainageway

South Drainageway

Unincorporated Larimer County

Unincorporated Weld County

City of Greeley

South Drainage Basin

BUS 34

34

257

17

City of Loveland

Great Western Railway

Town of Johnstown

WELD COUNTY

Legend

Existing Structures
- Culvert
- Detention
- Study Reaches
- River/Creek/Ditch
- Railroad

- Study Area
- Major Drainage Basin
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- Town of Johnstown
- City of Loveland
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Matrix Excellence by Design

designed by: SL
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project no.: 24.906.009
date: 07/10/2025

City of Greeley Colorado

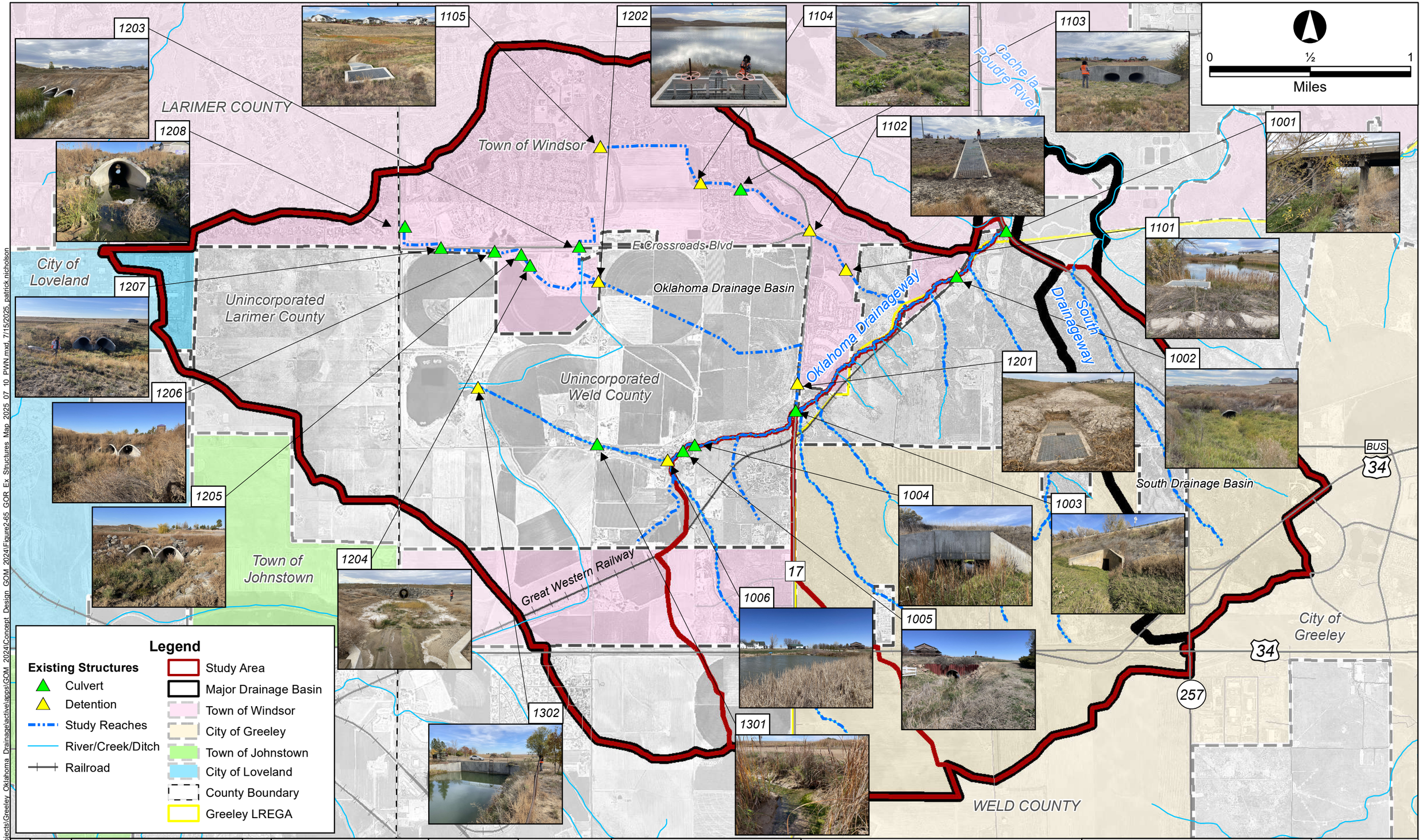
CITY OF GREELEY

COMPREHENSIVE DRAINAGE PLAN
OKLAHOMA & SOUTH BASINS

EXISTING STRUCTURES - GO

FIGURE
2-64

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No.	DATE	DESCRIPTION	APPR.

Matrix Excellence by Design

designed by: SML
drawn by: SML
checked by: BL
project no.: 24.906.009
date: 07/10/2025

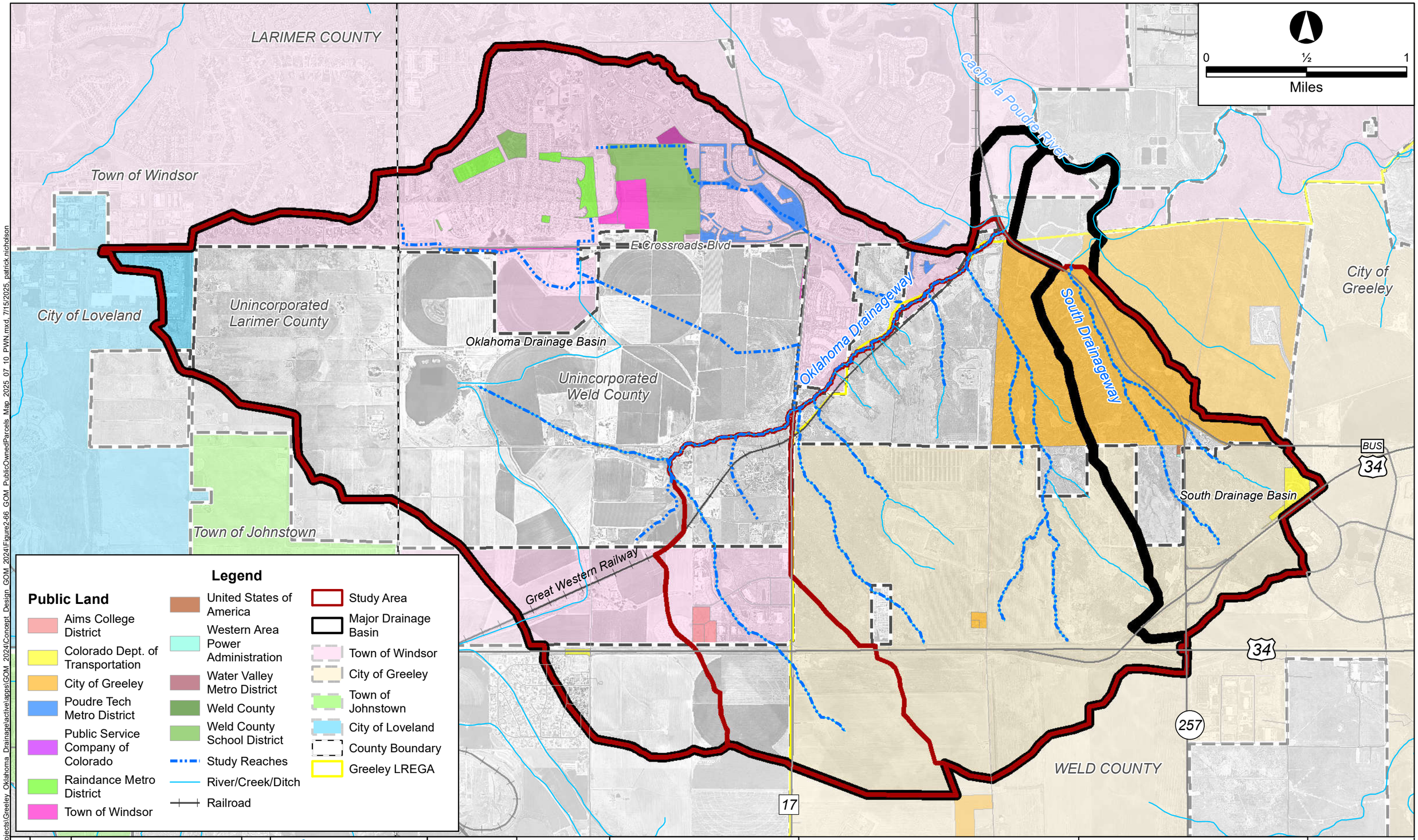
City of Greeley, Colorado

CITY OF GREELEY

COMPREHENSIVE DRAINAGE PLAN
OKLAHOMA & SOUTH BASINS

EXISTING STRUCTURES - GOR

FIGURE
2-65



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No.	DATE	DESCRIPTION	APPR.

Matrix Excellence by Design

designed by: SL
drawn by: SL
checked by: BL
project no.: 24.906.009
date: 07/09/2025

City of Greeley

CITY OF GREELEY

COMPREHENSIVE DRAINAGE PLAN
OKLAHOMA & SOUTH BASINS

PUBLIC OWNED LAND

FIGURE
2-66

Belmont Ridge Open Space
LARIMER COUNTY
Town of Windsor
Cherry Park
Barnyard Park
Plum Park
Pelican Farms Park
Eagle Lake Park
Cache la Poudre River
E Crossroads Blvd
City of Loveland
Unincorporated Larimer County
Oklahoma Drainage Basin
Unincorporated Weld County
Oklahoma Drainageway
South Drainageway
Arroyos Del Sol Natural Area
City of Greeley
Missile Site Park
South Drainage Basin
Promontory Park
Town of Johnstown
Great Western Railway
WELD COUNTY
BUS 34
34
257
17

0 ½ 1
Miles

Legend

- Parks and Open Spaces
- Study Reaches
- River/Creek/Ditch
- Railroad
- Study Area
- Major Drainage Basin
- Town of Windsor
- City of Greeley
- Town of Johnstown
- City of Loveland
- County Boundary
- Greeley LREGA

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No.	DATE	DESCRIPTION	APPR.

Matrix Excellence by Design

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drawn by: SL
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City of Greeley

CITY OF GREELEY

COMPREHENSIVE DRAINAGE PLAN
OKLAHOMA & SOUTH BASINS

PARKS AND OPEN SPACE

FIGURE
2-67

2.4 Future Trends

This study does not intend to update or change the general future trends documented in the *2060 Comprehensive Plan.* Rather, the future trends identified in other City of Greeley planning documents were used to inform the long-range storm drainage recommendations that are the focus of this study. Although the study watersheds are located approximately 10 miles west of the downtown core of Greeley, population growth has resulted in this area already facing development pressures. The US-34 corridor in particular is likely to be developed in the near to medium future.

Metropolitan districts are increasingly being established to finance and develop site infrastructure for large master-planned mixed-use communities in Colorado. These districts result in large scale changes to the watershed. The neighboring community of the Town of Windsor has seen extensive development through metropolitan districts in recent years. Two existing metropolitan districts bordering the study area that were recently built or under construction are the Tri-Pointe/Promontory community immediately southeast of the study area (between US-34 Business and US-34) and the Water Valley community immediately north of the study area (Town of Windsor). The Poudre Heights metropolitan district, located east of the study area, north of US-34 Business, is in the planning phases and was approved for rezone and preliminary planned unit development in April 2022.

2.4.1 Near-Term Developments

The Delantero project is an 822-acre proposed metropolitan district that is partially within the study area. Delantero is located south of US-34 between WCR-17 and SH-257 and includes 274 acres within the broader Oklahoma Basin. The other Delantero areas drain to the Sheep Draw and Big Thompson Basins. The *Conceptual Drainage Report for Delantero* (CWC Consulting Group, 2022) indicates that Delantero will be split into at least seven Planning Areas, with each Planning Area potentially constructed at a different time. It is expected to add thousands of housing units to the area along with more limited commercial and industrial developments.

Rainbow 24-9 HZ is a proposed 26-ac well pad and production facility for 28 oil/gas wells, located north of US-34 between WCR-17 and WCR-19 (131st Avenue). The Preliminary Drainage and Erosion Control Report for Rainbow 24-9 HZ (609 Consulting, 2022) indicates that a stormwater detention pond, five new culverts, and multiple diversion ditches with sediment traps will be constructed to control storm drainage and erosion on their site. This location drains to Reach 500 within the Oklahoma Basin.

There is also an Uptown development project located immediately southeast of WCR-17 and US-34 (adjacent to Delantero). We do not have much information on this development yet.

Cascadia Development is a proposed $1 billion destination project at the northeast corner of WCR-17 and US-34, which has been the subject of ongoing discussions between the developer and the City of Greeley. The proposal includes a state-of-the-art hockey arena, a hotel and convention center, a 12-slide water park, a retail and dining plaza, more than 6,000 housing units, and extensive outdoor recreation amenities such as horse trails and kayaking. Additionally, the plan features significant transportation infrastructure improvements, including a north-south overpass across US-34 and a future connection to a Bus Rapid Transit system. The development's scale and location within the Oklahoma Basin require careful stormwater planning, particularly given its substantial impervious surface area and the need for resilient drainage infrastructure. As the city continues its due diligence, including financial and infrastructure feasibility studies, Cascadia has the potential to redefine West Greeley’s growth while necessitating strategic stormwater management solutions within the basin.

CHAPTER 3 - THE WHAT

3.1 Hydrologic Analysis

3.1.1 Overview

The purpose of this study is to prepare a storm drainage master plan to identify major flood and drainage hazards and advise future development. The study area contains reaches of varying stability and existing culverts at roadways and railways. Sub-basin boundaries were generated using Personal Computer Storm Water Management Model (PCSWMM, version 7.6.3695) and then modified to match existing conditions along with the latest contours of the areas. The Colorado Unit Hydrograph Procedure (CUHP 2005), Version 2.0.1, was used to generate hydrographs for each sub-watershed. Hydrographs for the sub-watersheds were routed using the Environmental Protection Agency Stormwater Management Model (EPA SWMM), Version 5.1, build 5.1.012.

3.1.2 Design Rainfall

The rainfall duration used with CUHP varies with the size of the watershed being analyzed. For watersheds 2 square miles or greater, an adjustment is made to the depth reduction factor (DRF) to consider the averaging effects of greater watershed size (area correction). DRF is applied to point rainfall estimates to account for the decrease in average precipitation intensity as the area of a storm increases. For this study, the correction factors were not used. From the *USDCM*, Table 5-1: Storm Duration and Area Adjustment for CUHP modeling in the *USDCM* (reproduced below in Table 3-1) recommends a 2-hour storm duration for watershed area less than 15 square miles.

Table 3-1 Storm Duration and Area Adjustment for CUHP Modeling

Design Storm	Watershed Area (square miles)	Recommended Storm Duration	Apply DRF?
2-, 5-, and 10-Year	$A \leq 2.0$	2 hours	No
	$2.0 < A < 15.0$	2 hours	Yes – Use Table 5-3
	$A \geq 15.0$	6 hours	Yes – Use Table 5-3
25-, 50-, 100-, and 500-Year	$A < 15.0$	2 hours	No
	$A \geq 15.0$	6 hours	Yes – Use Table 5-4

The Oklahoma and South Basins are less than 15 square miles, so the recommended 2-hour duration design storm was used. To develop a 2-hour duration design storm, the first step is to determine the 1-hour and 6-hour point rainfall depths. For the GOS study the one-hour and six-hour rainfall depths (Table 3-2) were read from the *NOAA Atlas 14, Volume 8, Version 2* for the project location at Latitude 40.4181º and Longitude -104.889º. For the GO and GOS study, the one-hour and six-hour rainfall depths (Table 3-3) were read from the *NOAA Atlas 14, Volume 8, Version 2* for the project location at Latitude 40.4137º and Longitude -104.8966º.

Table 3-2 GOS Point Rainfall Depths (inch)

	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	500-Year
1-Hour Point Rainfall	0.85	1.12	1.40	1.87	2.30	2.79	4.16
6-Hour Point Rainfall	1.28	1.67	2.08	2.77	3.39	4.11	6.13

Table 3-3 GO & GOR Point Rainfall Depths (inch)

	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	500-Year
1-Hour Point Rainfall	0.84	1.12	1.4	1.87	2.31	2.8	4.18
6-Hour Point Rainfall	1.28	1.67	2.08	2.78	3.41	4.13	6.19

Note the exact precipitation values used for the *Town of Windsor Master Drainage Plan* were not specified for comparison, but that report stated that NOAA Atlas Volume III (1973) values were used. Inspection of the Rainfall Intensity-Duration Curves presented in the *Town of Windsor Storm Drainage Design Criteria* (2020) suggests that the NOAA Atlas Volume III 100-Year, 1-Hour Rainfall was 2.58-inches.

To create a design hyetograph, the 1-hour rainfall depths were converted into 2-hour design storms by multiplying the 1-hour precipitation depths by the temporal distribution shown in the *USDCM*, Table 5-2 (reproduced below as Table 3-4). These recommended storm distributions take into account the “leading intensity” nature of storms in the Front Range and are intended for use with CUHP. The rainfall distributions used for each storm event are included as Table B-1 in Appendix B.

Table 3-4 Design Storm Distribution of 1-hour Rainfall

Time Minutes	Percent of 1-hour precipitation depth (%)				
	2-Year	5-Year	10-Year	25- and 50-Year	100- and 500-Year
5	2.0	2.0	2.0	1.3	1.0
10	4.0	3.7	3.7	3.5	3.0
15	8.4	8.7	8.2	5.0	4.6
20	16.0	15.3	15.0	8.0	8.0
25	25.0	25.0	25.0	15.0	14.0
30	14.0	13.0	12.0	25.0	25.0
35	6.3	5.8	5.6	12.0	14.0
40	5.0	4.4	4.3	8.0	8.0
45	3.0	3.6	3.8	5.0	6.2
50	3.0	3.6	3.2	5.0	5.0
55	3.0	3.0	3.2	3.2	4.0
60	3.0	3.0	3.2	3.2	4.0
65	3.0	3.0	3.2	3.2	4.0
70	2.0	3.0	3.2	2.4	2.0
75	2.0	2.5	3.2	2.4	2.0
80	2.0	2.2	2.5	1.8	1.2
85	2.0	2.2	1.9	1.8	1.2
90	2.0	2.2	1.9	1.4	1.2
95	2.0	2.2	1.9	1.4	1.2
100	2.0	1.5	1.9	1.4	1.2
105	2.0	1.5	1.9	1.4	1.2
110	2.0	1.5	1.9	1.4	1.2
115	1.0	1.5	1.7	1.4	1.2
120	1.0	1.3	1.3	1.4	1.2
Totals	115.7%	115.7%	115.7%	115.6%	115.6%

3.1.3 Basin Delineations

The overall basin boundary is a modification of the boundary shapefile provided by the city of Greeley. The Northeast portion of the area within the provided boundary was excluded from this study, as it is tributary to Cache La Poudre River rather than the Oklahoma Drainageway. There are two watersheds in the study area. The Oklahoma watershed has an area of 11.22 square miles, while the South Basin watershed covers 1.18 square miles, for a total of 12.40 square miles.

Subbasins were defined using (PCSWMM, version 7.6.3695) along with the digital one-foot contour mapping provided for the project. Major basin and subbasin boundaries were established based on topographic and physical drainage boundaries, such as major roadways (e.g., US-34) and railroad. The Great Western Railway that runs parallel to the Oklahoma Drainageway was not used to delineate subbasin boundaries since it is close to the respective tributary confluences. The main Oklahoma Drainageway serves as the downstream boundary for subbasins within the Oklahoma Basin, and both the Oklahoma and South Drainageways are tributaries to the Cache La Poudre River.

Major basins were generally divided into subbasins with a target area of approximately 100 acres. Larger subbasins were kept in some cases, particularly in undeveloped areas, but subbasin sizes were not allowed to exceed 130 acres. Smaller subbasins were often necessary to evaluate more complicated drainage conditions where existing embankments or tributary confluences were located. Figure B-1 in Appendix B shows the subbasin delineations for the study area, and Table 3-5 presents a summary of the subbasin characteristics.

Table 3-5 Subbasin Characteristics

Watershed	Total Area (mi^2)	Subbasin Area (acre)			Number of Subbasins
		Average	Minimum	Maximum	
Oklahoma	11.22	65.25	4.04	128.69	110
South	1.18	62.94	19.77	122.62	12

A summary of the CUHP 2005 model input parameters can be found in Appendix B, existing conditions in Table B-3 and future conditions in Table B-4. One-foot contour mapping was used to determine the existing conditions flow path lengths and distance to centroid values.

3.1.4 Basin Imperviousness

A GIS-based approach was used to calculate the composite percent imperviousness within the watershed based on existing and future land use information. The land use data described in the previous sections was used in conjunction with Table 6-3 in the *USDCM*, to create percent impervious values for each land use type. It's important to note that as of March 28, 2024, MHFD has revised its recommendations for percent impervious values associated with various land use types, adopting more conservative estimates. Given that previous reports by Matrix on the study area utilized older values, the decision was made to continue using those values in this study

Table 3-6 lists each land use type and the associated percent impervious values used in the analysis, and Figure 3-1 shows the limited existing impervious surfaces within the study area. GIS data representing existing and future land use was intersected with subbasin polygons to calculate area-weighted, or composite, percent impervious values for each subbasin. Percent impervious values for existing and future conditions are shown in Figure B-1 of Appendix B.

Table 3-6 Future Land Use Impervious Summary

Land Use Description	MHFD Land Use	% Imp
Open Space Areas or undeveloped	Undeveloped Areas	2
Low Density/Clustered Residential, Rural, Urban-Rural Interface	Residential Lot, Single-family: 2.5 acres or larger	12
Medium Density Residential, Urban	Residential Lot, Single-family: 0.75 - 2.5 acres	20
Parks/Mixed Open Space	Community Parks	25
Gravel Road or Lot	Gravel (Packed) Streets	40
Residential High Density, Mixed Residential	Residential Lot, Single-family: 0.25 acres or less	45
Commercial Mixed Use, Public/Semi-Public, General Commercial, Employment Corridor	Business: Suburban Areas	75
Industrial Parks, Employment/Flex Industrial	Industrial: Light Areas	80
Pavement	Paved Streets	100
Water	Water	100

*Percent Imperviousness were determined from MHFD USDCM Table 6-3.

Depression losses/retention storage were determined using Table 6-6 in the *USDCM* (reproduced below as Table 3-7). An impervious depression loss of 0.1-inches was used for all subbasin in both the existing and future conditions. The pervious depression loss of 0.35-inches was used for future subbasins that are shown as developed in future land use, and a pervious depression loss of 0.4-inches was used for future subbasins that are planned to be kept as open space and existing undeveloped areas. The subbasins depression losses can be found in Appendix B, existing conditions in Table B-3 and future conditions in Table B-4.

Table 3-7 Typical Depression Losses for Various Land Covers

(All values in inches for use with the CUHP.)

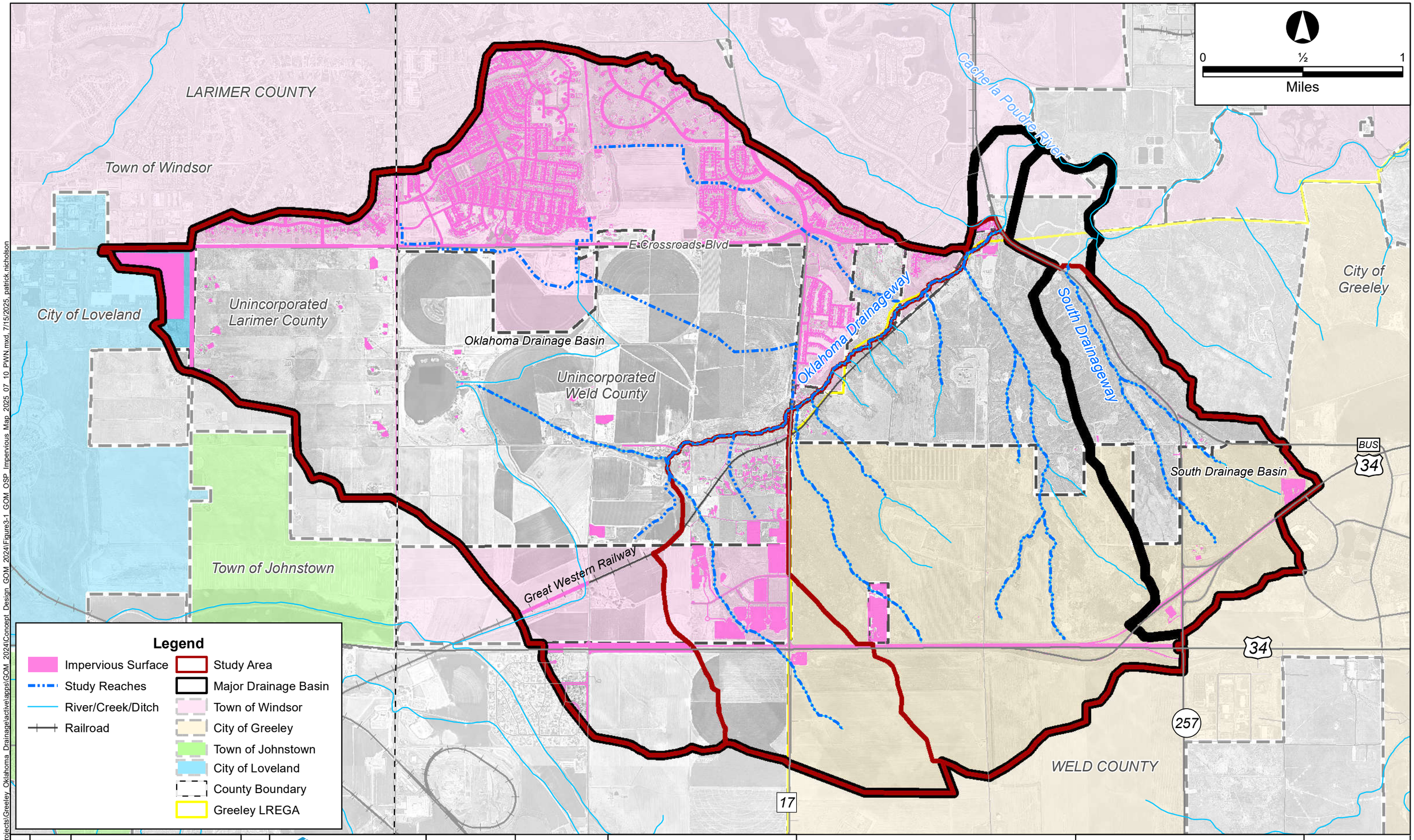
Land Cover	Range in Depression (Retention) Losses	Recommended
Impervious:		
Large paved areas	0.05 - 0.15	0.1
Roofs-flat	0.1 - 0.3	0.1
Roofs-sloped	0.05 - 0.1	0.05
Pervious:		
Lawn grass	0.2 - 0.5	0.35
Wooded areas and open fields	0.2 - 0.6	0.4

The soils in both the Oklahoma and South Basin consist primarily of all four hydrologic soil group (HSG) classifications, with HSG B comprising the largest area, as defined by the NRCS. These soil groups were determined using the Natural Resources Conservation Services, Web Soil Survey tool. Figure B-1 in Appendix B shows the HSG distribution. HSG-A soils are generally characterized by the highest infiltration rates and HSG-D soils are characterized by the lowest infiltration rates. For any large waterbodies present in the study area, a soil group was assigned based on the largest surrounding soil group around the water body. Table 3-8 shows the HSG distribution by area within the study area.

Table 3-8 Hydrologic Soil Group Distribution

Study Area Basins Only					
HSG	A	B	C	D	
Infiltration Rate	High	Moderate	Low	Very Low	Total
Area (acre)	2,050	2,840	2,457	587	7,934
% Area	26	36	31	7	100

Initial and final infiltration rates and Horton's decay rates were determined using Table 6-7 in the *USDCM*. For HSG-A soils, the initial infiltration rate was 5.0 inches per hour, the final infiltration rate was 1.0 inches per hour, and the decay coefficient was 0.0007. For HSG-B soils, the initial infiltration rate was 4.5 inches per hour, the final infiltration rate was 0.6 inches per hour, and the decay coefficient was 0.0018. For HSG-C and HSG-D soils, the initial infiltration rate was 3.0 inches per hour, the final infiltration rate was 0.5 inches per hour, and the decay coefficient was 0.0018. The most conservative (slowest to infiltrate) HSG classification within each subbasin was used to determine the infiltration and decay rates used in the CUHP models.



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No.	DATE	DESCRIPTION	APPR.

Matrix Excellence by Design

designed by: SL
drawn by: SL
checked by: BL
project no.: 24.906.009
date: 07/10/2025

City of Greeley

CITY OF GREELEY

COMPREHENSIVE DRAINAGE PLAN
OKLAHOMA & SOUTH BASINS

IMPERVIOUS SURFACES

FIGURE
3-1

3.1.5 Detention

No detention areas were modeled for the Baseline Hydrology, pursuant to MHFD's policy to recognize only regional, publicly-owned facilities that have assurances that they will be maintained as designed. No such facilities exist within the existing watersheds, although there are a number of existing detention basins within the Oklahoma Basin. Inadvertent detention behind roadway embankments and in low depression areas occurs at several locations within the study area, but future development may eliminate these by adding culverts and increasing capacity under the highways or railways; therefore, this detention caused by undersized culverts was not included in the models.

3.1.6 Hydrograph Routing

The Manning's roughness values were determined based on the 2013, 2018 and 2024 aerial imagery and supplemented by field observation. Table 3-9 shows the general rule-of-thumb for Manning's n values used for hydrograph routing (different from roughness values used for hydraulic analyses).

Table 3-9 Manning's Roughness Coefficients for SWMM

Routing Element Description	Original 'n'	Increase 'n' by 25%*
Reinforced Concrete Pipe	0.013	0.016
Asphalt Pavement	0.016	0.02
Engineered Channel, Ditch	0.035	0.044
Natural Drainageway with No Brush	0.035	0.044
Natural Drainageway with Brush	0.044 - 0.052	0.055 - 0.065
Natural Drainageway with Trees	0.06	0.075

* As recommended in USDCM Chapter 6 Section 4.2

Hydrographs from individual subbasins were routed through the drainageway system using the EPA SWMM 5.1 computer model. The drainage system was modeled using a system of channels, junction points, and direct flow elements. The conveyance element input parameters include length, slope, roughness coefficient, and cross-section geometry. The EPA SWMM input parameters are included as Table B-8 of Appendix B. A schematic of the EPA SWMM model elements, including subbasins, design points and conveyance elements is shown in Figure B-1 of Appendix B.

Existing channel elements were determined from the digital project mapping. Length, change in elevation, and cross-section shape were estimated from the one-foot interval topographic mapping and aerial imagery for each routing reach. The study area reaches were generally modeled as trapezoidal or triangular open channels. Future channel geometries are not yet known, so the existing reach geometry was also used for the future conditions routing model.

3.1.7 Sensitivity Analyses

Matrix performed a sensitivity analysis of the 2023 GOS Study area to determine the modeling impact of varying roughness values and time steps. This was done by increasing and decreasing the Manning's n roughness value by 25% in multiple SWMM conveyance elements. The results were compared at select locations such as drainageway outfalls and major confluences, see Figure 3-2 below.

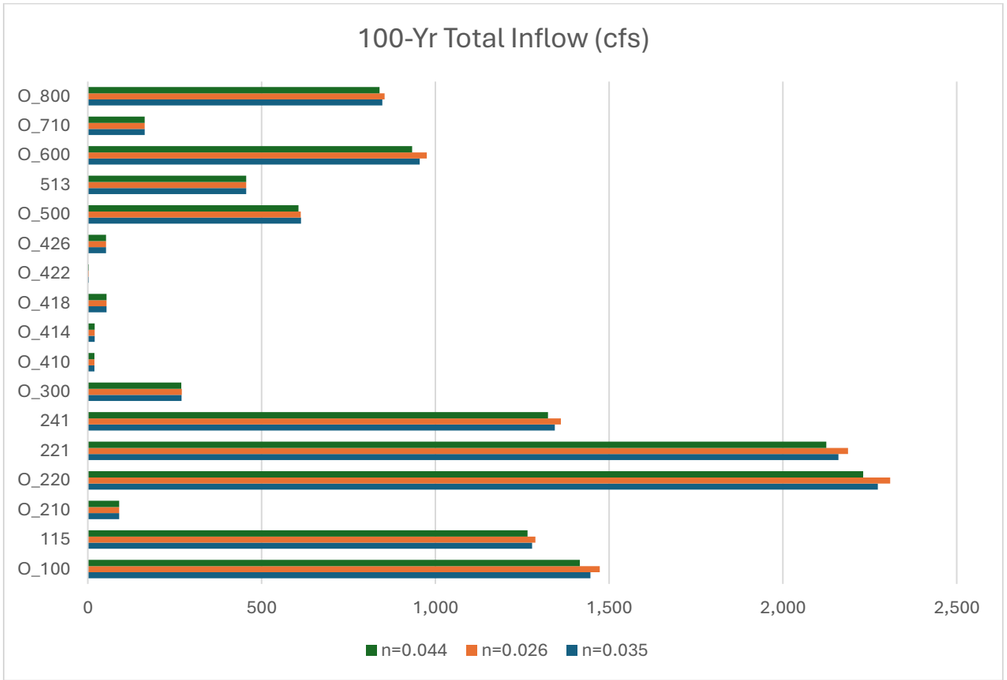


Figure 3-2 Conveyance Roughness Sensitivity Analysis

*O_stands for outfall

As shown in Figure 3-2, changing the roughness values by 25% resulted in 100-year peak flows of up to 2.3% different (reducing the roughness value increased peak flows and vice versa). Total modeled volumes were also compared for this sensitivity analysis: changing the roughness value by 25% resulted in 100-year total volumes to 0.6% different (reducing the roughness value decreased the total volume and vice versa). After discussing these results with the project sponsor, Matrix decided to use single set of roughness values (Original 'n' column in) for all SWMM models. This simplified approach is slightly conservative and allows the model results developed for alternatives analysis and concept design to be compared directly with the baseline hydrology results.

Matrix also performed a sensitivity analysis to determine whether varying the calculation time step would have an impact on results. This was done by increasing and decreasing the time step by 25% in SWMM. The variations in time step resulted in changes of less than 0.5% in both the 100-year peak flow and total volume. Given these minimal effects, the default 5-minute time step was retained for the model.

3.1.8 Previous Studies

A direct comparison of the runoff calculated from this CDP with the runoff from the *Town of Windsor Master Drainage Plan* was performed at several key points within the same tributary areas, and the results are summarized in Table 3-10. As seen from the table, the 100-year flow rates predicted by the current model are sometimes higher and sometimes lower than the flow rates documented in the *Town of Windsor Master Drainage Plan* (2003) and *2024 Windsor Drainage Master Plan Update: Oklahoma Basin* for both existing conditions and future conditions. This is because of differences in the land uses for the existing and future conditions models, subbasin delineations, and detention routing. Some more detailed observations of the comparison are listed below.

- This study used the Greeley *2060 Comprehensive Plan* for future land uses and impervious areas, which was not available in 2003. The *2003 Windsor MDP* stated that no changes were expected between existing and proposed conditions for the entire South Basin. The *2024 Windsor DMP Update* only updated the existing conditions because the *2003 Windsor MDP* showed decreased peak flows in future versus existing conditions.
- The major basins in this study do not exactly match the major basin delineations in the *Town of Windsor Master Drainage Plan*. The *2003 Windsor MDP* and *2024 Windsor DMP Update* were focused on the developing peak flows only for the mainline tributaries, so their SWMM models do not include many routing elements within our study area.
- This study divides the major basins into many more, much smaller subbasins than the *Town of Windsor Master Drainage Plan*. As noted in Chapter 6 Section 4.2 of the *USDSM*, discretization of large catchments into smaller ones often results in increased unit discharges.
- The decreases in peak flows are most likely due to the *2003 Windsor MDP* and *2024 Windsor DMP Update* accounting for inadvertent detention and reservoir detention in their hydrologic models. The *2024 Windsor DMP Update* includes seven detention elements in their Oklahoma routing models. As explained in Section 3.1.5, this study does not include detention. The July 2023 *Oklahoma Basin Hydrologic Update* (Anderson Consulting Engineering, Inc.) included in the appendices of the *2024 Windsor DMP Update* recognized that the inadvertent detention modeled for the Oklahoma Drainageway upstream of WCR-17 changed from 232 ac-ft in the *2003 Windsor MDP* to 117 ac-ft in the update 20 years later.
- The *2024 Windsor DMP Update* hydrologic modeling switched to CUHP methods to generate hydrographs, similar to this study. However, their SWMM model uses dynamic wave routing instead of kinematic wave routing. The kinematic wave routing method does not consider complex water surface slopes or pressure flows, which can sometimes lead to more conservative results.

3.1.9 Results of Analysis

The CUHP and SWMM models were run for the 2-, 5-, 10-, 25-, 50-, and 100-year storm events under existing conditions and future conditions, resulting in 12 hydrology scenarios. The computed baseline peak discharges and volumes for all of the EPA SWMM design points can be found in Tables B-7 and B-8 of Appendix B. Summaries of peak flow rates and runoff volumes at key design points are provided below in Table 3-11 and Table 3-12. Figure B-2 in Appendix B shows hydrographs generated by EPA SWMM 5.1 for the 10-year and 100-year storms for existing and future conditions at the outfall of each study reach. A sample SWMM output report (from the 100-year future conditions storm event) is included in Appendix B as Table B-10.

Table 3-10 Previous Studies Hydrology Comparison

Basin	Location	2003 Windsor		2024 Windsor		This Study		Existing Conditions Q_{100}					Proposed Conditions Q_{100}				
		SWMM Element	Area (ac)	SWMM Element	Area (ac)	SWMM Element	Area (ac)	2003 Windsor (cfs)	2024 Windsor (cfs)	This Study (cfs)	2003 Windsor Increase / Decrease (%)	2024 Windsor Increase / Decrease (%)	2003 Windsor (cfs)	2024 Windsor (cfs)	This Study (cfs)	2003 Windsor Increase / Decrease (%)	2024 Windsor Increase / Decrease (%)
South	SH-257	S802B	813	N/A	N/A	O_100	755	1,565	N/A	1,049	33	N/A	1,565	N/A	1,460	7	N/A
Oklahoma	SH-257	0201	7,189	N/A	N/A	O_1000	7,139	5,006	N/A	9,020	80	N/A	5,047	N/A	11,827	134	N/A
Oklahoma 200	Confluence	0802	1,172	N/A	N/A	210, O_220	1,104	1,833	N/A	1,491	19	N/A	1,826	N/A	2,543	39	N/A
Oklahoma 300 & 400	Confluence	0803	232	N/A	N/A	O_300, 410, 414, 418, 422, 426	269	281	N/A	406	45	N/A	281	N/A	418	49	N/A
Oklahoma 500 & 600	Confluence	0807	735	N/A	N/A	O_500, O_600	655	992	N/A	899	9	N/A	1,166	N/A	1,555	33	N/A
Oklahoma 620, 700, 800, 900	Confluence	0808	1,402	J08a, J08b	1,234	620, O_708, 714, O_803, O_909	1,252	1,695	2,008	1,813	7	10	1,692	N/A	3,061	81	N/A
Oklahoma 1100	Confluence	0804	763	N/A	N/A	O_1107, 1172, 1180	919	888	N/A	1,084	22	N/A	888	N/A	1,565	76	N/A
Oklahoma 1200	Confluence	0805	1,074	P0405	1,149	1208, O_1263, 1272	1,128	1,167	1,538	1,419	22	8	1,166	N/A	1,540	32	N/A
Oklahoma 1300	Confluence	0809	1,637	J0k09b_out	1,635	O_1307, 1382	1,804	1,959	1,149	2,439	24	112	1,955	N/A	2,784	42	N/A

Table 3-11 Peak Flows at Key Locations

Locations	Design Points / Conveyance Elements	Total Drainage Area		Station	Existing Conditions Peak Flows (cfs)						Future Conditions Peak Flow (cfs)					
		(acres)	(mi^2)	(ft)	Q_2	Q_5	Q_{10}	Q_{25}	Q_{50}	Q_{100}	Q_2	Q_5	Q_{10}	Q_{25}	Q_{50}	Q_{100}
South Basin Outfall, north of SH-257	O_100	755	1.18	0+00	24	73	183	499	734	1,049	136	235	388	785	1,081	1,460
South Basin Confluence	115	572	0.89	2+15	26	74	167	419	604	846	157	256	389	719	968	1,278
Drainageway 200 - Outfall to Oklahoma	O_220	1058	1.65	14+23	17	75	224	653	971	1,401	263	426	660	1,261	1,707	2,273
Drainageway 200 - Downstream Confluence	221	958	1.50	26+60	17	75	213	606	895	1,282	273	435	657	1,216	1,633	2,160
Drainageway 200 - Upstream Confluence	241	486	0.76	75+47	12	50	127	332	481	677	230	343	477	796	1,041	1,343
Subbasin 210 - Outfall to Oklahoma	210	49	0.08	0+00	1	7	18	45	65	90	1	7	18	45	65	90
Drainageway 300 - Outfall to Oklahoma	O_300	157	0.25	26+85	12	20	44	125	183	258	15	24	49	133	192	270
Subbasin 410 - Outfall to Oklahoma	410	13	0.02	40+93	0	1	3	9	13	19	0	1	3	9	13	19
Subbasin 414 - Outfall to Oklahoma	414	12	0.02	45+99	0	1	3	9	14	20	0	1	3	9	14	20
Subbasin 418 - Outfall to Oklahoma	418	40	0.06	50+62	1	4	10	26	38	54	1	4	10	26	38	54
Subbasin 422 - Outfall to Oklahoma	422	4	0.01	58+46	0	0	0	0	1	3	0	0	0	0	1	3
Subbasin 426 - Outfall to Oklahoma	426	43	0.07	65+20	1	1	7	25	37	53	1	1	7	25	37	53
Drainageway 500 - Outfall to Oklahoma	O_500	292	0.46	85+30	8	27	68	182	266	378	74	121	185	343	460	609
Drainageway 500 - Confluence	513	168	0.26	33+58	2	15	40	105	153	214	77	116	162	271	354	456
Drainageway 600 - Oklahoma Reach Outfall	O_600	363	0.57	87+82	9	34	88	244	362	521	134	209	304	542	720	945
Subbasin 620 - Outfall to Oklahoma	620	34	0.05	0+00	3	5	9	19	27	37	3	5	9	19	27	37
Drainageway 700 - Outfall to Oklahoma	O_708	90	0.14	0+00	13	24	42	85	118	160	15	28	47	93	128	172
Subbasin 714 - Outfall to Oklahoma	714	23	0.04	0+00	1	4	10	25	36	50	2	6	12	27	38	52
Drainageway 800 - Outfall to Oklahoma	O_803	696	1.09	0+00	63	108	192	494	722	1,039	349	515	709	1,203	1,591	2,072
Reach 800 Culvert at US-34	843	401	0.63	63+00	7	34	96	275	407	578	252	362	485	782	1,018	1,300
Drainageway 900 - Outfall to Oklahoma	O_909	446	0.70	0+00	10	27	74	235	358	527	79	123	187	383	531	728
Drainageway 900 - Confluence	929	345	0.54	23+00	11	29	73	207	304	434	78	113	169	328	447	602
Oklahoma Basin Outfall at SH-257	O_1000	7181	11.22	0+00	314	693	1,502	4,069	6,140	9,020	1,175	1,895	2,960	6,053	8,502	11,827
Oklahoma Drainageway at Railroad Crossing	1006_RR	5968	9.33	19+00	300	630	1,318	3,507	5,263	7,698	1,006	1,608	2,497	5,094	7,147	9,916
Oklahoma Drainageway at WCR-17	1030	3487	5.45	82+00	232	497	1,067	2,830	4,186	6,035	775	1,238	1,945	3,974	5,526	7,567
Drainageway 1000 - Upstream Confluence	1046	2854	4.46	118+00	118	289	674	1,844	2,723	3,912	573	903	1,401	2,797	3,853	5,220
Subbasin 1032 - Outfall to Oklahoma	1032	10	0.01	1+00	3	4	6	10	15	22	4	5	7	11	16	23
Drainageway 1100 - Outfall to Oklahoma	O_1107	854	1.33	0+00	57	99	160	400	653	1,031	167	256	362	706	1,036	1,511
Drainageway 1100 at WCR-15	1139	717	1.12	38+00	56	96	153	366	576	876	146	220	312	609	882	1,255
Subbasin 1172 - Outfall to Oklahoma	1172	49	0.08	24+00	0	1	2	6	15	28	1	1	2	7	16	28
Subbasin 1180 - Outfall to Oklahoma	1180	13	0.02	42+00	3	5	6	13	19	25	3	5	6	13	19	26
Drainageway 1200 - Outfall to Oklahoma	O_1263	1042	1.63	0+00	94	152	259	627	927	1,340	116	186	303	684	992	1,415
Drainageway 1200 at WCR-15	1231	583	0.91	75+00	120	183	287	571	786	1,063	133	202	309	597	816	1,097
Subbasin 1208 - Outfall to Oklahoma	1208	63	0.10	55+00	2	4	6	20	39	65	12	18	24	48	76	109
Drainageway 1200 - Downstream Confluence	1233	235	0.37	15+00	65	100	151	280	377	499	67	102	153	283	381	504
Drainageway 1200 - Upstream Confluence	1255	178	0.28	122+00	19	33	58	131	187	261	24	37	63	137	194	269
Subbasin 1272 - Outfall to Oklahoma	1272	23	0.04	99+00	0	0	0	2	7	14	0	1	1	4	9	16
Drainageway 1300 - Outfall to Oklahoma	O_1307	1712	2.68	0+00	73	177	410	1,119	1,647	2,356	188	341	606	1,373	1,945	2,697
Drainageway 1300 at Outlet of Oklahoma Reservoir	1340	919	1.44	54+00	63	134	271	665	954	1,339	101	187	330	736	1,034	1,428
Drainageway 1300 - Confluence	1315	1561	2.44	21+00	75	179	410	1,103	1,616	2,302	188	341	604	1,354	1,911	2,640
Subbasin 1382 - Outfall to Oklahoma	1382	92	0.14	115+00	1	2	10	36	56	83	3	5	13	40	60	87

Table 3-12 Runoff Volume at Key Locations

Locations	Design Points / Conveyance Elements	Total Drainage Area		Station	Existing Conditions Runoff Volume (ac-ft)						Future Conditions Runoff Volume (ac-ft)					
		(acres)	(mi^2)	(ft)	V_2	V_5	V_{10}	V_{25}	V_{50}	V_{100}	V_2	V_5	V_{10}	V_{25}	V_{50}	V_{100}
South Basin Outfall, north of SH-257	O_100	755	1.18	0+00	4.1	10.6	24.2	57.4	84.1	120.0	15.1	24.3	39.3	72.1	99.4	134.7
South Basin Confluence	115	572	0.89	2+15	3.6	8.9	19.2	44.2	64.4	91.4	14.1	22.2	33.8	58.3	79.5	105.9
Drainageway 200 - Outfall to Oklahoma	O_220	1058	1.65	14+23	3.7	11.6	29.8	76.1	112.9	163.2	26.9	41.4	62.9	108.6	147.3	196.4
Drainageway 200 - Downstream Confluence	221	958	1.50	26+60	3.5	11.0	27.5	69.3	102.8	148.2	26.6	40.8	60.4	101.6	136.9	181.3
Drainageway 200 - Upstream Confluence	241	486	0.76	75+47	1.8	6.0	14.6	35.9	52.8	75.8	18.6	27.3	38.0	58.9	77.0	99.4
Subbasin 210 - Outfall to Oklahoma	210	49	0.08	0+00	0.1	0.5	1.3	3.4	5.1	7.5	0.1	0.5	1.3	3.4	5.1	7.5
Drainageway 300 - Outfall to Oklahoma	O_300	157	0.25	26+85	1.3	2.1	4.1	10.8	16.1	23.4	1.5	2.3	4.4	11.1	16.4	23.7
Subbasin 410 - Outfall to Oklahoma	410	13	0.02	40+93	0.0	0.1	0.3	0.9	1.4	2.0	0.0	0.1	0.3	0.9	1.4	2.0
Subbasin 414 - Outfall to Oklahoma	414	12	0.02	45+99	0.0	0.1	0.3	0.8	1.2	1.8	0.0	0.1	0.3	0.8	1.2	1.8
Subbasin 418 - Outfall to Oklahoma	418	40	0.06	50+62	0.1	0.3	1.0	2.7	4.1	6.0	0.1	0.4	1.0	2.8	4.1	6.0
Subbasin 422 - Outfall to Oklahoma	422	4	0.01	58+46	0.0	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.1	0.2
Subbasin 426 - Outfall to Oklahoma	426	43	0.07	65+20	0.1	0.2	0.7	2.6	4.0	6.0	0.1	0.2	0.7	2.6	4.0	6.0
Drainageway 500 - Outfall to Oklahoma	O_500	292	0.46	85+30	1.2	3.8	9.0	21.8	31.9	46.0	7.4	11.8	17.7	30.3	41.1	54.6
Drainageway 500 - Confluence	513	168	0.26	33+58	0.2	1.5	4.3	11.6	17.5	25.5	6.2	9.2	12.9	20.2	26.5	34.1
Drainageway 600 - Oklahoma Reach Outfall	O_600	363	0.57	87+82	1.7	5.1	11.6	27.6	40.5	57.7	12.7	19.0	26.9	42.3	56.2	72.7
Subbasin 620 - Outfall to Oklahoma	620	34	0.05	0+00	0.4	0.9	1.5	3.0	4.2	5.8	0.4	0.9	1.5	3.0	4.2	5.8
Drainageway 700 - Outfall to Oklahoma	O_708	90	0.14	0+00	1.4	2.6	4.4	8.3	11.6	15.8	1.6	2.8	4.6	8.5	11.9	16.0
Subbasin 714 - Outfall to Oklahoma	714	23	0.04	0+00	0.0	0.2	0.6	1.6	2.4	3.5	0.1	0.4	0.8	1.7	2.6	3.6
Drainageway 800 - Outfall to Oklahoma	O_803	696	1.09	0+00	6.7	13.1	25.1	54.6	79.5	111.7	30.7	43.9	59.2	88.1	114.5	145.8
Reach 800 Culvert at US-34	843	401	0.63	63+00	0.8	3.4	9.9	27.3	41.4	60.4	18.7	26.6	35.9	52.8	68.4	86.5
Drainageway 900 - Outfall to Oklahoma	O_909	446	0.70	0+00	1.7	4.1	10.3	29.5	44.8	66.0	10.2	15.8	23.9	43.0	59.2	80.1
Drainageway 900 - Confluence	929	345	0.54	23+00	1.4	3.7	9.1	24.4	36.5	52.8	8.4	13.2	20.1	35.3	47.9	64.1
Oklahoma Basin Outfall at SH-257	O_1000	7181	11.22	0+00	54.6	107.1	213.9	503.2	748.7	1,077.0	162.3	248.5	374.3	665.8	923.6	1,248.8
Oklahoma Drainageway at Railroad Crossing	1006_RR	5968	9.33	19+00	50.3	94.5	182.0	423.4	629.0	905.2	134.7	205.6	309.9	552.3	767.1	1,043.3
Oklahoma Drainageway at WCR-17	1030	3487	5.45	82+00	37.7	72.7	143.6	334.5	494.0	705.7	99.4	154.3	236.3	426.5	589.1	797.8
Drainageway 1000 - Upstream Confluence	1046	2854	4.46	118+00	19.4	40.8	87.1	210.8	309.9	444.9	66.3	102.8	156.8	278.9	383.6	515.5
Subbasin 1032 - Outfall to Oklahoma	1032	10	0.01	1+00	0.2	0.3	0.4	0.7	0.9	1.3	0.3	0.3	0.5	0.7	1.0	1.3
Drainageway 1100 - Outfall to Oklahoma	O_1107	854	1.33	0+00	9.1	14.2	21.1	43.9	68.7	104.0	24.1	33.8	45.4	72.4	100.3	136.9
Drainageway 1100 at WCR-15	1139	717	1.12	38+00	8.2	12.7	18.9	37.4	57.1	84.7	18.6	26.2	35.3	56.8	78.2	106.5
Subbasin 1172 - Outfall to Oklahoma	1172	49	0.08	24+00	0.1	0.2	0.3	0.9	2.1	3.7	0.1	0.2	0.4	0.9	2.1	3.8
Subbasin 1180 - Outfall to Oklahoma	1180	13	0.02	42+00	0.3	0.5	0.6	1.1	1.5	2.1	0.3	0.5	0.6	1.1	1.5	2.2
Drainageway 1200 - Outfall to Oklahoma	O_1263	1042	1.63	0+00	14.4	22.5	37.1	78.2	114.1	161.7	17.6	27.3	43.3	85.3	121.8	169.7
Drainageway 1200 at WCR-15	1231	583	0.91	75+00	12.8	19.9	31.0	56.2	77.3	104.3	13.8	21.3	32.5	57.7	78.9	105.9
Subbasin 1208 - Outfall to Oklahoma	1208	63	0.10	55+00	0.2	0.4	0.6	1.7	3.3	5.7	1.1	1.6	2.2	3.7	5.6	8.1
Drainageway 1200 - Downstream Confluence	1233	235	0.37	15+00	6.7	10.1	14.7	24.8	33.4	44.5	6.8	10.2	14.9	25.0	33.8	44.5
Drainageway 1200 - Upstream Confluence	1255	178	0.28	122+00	2.7	4.8	8.1	15.9	22.4	30.7	3.1	5.2	8.6	16.4	23.0	31.3
Subbasin 1272 - Outfall to Oklahoma	1272	23	0.04	99+00	0.0	0.0	0.0	0.3	0.8	1.6	0.0	0.1	0.2	0.5	1.1	1.9
Drainageway 1300 - Outfall to Oklahoma	O_1307	1712	2.68	0+00	11.0	23.7	51.5	126.7	186.9	267.6	25.2	43.0	73.6	148.2	209.9	290.0
Drainageway 1300 at Outlet of Oklahoma Reservoir	1340	919	1.44	54+00	8.7	16.9	32.8	73.3	105.9	149.4	12.5	22.3	39.0	79.5	112.6	155.6
Drainageway 1300 - Confluence	1315	1561	2.44	21+00	10.7	23.2	50.6	123.0	181.3	259.0	24.6	42.0	72.1	144.2	203.7	280.8
Subbasin 1382 - Outfall to Oklahoma	1382	92	0.14	115+00	0.2	0.3	1.5	5.4	8.4	12.7	0.4	0.8	2.0	6.0	9.1	13.4

3.2 Hydraulic Analysis

3.2.1 Evaluation of Existing Facilities

There are 9 existing culvert crossings located within the study area. Refer to Figure 2-63, Figure 2-64, and Figure 2-65 for the locations of existing crossing structures within the GOS, GO, and GOR study areas respectively. Culvert sizes and material were observed during the multiple Matrix field assessments, but not all structures were visited due to property access constraints. One goal of the hydraulic analysis was to determine the capacity of these structures and identify structures that are undersized and will need to be replaced to safely convey the 100-year future flows. For this analysis it was assumed that any overtopping was unacceptable and proposed crossing sizes pass future flows without overtopping the embankment. Of the 33 structures analyzed, seven existing structures have 100-year capacity. Table 2-1 summarizes the existing capacities. Table 3-20 shows the proposed culvert improvements for the study area.

HY-8 version 7.00.2 software was used to evaluate the hydraulic capacity of crossings within the study reach. Survey data was collected for each crossing and used for the elevation inputs and crossing length inputs. LiDAR data was used to approximate the channel cross section geometry and embankment profiles. Proposed culvert improvements were assumed to have the same invert elevations and length as existing structures for the purposes of this capacity analysis. Table 3-13 shows a summary of Manning's n used in the model based on the culvert material. It should be noted that the manning's n values used in the HY-8 models are different compared to the SWMM models as the HY-8 models are being used for a culvert analysis while the SWMM models are being used for a runoff analysis. Detailed HY-8 inputs and outputs for existing crossing structures can be found in Appendix C.

Table 3-13 Manning's n-Values

Culvert Material	Manning's n
Reinforced Concrete Pipe (RCP)	0.011-0.012
Corrugated Steel (CMP)	0.024
Concrete Box Culvert	0.013
Polyvinyl Chloride (PVC)	0.013

Crossing 603 is a unique structure because it is the outlet to a private detention basin on Parcel 095709000009. It was included in the crossings evaluation because the basin is an inline structure on Reach 618. There was no available information on the design of the detention basin, so it was assumed that no detention was provided by the basin. The resulting proposed culvert size is more representative of an emergency spillway rather than an outlet pipe because the crossing was sized purely for capacity without any considerations for drain time or other detention features.

Crossing 804 is a unique structure as its inlet is a concrete box culvert with its outlet becoming a wooden box culvert. There are also two restrictor plates inside of the structure shortening the opening. To simulate this, an embankment depth of 60 inches was placed into the crossing model. Crossing 701 while noted, was excluded from the study due to its inlet possibly being located inside of a pond. This could not be confirmed due to the pond being located inside private property.

Structure 806 and 703 were not included in the report. Structure 806 was deemed an outlet structure for the existing Southgate detention basin and Structure 703 is a small-diameter pipe through a small, informal embankment. Due to these situations, it was decided to not design 100-year pipe conveyance for either pipe.

Crossing 1001 at SH-257 is the only existing bridge within these watersheds, and the Oklahoma Drainageway outfall for this study. The existing bridge has two concrete piers and appears to be in fair condition. This study did not include detailed backwater analyses to fully examine the hydraulic performance of bridges, but the existing capacity was noted previously in the *Town of Windsor Master Drainage Plan* (2003). Future proposed bridge spans were estimated by assuming that the bridge will provide a clean span across the entire future 100-year floodplain width.

Crossing 1003 at WCR-17 is currently being considered for replacement by the Town of Windsor. Our understanding is the need to replace this crossing was the primary driver behind the draft *Oklahoma Basin 2024 Master Plan Update* recently completed by the Town of Windsor. That report recommended replacing the existing crossing with dual 10'x10' box culverts along with roadway profile improvements.

Crossings 1203, 1205, 1206, 1207, and 1208 were all constructed in the last few years as part of the Raindance development in the Town of Windsor. These crossings have 100-year capacities and are not expected to require replacement (for capacities reasons).

Crossing 1301 comprises two pipes that cross WCR-17, corresponding to a roadside ditch on each side of the upstream WCR-60. Both pipes are CMPs in poor condition and were very difficult to assess in the field due to stagnant water and sediment that fills the culverts and channels. Based on upstream flow patterns, the northern crossing was identified as the primary culvert for this study. The wetland area located immediately west of WCR-17 provides some storage function but also results in a lack of a defined channel and poor conveyance capacities. Future crossing improvements will likely require a reconfiguration/raising of the roadway profile and intersection. The two highways at this intersection are currently low-traffic dirt roads.

3.2.2 Flood Hazards

There are no existing mapped floodplain hazards within the study area. This study did not include detailed river hydraulics or flood mapping, but the GOS study did include the development of Relative Elevation Models (REMs) for all major drainageways. REMs are a visualization tool derived from a Digital Elevation Model (DEM) of the existing topography (2018 LiDAR for this study). Matrix produced REMs by defining the thalweg (lowest elevation within the channel) for each desired drainageway then calculating the relative elevation of the surrounding cells to that thalweg as one moves up and down the reach. For a more detailed discussion of how to create REMs, please refer to the *Colorado Fluvial Hazard Zone Delineation Protocol Appendix C: Relative Elevation Model (REM) Guidance* (CWCB, 2020).

REMs can be used to more easily identify fluvial signatures such as alluvial terraces, relic channel/meander scars, and floodplain surfaces. In addition to the raw REM grids, Matrix created polygons that represented depth thresholds of 1-foot and 3-feet. These polygons, shown in Figures E-1 through E-3 of Appendix E, can be used as an approximation of the extents of 1-foot and 3-feet flood inundation, which roughly correspond to areas that are most likely to be subjected to concentrated flows during runoff events. Note that REMs were not produced for the GO and GOR study areas because these areas featured major drainageways that had already been heavily modified by human activities (primarily agriculture). REMs are useful where natural topography determines the flood depths of conveyance channels, but are less useful for shallow grass swales or small constructed channels.

Figure 3-3, Figure 3-4, and Figure 3-5 present the observations made during field assessments for the GOS, GO, and GOR studies respectively. Observations were grouped into two categories: stream characterization and potential drainage problems. Detailed geomorphic analyses were not performed as part of this study, but the general health and shape of existing flood valleys were noted. Most of the drainageways observed within the study area appeared to be relatively stable – identified potential drainage problems were usually localized issues such as erosion at concentrated flow areas or existing culverts that lacked appropriate end treatments.

3.2.3 Previous Analyses

No previous hydraulic analyses of the reaches within the GOS and GO study areas were identified. However, portions of the 1000, 1100, and 1200 reaches within the GOR study area have been analyzed due to the recent developments in this area. A summary of these studies is provided below.

Document: *Town of Windsor Master Drainage Plan*, dated October 3, 2003, prepared by Anderson Consulting Engineers, Inc.
Pertinent Information:
The purpose of this master plan was to analyze major drainage basins within the Town of Windsor, which was experiencing rapid growth at the time of the plan.
The plan includes the overtopping flow for the State Highway 257 bridge (Matrix structure number 1001) and the Great Western Railroad cross (structure 1002). The plan identifies the railroad crossing as a 12'x9' arched CMP culvert.

Document: *Oklahoma Basin Hydrologic Update memorandum*, dated July 7, 2023, prepared by Anderson Consulting Engineers, Inc.
Pertinent Information:
This memo provides results from an analysis of rerouting Oklahoma Subbasin O05 from entering the drainageway downstream of Weld County Road (WCR) 17 (existing condition) to upstream of WCR17 (proposed condition). The existing 5.5'x8.5' concrete box culvert at WCR17 (structure 1003) creates inadvertent detention, represented by existing D1034 detention pond. This memo analyzed the crossing capacity and recommends a 10'x10' concrete box culvert to pass the 100-year in the existing condition, and a 15'x10' concrete box culvert in the proposed condition.

Document: *2024 Windsor Drainage Master Plan Update: Oklahoma Basin*, dated July 17, 2024, prepared by Wilson & Company.
Pertinent Information:
The purpose of this report is to provide an update to the 2003 master plan and create a conceptual design of improvements for the WCR17 culvert crossing (structure 1003). The preferred alternative is to replace the existing culvert with a 2-10'x10' concrete box culvert.
This report also included information regarding future improvements to WCR17. An additional phase of the Trautman subdivision is planned for the west side of WCR17. This subdivision will include widening and raising WCR17 between this subdivision and the railroad tracks to the south. The road will be raised 7 feet to reduce the existing sag and increase sight distance to improve road safety. The road will also get widened to 66 feet of total road width.

Document: *Final Drainage Report For Water Valley South Hill Subdivision Second Filing*, dated May 19, 2016, prepared by TST, Inc. Consulting Engineers.
Pertinent Information:
This report provides drainage information for the South Hill development, located within Reach 1100, northwest of the CR-17 / Crossroads Blvd intersection. This report contains information for structure 1103, which corresponds to the culvert underneath Grain Bin Drive, as well as information for the existing D1141 and D1155 detention ponds included in Options 2 and 4.

Document: *Final Drainage Report For Raindance Subdivision, Filing One*, dated June 9, 2017, prepared by TST, Inc. Consulting Engineers.
Pertinent Information:
This report provides drainage information for the first filing of the Raindance Subdivision, located in Reach 1200, northwest of the intersection of Crossroads Blvd and CR-15. This report contains information for structure 1203, which corresponds to the 3-66" RCP culverts that cross Crossroads Blvd on the east side of the development.

Document: *Construction Plans for Raindance Major Infrastructure Addendum 1*, dated December 21, 2020, prepared by TST, Inc. Consulting Engineers.
Pertinent Information:
These plans provide the design for the two 60-inch RCP culverts (Structure 1207) located underneath Crossroads Blvd, approximately 1,100 feet east of Colorado Blvd.

Document: *Raindance Reservoir #2 Pump Station Drainage Letter*, dated January 22, 2024, prepared by TST, Inc. Consulting Engineers.
Pertinent Information:
The purpose of this letter is to evaluate the drainage conditions of the proposed pump station building site and adequately size the proposed drainage infrastructure throughout the site, including the design of Raindance Reservoir #2, which is the existing D1233 detention pond.

Document: *Construction Plans for Raindance Non-Pot Pump Station #2*, dated January 12, 2024, prepared by TST, Inc. Consulting Engineers.
Pertinent Information:
These plans include the design information for the 78" epoxy coated steel pipe culvert (structure 1204) under a maintenance access road.

minor bank scour at inlet and outlet of culvert
local erosion (vertical bank)
erosion on high end of channel
knickpoint (bed instability)
entrenched channel (short vertical banks)
dam
large concrete debris is arresting headcount
90 deg culvert entrance blocked with sediment/vegetation
stable broad swale
culvert partially buried
informal embankment
stable reach
salvage line built over creek
broad stable swale, taller banks
localized top of bank failures (steep slopes)
localized top of bank failures (steep slopes)
more confined valley
narrow, vegetated channel
pond outlet lacks FES, apron
pond in junk yard, no visible inlet
dam upstream
culvert lacks FES/headwalls, appears to have minimal cover
broad swale, no defined channel
local erosion at culvert outlet
tributary headcut
tributary headcut
culvert outlet lacks wingwall/headwall
culvert outlet lacks energy dissipation or apron
broad swale with intermittent low-flow channel
6'-8' tall embankment (old stockpond)
woody veg top of banks, herbaceous veg in channel
broad, shallow plain swale
stable confined channel with tall banks & good vegetation
v-shaped upstream with taller steep banks
confined valley, thick riparian vegetation with cottonwoods
likely borrow pit
berm blocks tributary inflows
some local erosion where channel is near valley walls
broad plain, no channelization
culvert partially buried, lacking fes
broad plain, no channelization
pond
local erosion at culvert outlet
6" pipe riser, local bank erosion (vertical slopes)
stable reach with good vegetation
E Crossroads Blvd
Windsor
Oklahoma Drainageway
South Drainageway
Unincorporated Weld County
Oklahoma Drainage Basin
South Drainage Basin
City of Greeley
Town of Windsor
Great Western Railway
BUS 34
34
257
17
0 ¼ ½ Miles

Legend

Field Notes
- Stream Characterization
- Potential Drainage Problems
- Study Reaches
- River/Creek/Ditch
- Railroad

- Study Area
- Major Drainage Basin
- Town of Windsor
- City of Greeley
- Greeley LREGA

No.	DATE	DESCRIPTION	APPR.

Matrix Excellence by Design

designed by: SL
drawn by: SL
checked by: BL
project no.: 24.906.009
date: 07/11/2025

City of Greeley Colorado

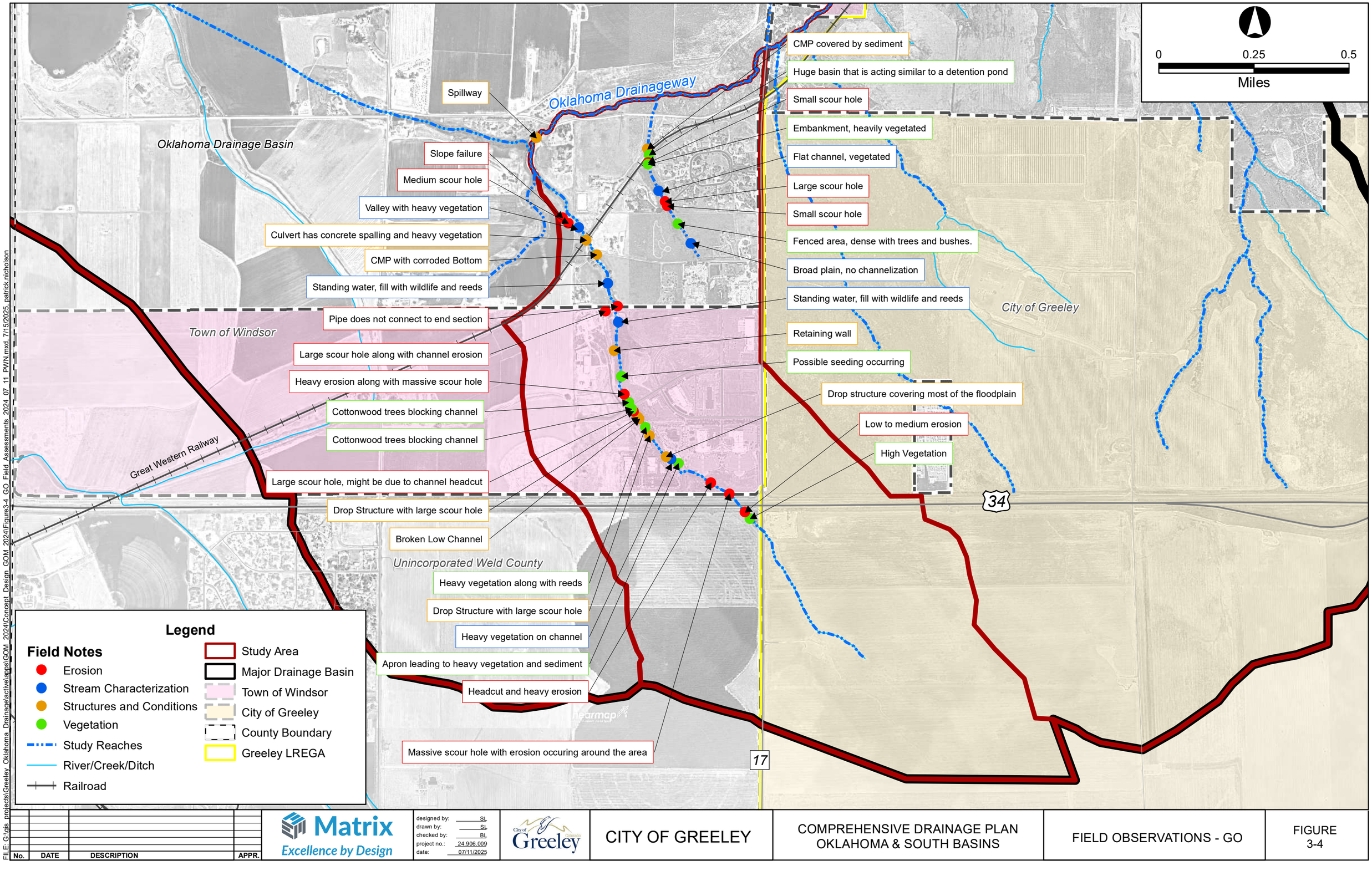
CITY OF GREELEY

COMPREHENSIVE DRAINAGE PLAN
OKLAHOMA & SOUTH BASINS

FIELD OBSERVATIONS - GOS

FIGURE
3-3

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City of Greeley

CITY OF GREELEY

COMPREHENSIVE DRAINAGE PLAN
OKLAHOMA & SOUTH BASINS

FIELD OBSERVATIONS - GO

FIGURE
3-4

LARIMER COUNTY

Town of Windsor

City of Loveland

Unincorporated Larimer County

Unincorporated Weld County

Town of Johnstown

City of Greeley

WELD COUNTY

Oklahoma Drainage Basin

South Drainage Basin

Great Western Railway

Cache la Poudre River

Oklahoma Drainageway

South Drainageway

E Crossroads Blvd

0 ½ 1
Miles

Small channel, low vegetation
Wide channel with heavy vegetation
Broad plain, no channelization
Multiple check dams
Multiple check dams
Large reservoir currently under construction
Rip rap buried under vegetation
Low flow channel, not man made
Wide channel, medium vegetation
New flume
Reeds and tall grass
Wide channel with heavy vegetation
Wooden bridge, very unstable
Small channel, low vegetation
Bank erosion, bend scour 7 ft tall
Small channels coming from the sides
Grove of standing and fallen trees
Grassy rolling terrain, no channelization
Mild erosion, causing cutbanks
Broad plain, no channelization
Heavy vegetation in channel
Broad plain, no channelization
Oklahoma Reservoir, no obvious spillway
Massive channel erosion covering culvert pipe
Standing water, no channelization
Detention that is filled to the brim with sediment
Heavy erosion, vertical bank walls
Large patch of reeds, bushes, and cattails
Valley with heavy vegetation
25' cut bank
Heavy erosion by pond
12' cut bank
Valley with heavy vegetation
Large valley, medium grass vegetation
Wide channel, medium vegetation
Spillway for wet pond
East bank eroding
Large patch of bushes
East bank eroding
Wide channel with heavy vegetation
Active farmland, no channelization

BUS 34
34
257
17

Legend

Field Notes
- Erosion
- Stream Characterization
- Structures and Conditions
- Vegetation
- Study Reaches
- River/Creek/Ditch
- Railroad

- Study Area
- Major Drainage Basin
- Town of Windsor
- City of Greeley
- Town of Johnstown
- City of Loveland
- County Boundary
- Greeley LREGA

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City of Greeley, Colorado

CITY OF GREELEY

COMPREHENSIVE DRAINAGE PLAN
OKLAHOMA & SOUTH BASINS

FIELD OBSERVATIONS - GOR

FIGURE
3-5

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3.3 Alternatives Analysis

3.3.1 Action Plan

Alternative Development Process

Alternative options were selected based on applicability, effectiveness, and ease of implementation. Matrix evaluated four broad classes of alternatives for every reach in the study area.

The first alternative considered was a 'no action' option. This alternative is useful for identifying existing reaches that may be stable under future flows and provides a baseline to compare other alternatives against.

The second alternative considered was detention because it can be scaled up or down based on watershed needs. Detention basins are effective at reducing the peak flows on receiving channels and can reduce or eliminate the need for channel improvements and stabilization in receiving channels. Detention basins can also provide water quality treatment to reduce pollutants that reach the Cache la Poudre River. Potential drawbacks of detention basins are the large footprint and maintenance requirements, but advanced planning and budget prioritization can minimize these concerns.

The third option considered was channel improvements. Channel improvements were defined as establishing channel geometry that can convey the 100-year event in a non-erosive manner. Channel improvements are useful for addressing reach instability at either a reach or watershed level. Channel improvements also provide the opportunity to make stream corridors into a community asset by building trail networks, parks, and open spaces.

The fourth alternative considered was implementing low impact development (LID) practices within the study area. LID, also known as green infrastructure, encompasses a wide suite of practices including bioretention/rain gardens, vegetated/green rooftops, rain barrels, permeable pavement, grass swales, and vegetated buffers. This planning study focused on vegetated buffers, which are gently sloping, grass or other dense vegetation strategically placed to break up impervious areas. Disconnecting paved areas slows runoff and increases infiltration, filters out sediment and pollutants, and reduces peak flows. Incorporating LIDs on developed land can reduce the need for structural improvements such as detention and large flood channels.

Various combinations of the alternatives presented above were evaluated in this analysis. The methods and results are discussed below.

3.3.2 Policy Recommendations

Implementing a comprehensive drainage plan along each major drainageway is necessary to achieve the sponsor goals. Isolated proposed improvements described in this study should not be constructed without considering the performance of the entire drainageway. For example, if a particular channel improvement is located downstream of a reach with recommended regional detention, the upstream detention must be in operation, or the downstream channel will be undersized.

Multiple alternatives are presented in this report, and an alternatives evaluation matrix was used to compare the benefits and drawbacks of each alternative for each reach. The highest scoring alternatives become the recommended alternatives for long-range implementation.

3.3.3 Alternatives Criteria

Major drainageways 100, 200, 300, 500, 600, and 800 were evaluated comprehensively so that the effects of upstream alternatives on downstream reaches could be determined. Combinations of the alternatives were formed into four Options. Option 1 considered only the do nothing alternative for each reach within a drainageway. Option 2 included detention and, if necessary, channel improvements. Option 3 considered only using channel improvements to address reach stability. Lastly, Option 4 assumed watershed-wide LID implementation, then included detention and channel improvements as necessary. The assumptions and criteria used for each alternative category are discussed below.

Do Nothing

This alternative evaluated channel stability with future hydrology if no action is taken.

Detention

Regional in-line, full spectrum extended detention basins were assumed for this analysis. Full spectrum detention (FSD) refers to a design process that seeks to control both the 100-year flood and smaller, more frequent storm events. FSD basins typically feature multistage outlet works to achieve multiple goals. Proposed detention basins were designed to reduce the future peak flow to match the existing peak flow.

Channel Improvements

Proposed channel improvements assumed a trapezoid cross section with 5H:1V side slopes. The bottom width of the channel was widened until the average 100-year velocity was below 5 ft/s. Per MHFD criteria, 1.5' of freeboard was assumed and included in corridor width recommendations.

Detention & Channel Improvements

Both detention and channel improvements were considered for this analysis.

Low Impact Development (LID)

Low impact development was defined as grass buffers between paved areas to slow runoff velocities and increase infiltration. LID practices were assumed to be applied to all new development areas.

3.3.4 Alternatives Modeling

Different combinations of the four alternatives presented above were evaluated for each major drainageway using the Environmental Protection Agency Stormwater Management Model (SWMM) versions 5.1 and 5.2 software. The kinematic wave flow routing method was used in SWMM to perform hydraulic calculations. A summary of the alternative options and where each option was considered is provided in Table 3-14.

Table 3-14 Alternative Options Descriptions

Option No.	Option Description	Major Drainageway											
		100	200	300	500	600	700	800	900	1000	1100	1200	1300
1	Do Nothing except crossing structure upgrades	x	x	x	x	x	x	x	x	x	x	x	x
2	Detention in all major tributaries and channel improvements	x	x		x	x	x	x		x	x	x	x
3	Channel only improvements	x	x		x	x	x	x		x	x	x	x
4	LID, detention, and channel improvements	x	x		x	x	x	x		x	x	x	x

All of the options except 1 (Do Nothing) include some form of channel improvements, although the channel improvements may differ between each option. The specific methods used for modeling each alternative are discussed below.

Option 1 – Do Nothing

Future 100-year flows were used for the SWMM input hydrology. Hydraulic inputs for the nodes and links matched the existing and future conditions SWMM models. A channel threshold 100-year velocity criteria was set at 5 ft/s for the boundary between erosive and non-erosive flows. This threshold is typically appropriate for vegetated channels without hardened erosion protection. If 5 ft/s was exceeded the channel was deemed to be inadequate to convey future flows and no action was not considered a viable option.

Option 2 – Detention

The Mile High Flood District (MHFD) Detention workbook version 4.06 was used to design the detention basins. With the exception of pre-existing detention basins, conceptual detention basins assumed the minimum rectangular footprint with 4:1 side slopes that would result in the required volume. The workbook has an integrated CUHP model that runs and determines the necessary volume to detain. For consistency, the same CUHP inputs used to develop the hydrology were used in the detention basin worksheets. When this was not possible the inputs were kept as close as possible.

The basins were designed for full spectrum detention and had three zones: water quality capture volume (WQCV), excess urban runoff volume (EURV), and the 100-year event. The design 100-year depth for the detention basins was eight feet to avoid additional requirements associated with jurisdictional dams. The WQCV, EURV, and 100-year outlet structures were assumed to be an orifice plate, vertical orifice, and weir and pipe with a restrictor plate respectively. The target release time for the 100-year event was 72 hours. Once the basin and outlet structures had been properly sized the storage curve and rating curve were imported into the SWMM model. Table 3-15 summarizes the proposed detention basin alternatives. Detailed outputs from the MHFD Detention worksheets are in Appendix E.

Table 3-15 Detention Basin Summary

Study Area	Detention Facility No.	Existing or Proposed	Existing Retention?	Reach Location	Storage Volume (acre-feet)	Drainage Area (acre)	Detention Facility (Q_{100} Future Sizing)		
							Size (acre)	Peak Inflow (cfs)	Peak Outflow (cfs)
GOS	D150	Proposed	No	150	13	149	3.9	400	214
	D134	Proposed	No	134	16	137	5.2	469	211
	D248	Proposed	No	244	19	140	7.1	509	194
	D268	Proposed	No	260	16	127	5.4	348	152
	D510	Proposed	No	510	18	168	6.0	456	230
	D618	Proposed	No	618	21	157	8.0	544	214
GO	D711	Proposed	No	700	6.5	90	1.6	176	127
	D823	Proposed	No	829	43	327	6.3	793	356
	D841[A]	Proposed	No	843	25	211	12.2	647	41
	D844	Proposed	No	844	17	127	4.4	523	204
GOR	D1034[B]	Existing	No	1088	11	3,487	14.1	1,034	815
	D1050	Proposed	No	1088	159	2,854	16.5	2,062	1,213
	D1127	Proposed	Yes	1100	46	834	5.5	411	285
	D1141[C]	Existing	No	1140	35	717	6.9	460	301
	D1155[C]	Existing	No	1148	43	461	7.3	499	246
	D1163	Existing	No	1148	32	173	5.9	491	161
	D1170[C]	Existing	No	N/A	21	78	4.6	147	71
	D1233[B,D]	Existing	Yes	1216	62	583	13.1	784	220
	D1315	Proposed	No	1300	43	1,561	5.1	1,301	1,058
	D1340[E]	Existing	Yes	1340	493	919	73.1	1,423	131

[A]D841 was previously named D814 in the GOS study.
[B]Source: *Oklahoma Basin Hydrologic Update,*dated July 7, 2023, prepared by Anderson Consulting Engineers, Inc.
[C]Source: *Final Drainage Report for Water Valley South Hill Subdivision Second Filing,* dated May 19, 2016, prepared by TST, Inc. Consulting Engineers.
[D]Source: *Raindance Reservoir #2 Pump Station Drainage Letter,* dated January 22, 2024, prepared by TST, Inc. Consulting Engineers.
[E]Source: *Oklahoma Lake (Weld County, CO) Dam Safety Inspection,* dated December 20, 2024, prepared by Reno Gazette Journal.

Where possible detention facilities were placed to take advantage of existing topographic features such as roadway embankments or partially enclosed areas. Typically, these features were undersized but could be expanded to meet detention needs.

Many existing detention facilities were included in this Option 2 model, as shown in Table 3-15. Note that this report did not include the existing detention facility named Pond B in the *Final Drainage Report for Trautman Subdivision, Fifth Filing*, dated October 26th, 2023, prepared by TST, Inc. Consulting Engineers. This detention facility is located north of the main drainageway on the west side of Weld County Road 17. This detention facility was not included in this model since it had a negligible impact on the 100-year peak flow due to its small size.

Option 3 – Channel Improvements

Channel improvements were modeled in SWMM. A trapezoid with 5H:1V side slopes and a varying bottom width was assumed for channel geometry. Other link inputs were not changed. Channel size was based on meeting the threshold velocity criteria of 5 ft/s. The reported channel top widths for each alternative include 1.5 feet of freeboard per MHFD criteria. The peak discharge in each reach is dependent on upstream conditions.

For this alternatives analysis, simple trapezoidal cross sections with 5:1 (H:V) side slopes and existing longitudinal slopes were assumed for the majority of links. Some links could not achieve the threshold velocity with a reasonable channel bottom, so grade control structures were included to reduce the longitudinal slopes. Multistage channels and additional grade control structures should be considered during subsequent design. A multistage section generally results in greater stream stability and is more aesthetically pleasing. However, going from a simple trapezoid to a multistage section does not drastically reduce the required corridor width since the 100-year storm event still needs to be spread out over a similar area to the simple trapezoid. Figure 3-6 depicts the modeled trapezoid channel configuration (solid lines) and also the potential bankfull and flood terrace stages (dashed lines). Future additional grade control could reduce longitudinal slopes and increase proposed flood depths if desired. Table 3-19 summarizes the required channel top width for each option and depth of flow during the 100-year event.

Option 4 – LID

LIDs were assumed to be grass buffers that would be implemented in parcels zoned with a developed land use. The impact of LIDs on watershed hydrology was evaluated by changing the directly connected impervious area (DCIA) input option in CUHP from 0 to 1. The DCIA input accepts 0, 1, and 2 indicating different levels of LID implementation. 0 indicates no LIDs are used, 1 indicated grass buffers or similar are used, and 2 reflects conveyance-based LIDs such as grass swales are used. To be conservative and not overestimate implementation of LIDs a DCIA values of 1 was entered for all subbasins. These LID-modified CUHP inputs and outputs are included in Appendix E.

LID practices alone did not reduce peak flows of larger storm events very much, so EURV and flood control (100-year event) detention ponds were sized in conjunction with the LID-modified CUHP results and can be seen in Table 3-16. These detention ponds were generally smaller than the regional detention ponds described in Option 2. A subsequent SWMM model was created using the revised CUHP outputs and detention rating curves developed in the MHFD detention workbooks (see Appendix E for detention workbook results) for each study reach to evaluate channel velocities and determine if further action was needed. Note that the existing detention ponds were included in this LID model.

The hydraulic results and required channel parameters for each option are shown in Table 3-17, Table 3-18, and Table 3-19, and discussed below. Preliminary 100-year (future flows) sizing of crossing structures under each alternative Option is presented in Table 3-20.

The proposed crossings were sized to ensure no roadway overtopping and a maximum headwater to depth ratio (HW/D) of 1.5. Note that Weld County Road 17 was raised and widened in the alternatives crossing analysis to match the future roadway as described in the 2024 Windsor Drainage Master Plan Update: Oklahoma Basin, dated July 17, 2024, prepared by Wilson & Company. Results discussions for each major drainageway follows.

Table 3-16 LID Detention Basin Summary

Study Area	Detention Facility No.	Reach Location	Contributing Subbasins	Drainage Area (acre)	Future % Imperv.	EURV Ponds				Flood Control Ponds			
						Storage Volume (acre-feet)	Size (acre)	Peak Inflow (cfs)	Peak Outflow (cfs)	Storage Volume (acre-feet)	Size (acre)	Peak Inflow (cfs)	Peak Outflow (cfs)
GOS	D121	N/A (upstream of 118)	122/126	143	37%	6.2	4.0	248	245	-	-	-	-
	D134	134	134/138	137	63%	11.2	6.0	465	376	5.4	1.1	376	210
	D146	N/A (upstream of 142)	146	40	29%	1.1	0.6	48	48	-	-	-	-
	D150	150	150/154	149	40%	7.2	4.2	398	369	4.0	0.8	369	249
	D225	224	226/228	127	43%	6.3	4.1	294	277	-	-	-	-
	D236	N/A (upstream of 232)	236	60	31%	2.1	1.2	104	105	-	-	-	-
	D244	N/A (Upstream of 244)	244	90	54%	5.9	3.5	235	213	-	-	-	-
	D245	244	248/250/252	203	71%	18.8	10.9	679	509	10.3	1.8	509	266
	D256	N/A (Upstream of 239)	256	94	44%	5.0	3.2	180	168	-	-	-	-
	D263	260	264/268	127	62%	9.8	5.0	349	302	6.6	1.1	302	137
	D510	N/A (Upstream of 500)	514/518	168	57%	12.8	7.6	453	382	7.5	1.3	382	210
	D614	N/A (Upstream of 600)	614	100	52%	6.6	4.2	319	284	-	-	-	-
	D618	618	618/622	157	75%	14.2	7.1	544	415	6.8	1.3	415	234
	D810	N/A (Upstream of 800)	810	64	77%	5.8	3.1	199	166	-	-	-	-
	D814	800	814/818	211	65%	28.5	10.1	645	327	2.4	0.6	327	282
GO	D_EURV_711	700	712	90	30%	2.4	0.6	170	155	6.5	1.3	155	111
	D_EURV_820	829	820	81	70%	5.5	1.3	332	240	-	-	-	-
	D_EURV_830	829	830	829	68%	5.6	1.5	293	193	-	-	-	-
	D_EURV_840	843	840	63	77%	5.4	3.1	200	165	-	-	-	-
	D_EURV_842	843	842/850	211	69%	14.3	9.5	646	328	2.4	0.6	328	284
	D_EURV_844	N/A (Upstream of 843)	844	127	76%	9.4	2.3	523	383	-	-	-	-
	D_FC_823	829	820/830/844/842/840	327	73%	-	-	-	-	20.0	5.0	475	261
	D_FC_838	829	844	127	76%	-	-	-	-	17.3	3.3	524	292
GOR[A]	D_EURV_1172	N/A (Trib to 1010)	1172	49	10%	0.4	0.1	28	28	-	-	-	-
	D_EURV_1116	N/A (Trib to 1100)	1116	60	40%	2.5	0.7	142	115	-	-	-	-
	D_EURV_1127	1100	Reach 1100 upstream of 1127	834	41%	36.1	10.8	407	300	-	-	-	-
	D_EURV_1208	N/A (Trib to 1024)	1208	63	32%	2.0	0.5	104	86	-	-	-	-
	D_EURV_1264	N/A (Trib to 1200)	1264	40	10%	0.3	0.1	47	47	-	-	-	-
	D_EURV_1382	N/A (Trib to 1088)	1382	92	10%	0.9	0.3	87	86	-	-	-	-
	D_FC_1050	1088	Reach 800, 900, and 1300	2,854	36%	-	-	-	-	159	16.5	1,553	900
	D_EURV_909	900	910/930/940/950/960	446	65%	30.1	8.3	722	351	-	-	-	-
	D_EURV_1392	N/A (Trib to 1300)	1388/1392/1394/1396/1398	433	36%	14.8	3.7	666	590	-	-	-	-
	D_EURV_1395	N/A (Trib to 1300)	1396/1398	130	75%	9.5	2.4	405	267	-	-	-	-
	D_EURV_1316	N/A (Trib to 1316)	1320/1322	127	11%	1.2	0.3	220	220	-	-	-	-

[A]Existing detention facilities were included in the Option 4 model, but were not included in this table. Refer to the Option 2 Detention Basin Summary table existing detention facilities information.

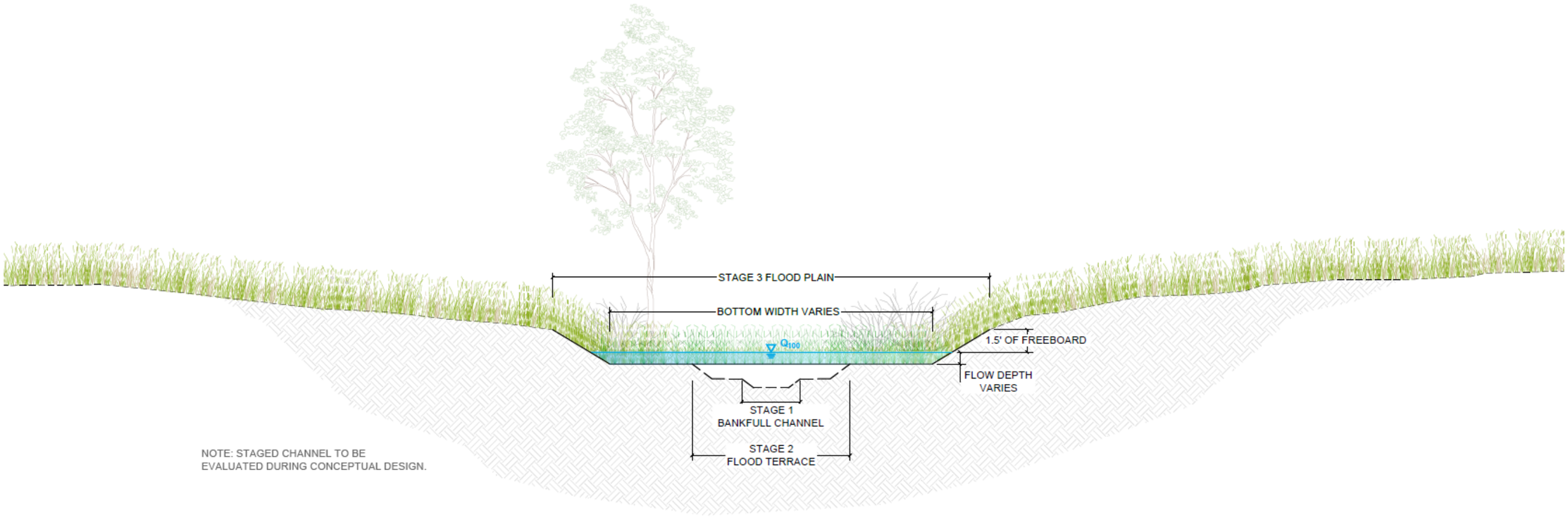


Figure 3-6 Typical Channel Cross Section

Table 3-17 100-Year Channel Velocities

100-Yr Velocity (ft/s)						
Reach	SWMM Link	Existing	Option 1 Do Nothing	Option 2 Detention	Option 3 Channel Improvements	Option 4 LID
100	L_115	5.3	6.2	5.0	5.0	5.0
118	L_119	8.7	10.0	5.0	5.0	5.0
134	L_138	4.6	5.8	5.0	5.0	4.8
142	L_149	7.4	8.5	5.0	5.0	5.0
150	L_154	4.9	6.0	5.0	5.0	5.0
200	L_221	7.1	8.3	5.0	4.9	4.8
225	L_225	5.9	6.8	5.0	5.0	4.8
235	L_235	6.4	8.2	5.0	5.0	4.8
239	L_239	6.5	8.3	5.0	4.9	4.8
241	L_241	7.5	9.4	4.9	4.9	4.7
245	L_245	9.8	12.4	4.9	5.0	4.6
263	L_263	6.7	8.6	5.0	5.0	4.8
300	L_314	4.7	4.9	4.9	4.9	4.8
500	L_513	4.8	6.3	4.9	5.0	4.7
600	L_613	5.0	6.6	4.8	5.0	4.9
614	L_617	4.8	6.6	4.6	5.0	4.7
618	L_622	5.3	6.8	5.0	5.0	5.0
700	L_708	10.4	10.7	6.6	5.0	9.1
700	L_709	5.4	5.6	5.0	4.8	4.7
700	L_710	4.3	4.4	3.9	4.4	3.7
700	L_711	4.1	4.2	4.1	4.2	3.4
700	L_712	3.6	3.7	3.7	3.7	3.7
700	L_713	2.9	3.0	3.0	3.0	3.0
800	L_808	5.0	6.4	3.6	4.9	3.2
800	L_811	5.3	6.8	3.7	4.9	3.4
800	L_819	3.5	4.6	2.4	4.6	2.2
829	L_823	3.1	4.1	2.6	4.1	1.7
829	L_829	8.0	10.6	6.4	4.9	5.9
829	L_834	3.3	4.3	2.8	4.3	2.6
829	Overflow_836	6.2	8.6	4.4	5.0	3.4
829	L_838	4.4	5.5	3.8	5.0	2.6
843	L_839	3.0	4.0	2.5	4.0	3.4
843	L_841	4.2	5.1	2.6	5.0	4.1
843	L_850	3.5	4.4	4.2	4.4	4.4
900	L_911	4.1	4.6	4.6	4.6	4.6
900	L_912	4.6	5.0	5.0	5.0	5.0
1000	L_1004	7.9	8.6	5.0	5.0	5.0
1010	L_1006	10.2	10.9	4.7	4.8	4.7

100-Yr Velocity (ft/s)						
Reach	SWMM Link	Existing	Option 1 Do Nothing	Option 2 Detention	Option 3 Channel Improvements	Option 4 LID
1010	L_1008	8.8	9.4	4.9	4.9	5.0
1010	L_1010	7.6	8.1	4.8	4.1	4.9
1010	L_1012	5.4	5.8	3.8	5.0	3.8
1024	L_1014	4.3	4.6	2.9	4.6	3.0
1024	L_1018	6.7	7.1	4.5	5.0	4.2
1024	L_1020	9.0	9.6	5.0	5.0	5.0
1024	L_1022	8.6	9.2	5.0	5.0	4.9
1024	L_1024	7.7	8.2	4.6	5.0	4.8
1024	L_1028	10.6	11.4	4.9	5.0	5.0
1024	L_1030	12.4	13.3	4.6	4.3	4.1
1088	L_1034	8.0	8.7	-	5.0	5.0
1088	L_1036	9.0	9.8	-	5.0	4.8
1088	L_1038	7.1	7.6	-	5.0	4.7
1088	L_1040	8.5	9.1	-	5.0	5.0
1088	L_1042	10.5	11.3	-	4.5	4.6
1088	L_1044	9.4	10.2	-	4.8	5.0
1088	L_1046	11.2	12.0	4.0	4.9	3.7
1088	L_1048	9.5	10.2	4.9	4.9	5.0
1100	L_1115	10.2	11.2	4.8	5.0	4.1
1100	L_1123	6.0	6.9	3.8	5.0	3.7
1100	L_1127	5.3	6.1	2.8	5.0	3.1
1100	L_1130	4.5	5.1	3.0	4.8	3.0
1140	L_1141	3.1	3.5	-	3.5	-
1140	L_1147	6.9	7.5	4.2	5.0	4.2
1148	L_1151	7.1	7.7	5.0	4.9	4.6
1148	L_1156	2.2	2.5	-	2.5	-
1200	L_1217	4.8	4.9	4.1	4.9	4.1
1216	L_1223	3.8	3.9	3.2	3.9	3.2
1216	L_1231	4.4	4.4	3.6	4.4	3.5
1232	L_1235	6.0	6.1	4.9	4.9	4.9
1240	L_1239	8.4	8.5	4.9	3.2	4.9
1240	L_1255	4.1	4.1	4.1	4.1	4.1
1240	L_1273	2.9	2.9	2.9	2.9	2.9
1256	L_1257	3.3	3.3	3.3	3.3	3.3
1300	L_1315	6.6	6.9	5.0	5.0	4.8
1316	L_1316	4.8	4.8	3.3	4.8	3.3
1340	L_1340	6.9	7.0	3.3	4.9	3.3

Table 3-18 100-Year Channel Discharges

100-Yr Peak Flows (cfs)						
Reach	SWMM Link	Existing	Option 1 Do Nothing	Option 2 Detention	Option 3 Channel Improvements	Option 4 LID
100	L_115	830	1,233	780	1,196	811
118	L_119	476	768	470	755	465
134	L_138	172	316	312	312	310
142	L_149	268	400	213	396	249
150	L_154	179	307	304	304	302
200	L_221	1,277	2,139	1,253	1,961	1,113
224	L_225	202	295	293	293	264
232	L_235	869	1,634	865	1,510	770
239	L_239	772	1,524	763	1,439	680
241	L_241	676	1,342	632	1,263	561
244	L_245	299	669	304	614	261
260	L_263	171	347	151	338	136
300	L_314	149	161	161	161	159
500	L_513	211	438	228	428	208
600	L_613	391	801	344	752	364
614	L_617	235	542	213	528	233
618	L_622	148	352	351	351	350
700	L_708	160	172	128	172	111
700	L_709	160	172	128	172	111
700	L_710	160	172	129	172	111
700	L_711	160	172	172	172	170
700	L_712	160	173	173	173	170
700	L_713	160	173	173	173	170
800	L_808	1,022	2,049	412	2,033	298
800	L_811	928	1,882	355	1,873	283
800	L_819	928	1,882	355	1,873	283
829	L_823	709	1,504	434	1,499	311
829	L_829	711	1,511	434	1,507	311
829	L_834	576	1,290	340	1,291	292
829	Overflow_836	331	1,053	95	806	46
829	L_838	577	1,300	341	1,300	524
843	L_839	372	844	203	844	528
843	L_841	290	649	41	649	284
843	L_850	139	306	305	306	304
900	L_911	430	594	594	594	592
900	L_912	434	602	602	602	600
1000	L_1004	8,966	11,757	3,267	11,242	3,315
1010	L_1006	7,697	9,915	2,004	9,594	2,153

100-Yr Peak Flows (cfs)						
Reach	SWMM Link	Existing	Option 1 Do Nothing	Option 2 Detention	Option 3 Channel Improvements	Option 4 LID
1010	L_1008	7,698	9,916	2,005	9,598	2,154
1010	L_1010	7,677	9,892	1,986	9,580	2,135
1010	L_1012	7,504	9,682	1,852	9,412	2,004
1024	L_1014	6,557	8,294	1,761	8,196	1,934
1024	L_1018	6,532	8,264	1,739	8,174	1,913
1024	L_1020	6,519	8,249	1,729	8,162	1,903
1024	L_1022	6,475	8,200	1,692	8,120	1,866
1024	L_1024	6,475	8,201	1,691	8,124	1,865
1024	L_1028	6,389	8,080	1,610	8,020	1,775
1024	L_1030	6,035	7,567	1,264	7,542	1,458
1088	L_1034	4,211	5,553	-	5,467	992
1088	L_1036	4,212	5,554	-	5,469	992
1088	L_1038	4,176	5,517	-	5,433	979
1088	L_1040	4,166	5,504	-	5,422	975
1088	L_1042	4,025	5,343	-	5,270	935
1088	L_1044	3,993	5,304	-	5,235	934
1088	L_1046	3,912	5,219	1,213	5,150	901
1088	L_1048	3,912	5,220	1,213	5,152	901
1100	L_1115	1,028	1,507	285	1,442	260
1100	L_1123	948	1,388	285	1,333	260
1100	L_1127	926	1,347	363	1,298	361
1100	L_1130	893	1,288	311	1,248	311
1140	L_1141	786	1,072	-	1,046	-
1140	L_1147	789	1,070	271	1,044	275
1148	L_1151	410	542	184	531	183
1148	L_1156	646	845	-	826	-
1200	L_1217	1,309	1,380	718	1,369	703
1216	L_1223	1,168	1,219	554	1,210	539
1216	L_1231	975	1,001	329	993	315
1232	L_1235	150	152	152	152	150
1240	L_1239	316	327	327	327	326
1240	L_1255	261	269	269	269	268
1240	L_1273	282	292	292	292	291
1256	L_1257	157	158	158	158	158
1300	L_1315	2,296	2,633	1,053	2,612	951
1316	L_1316	1,656	1,758	366	1,753	362
1340	L_1340	1,334	1,422	131	1,419	119

Table 3-19 Proposed Channel Geometry

GOM Table									
Reach	Reach Length (LF)	Option 1- Do Nothing		Option 2 Detention		Option 3 Channel Improvements		Option 4 LID	
		Top Width (ft)	Depth (ft)	Top Width (ft)	Depth (ft)	Top Width (ft)	Depth (ft)	Top Width (ft)	Depth (ft)
100	3,379	128	1.3	142	1.3	213	1.3	146	1.3
118	3,960	20	1.0	114	1.0	175	1.0	99	1.0
134	1,478	85	0.7	108	0.7	108	0.7	109	0.8
142	2,059	38	0.6	90	0.6	154	0.6	101	0.6
150	1,637	59	0.7	101	0.7	103	0.7	101	0.7
200	2,640	88	4.5	172	1.7	281	1.6	172	1.7
224	3,274	50	1.0	111	0.6	111	0.6	80	0.6
232	3,432	120	1.9	214	0.9	374	0.9	214	0.9
239	422	90	2.3	165	1.0	315	1.0	167	1.0
241	1,056	51	3.8	127	1.2	237	1.2	127	1.3
244	3,379	29	3.3	131	0.6	250	0.5	119	0.6
260	3,749	33	1.7	62	0.7	122	0.7	67	0.7
300	2,746	59	0.7	59	0.7	59	0.7	59	0.7
500	3,485	61	1.3	60	0.9	116	0.9	60	0.9
600	3,749	116	1.2	114	0.8	202	0.9	114	0.8
614	1,795	90	1.0	88	0.6	184	0.6	88	0.6
618	2,006	80	1.5	123	0.7	123	0.7	123	0.7
700	2,429	163	0.4	163	0.4	163	0.4	163	0.4
800	2,746	149	4.2	84	1.6	194	2.6	82	1.3
829	3,538	265	1.5	257	0.7	265	1.5	258	0.8
843	2,957	152	1.1	208	0.5	240	1.1	146	0.8
900	2,376	108	1.4	108	1.4	108	1.4	116	2.4
1000	1,531	92	7.8	113	3.4	442	2.7	113	3.4
1010	2,218	79	7.5	115	2.0	582	1.7	121	2.1
1024	4,963	101	5.6	85	2.4	101	5.6	86	2.6
1088	3,590	66	5.3	68	2.8	404	1.4	68	1.8
1100	3,643	111	2.6	103	1.1	130	2.5	103	1.1
1140	3,326	74	3.4	59	1.9	126	2.1	59	1.9
1148	3,485	352	1.1	32	2.2	352	1.1	45	2.0
1200	1,742	71	7.0	59	5.0	71	7.0	59	5.0
1216	5,755	165	4.0	123	2.6	165	4.0	123	2.6
1232	2,482	33	2.1	50	1.0	50	1.0	50	1.0
1240	4,805	53	5.1	53	5.1	53	5.1	52	5.0
1256	1,742	26	4.0	26	4.0	26	4.0	26	4.0
1300	2,165	122	3.8	112	2.2	267	2.2	112	2.1
1316	1,320	192	4.9	126	2.7	192	4.9	126	2.7
1340	2,112	156	3.7	93	1.6	276	1.1	93	1.6

Notes: Top Width and Depth reflect future 100-yr flood widths and depths, Top Width includes 1.5-ft of freeboard

Table 3-20 Proposed Crossing Structures

Study Area	Structure Number	Reach Number	Structure Size and Type				Design Q_{100} (cfs)[A]			
			Option 1	Option 2	Option 3	Option 4	Option 1	Option 2	Option 3	Option 4
GOS	101	100	3 -12'x5' CBC	2 -12'x4' CBC	3 -12'x5' CBC	2 -14'x4' CBC	1,460	780	1,196	826
	102	100	2 - 10'x6' CBC	2 - 10'x6' CBC	2 - 10'x6' CBC	2 - 10'x6' CBC	1,389	780	1,196	826
	103	142	1 -8'x5' CBC	1 - 6'x4' CBC	1 -8'x5' CBC	1 - 6'x4' CBC	401	214	396	267
	104	134	1 -10'x5' CBC	1 - 6'x3' CBC	1 -10'x5' CBC	1 - 6'x3' CBC	473	211	444	249
	201	200	3 - 12'x5' CBC	2 - 11'x4' CBC	3 - 12'x5' CBC	2 - 11'x4' CBC	2,273	1,364	2,087	1,344
	202	260	1 - 6'x3' CBC	1 - 6'x3' CBC	1 - 6'x3' CBC	1 - 6'x3' CBC	158	156	158	81
	203	260	1 - 48" RCP	1 - 48" RCP	1 - 48" RCP	1 - 48" RCP	158	158	158	81
	301	300	1 - 8'x3' CBC	1 - 8'x3' CBC	1 - 8'x3' CBC	1 - 8'x3' CBC	270	270	270	270
	501	500	1 - 8'x5' CBC	1 - 8'x5' CBC	1 - 8'x5' CBC	1 - 8'x5' CBC	438	226	428	211
	601	600	1 - 10'x6' CBC	1 - 8'x5' CBC	1 - 10'x6' CBC	1 - 8'x5' CBC	950	344	765	393
	602	600	2 - 8'x5' CBC	1 - 8'x4' CBC	2 - 8'x5' CBC	1 - 8'x4' CBC	950	344	765	393
	603	614	1 - 12'x5' CBC	1 -7'x3' CBC	1 - 12'x5' CBC	1 -7'x3' CBC	542	213	528	236
GO	702	700	2-42" RCP	2-36" RCP	2-42" RCP	1-48" RCP	172	128	172	111
	704	700	2-48" RCP	2-48" RCP	2-48" RCP	2-48" RCP	172	172	172	170
	801	843	2-9'x5' CBC	1 - 6'x4' CBC	2-9'x5' CBC	2-9'x4' CBC	846	203	846	535
	804	800	2-10'x8' CBC	1-6'x7' CBC	2-10'x8' CBC	1-6'x5' CBC	2,057	413	2,045	261
	805	800	10-10'x3' CBC	3-8'x3' CBC	10-10'x3' CBC	2-8'x3' CBC	1,882	355	1,872	261
	807	829	3-12'x5' CBC	1-12'x4' CBC	3-12'x5' CBC	1-12'x4' CBC	1,511	435	1,507	311
	808	829	3-12'x5' CBC	1-12'x4' CBC	3-12'x5' CBC	1-12'x4' CBC	1,300	341	1,300	292
	809	843	2-12'x7' CBC	1-10'x4' CBC	2-12'x7' CBC	1-10'x4' CBC	1,300	341	1,300	528
GOR	1001	1000	92' Span Bridge	Ex. 60' Span Bridge[B]	442' Span Bridge	Ex. 60' Span Bridge[B]	11,827	5,000[B]	11,302	5,000[B]
	1002	1010	79' Span Bridge	2-10'x10' CBC	582' Span Bridge	2-10'x10' CBC	9,916	2,005	9,605	2,153
	1003	1024	3-12'x12' CBC	1-12'x10' CBC	3-12'x12' CBC	1-12'x10' CBC	7,567	1,264	7,546	1,437
	1004	1088	4-10'x10' CBC	2-8'x5' CBC	4-10'x10' CBC	Ex. 2-7'x5' CBC	5,305	1,260	5,237	935
	1005	1088	5-12'x8' CBC	1-14'x8' CBC	5-12'x8' CBC	1-14'x8' CBC	5,220	1,213	5,152	901
	1103	1140	3-10'x6' CBC	Ex. 2-68"x43" Elliptical RCP	3-10'x6' CBC	Ex. 2-68"x43" Elliptical RCP	1,109	286	1,082	289
	1203	1232	Ex. 3-66" RCP	Ex. 3-66" RCP	Ex. 3-66" RCP	Ex. 3-66" RCP	970[C]	970[C]	970[C]	970[C]
	1204	1240	Ex. 1-78" Steel[D]	Ex. 1-78" Steel[D]	Ex. 1-78" Steel[D]	Ex. 1-78" Steel[D]	327	327	327	327
	1205	1240	Ex. 2-54" RCP	Ex. 2-54" RCP	Ex. 2-54" RCP	Ex. 2-54" RCP	327	327	327	327
	1206	1240	Ex. 2-54" RCP	Ex. 2-54" RCP	Ex. 2-54" RCP	Ex. 2-54" RCP	327	327	327	327
	1207	1256	Ex. 2-60" RCP	Ex. 2-60" RCP	Ex. 2-60" RCP	Ex. 2-60" RCP	269	269	269	269
	1208	1256	Ex. 1-66" RCP	Ex. 1-66" RCP	Ex. 1-66" RCP	Ex. 1-66" RCP	159	159	159	159
	1301	1316	3-10'x8' CBC	3-10'x4' CBC	3-10'x8' CBC	3-10'x4' CBC	2,640	1,056	2,627	958

[A]Crossing structures designed to convey expected future conditions flow (Q_{100}).
[B]Source: *Town of Windsor Master Drainage Plan,*dated October 3, 2003, prepared by Anderson Consulting Engineers, Inc.
[C]Source: *Final Drainage Report for Raindance Subdivision, Filing One*, dated June 9, 2017, prepared by TST, Inc. Consulting Engineers.
[D]Source: *Construction Plans for Raindance Non-Pot Pump Station #2, dated January 12, 2024, prepared by TST, Inc. Consulting Engineers.*

Major Drainageway 100

Option 1 was considered infeasible because all the reach velocities significantly exceeded 5 ft/s. Thus, improvements are needed to ensure the reach is stable under future conditions.

Major drainageway 100 is divided by SH-257 in Reach 134 and Reach 150. This creates a natural barrier that could be well suited for a detention basin. Additionally, Reaches 134 and 150 are located in the upstream portion of drainageway 100 and detention higher in the watershed allows downstream reaches to be designed for smaller peak flows. Option 2 was split into Option 2A, 2B, and 2C to model the effects of placing detention in both reaches, reach 134 alone, or reach 150 alone respectively. As seen in, Option 2A reduces peak flows more than Option 2B or 2C but all detention options still require channel improvements to protect against erosive velocities.

Option 3 has the largest channel corridors because there is no peak flows reduction.

Option 4 incorporates LIDs in developed areas of the watershed to provide water quality and minor flow reduction. Option 4 also incorporates regional flood control basins at the same two locations as Option 2A, plus four smaller EURV basins where tributaries reach major drainageway. With these detention improvements, in-channel flows are reduced to similar levels as Option 2A allowing for narrower channel corridors than Option 3.

Major Drainageway 200

Option 1 was considered infeasible because all the reach velocities significantly exceeded 5 ft/s in both existing and future conditions. Thus, improvements are needed to ensure the reach is stable under future conditions.

Option 2 was divided into Option 2A, 2B, and 2C to consider placing detention in both Reach 248 and Reach 268, only in Reach 248, and only in Reach 268 respectively. As seen in, Option 2A reduces peak flows more than Option 2B or 2C but all detention options still require channel improvements to protect against erosive velocities.

Option 3 has the largest channel corridors because there is no peak flows reduction.

Option 4 incorporates LIDs in developed areas of the watershed to provide water quality and minor flow reduction. Option 4 also incorporates regional flood control basins at the same two locations as Option 2A, plus five smaller EURV basins where tributaries reach major drainageway. With these detention improvements, in-channel flows are reduced to similar levels as Option 2A allowing for narrower channel corridors than Option 3.

Major Drainageway 300

Option 1 is an acceptable option for drainageway 300. Even with future flows the existing channel can convey the 100-year peak flow without exceeding 5 ft/s. Because no action is needed, no other options were evaluated. Note that the existing channel is sufficient largely because much of the contributing area for drainageway 300 is expected to be kept undeveloped as shown in the *2060 Comprehensive Plan.* If future land uses change Reach 300 should be reevaluated.

Major Drainageway 500

Option 1 was considered infeasible because velocities exceeded 5 ft/s. Thus, improvements were needed to ensure the reach is stable under future conditions.

Option 2 considered placing a detention basin in the upper portion of Reach 500. This detention basin reduced peak flows to pre-development levels. The channel velocities are below 5 ft/s with existing flows, so no additional channel improvements were needed in Option 2.

Option 3 requires a channel corridor width approximately double of other options to convey the 100-year event.

Option 4 incorporates LIDs in developed areas of the watershed to provide water quality and minor flow reduction. Option 4 also incorporates a regional flood control basin at the same location as Option 2, plus one smaller upstream EURV basin. With these detention improvements, Option 4 showed that LIDs reduce peak runoff enough so that downstream channel improvements are not needed.

Major Drainageway 600

Option 1 was considered infeasible because velocities exceeded 5 ft/s. Thus, improvements were needed to ensure the reach is stable under future conditions.

Option 2 considered placing a detention basin in Reach 618. This detention basin reduced peak flows to pre-development levels in downstream reaches. The channel velocities in Reach 614 and Reach 600 were below 5 ft/s with existing flows, so no additional channel improvements were needed on those reaches. However, existing flows in Reach 618 were above 5 ft/s so channel improvements were proposed for Reach 618.

Option 3 has the largest required channel corridors because there was no peak flow reduction.

Option 4 incorporates LIDs in developed areas of the watershed to provide water quality and minor flow reduction. Option 4 also incorporates a regional flood control basin at the same location as Option 2, plus two smaller upstream EURV basins. With these detention improvements, Option 4 reduces peak runoff enough to pre-development levels, however, minor channel improvements on Reach 618 were needed.

Major Drainageway 800

Option 1 was considered infeasible because velocities exceeded 5 ft/s. Thus, improvements were needed to ensure the reach is stable under future conditions.

Option 2 considered placing a detention basin in the upper portion of Reach 800. This detention basin reduced peak flows to pre-development levels. The channel velocities are below 5 ft/s with existing flows, so no additional channel improvements were needed in Option 2.

Option 3 requires a channel corridor width approximately double of other options to convey the 100-year event.

Option 4 incorporates LIDs in developed areas of the watershed to provide water quality and minor flow reduction. Option 4 also incorporates a regional flood control basin at the same location as Option 2, plus two smaller upstream EURV basins. With these detention improvements, Option 4 reduces peak runoff enough so that no downstream channel improvements are needed.

Major Drainageway 900

Option 1 is an acceptable option for drainage 900. Even with future flows the existing channel can convey the 100-year peak flow without exceeding 5 ft/s. Because no action is needed, no other options were evaluated.

Major Drainageway 1000

Option 1 was considered infeasible because velocities exceeded 5 ft/s. Thus, improvements were needed to ensure the reach is stable under future conditions.

Option 2 considered placing two detention basins, one in Reach 1024 immediately upstream of the Weld County Road 17 crossing and the other in Reach 1088 at the existing retention pond upstream of Weld County Road 60. This detention basin reduced peak flows, but not enough to decrease the velocity in the downstream links to be below 5 ft/s without the aid of grade control structures.

Option 3 has the largest required channel corridors because there is no peak flows reduction as part of this option.

Option 4 incorporates LID in developed areas of the watershed to provide water quality and minor flow reduction. Option 4 also incorporates four EURV basins placed where small tributaries reach the major drainageway. With these detention improvements, Option 4 significantly reduces peak runoff, but not enough to bring velocities below 5 ft/s without the aid of grade control structures.

Major Drainageway 1100

Option 1 was considered infeasible because velocities exceeded 5 ft/s. Thus, improvements were needed to ensure the reach is stable under future conditions.

Option 2 considered placing a detention basin at the site of the existing retention pond southeast of the intersection of Crossroads Blvd and Weld County Road 17 within Reach 1100. This detention basin reduced peak flows enough to decrease the velocity in the downstream links to be below 5 ft/s. The remainder of this drainageway had many existing detention ponds. These existing detention ponds were included in the Option 2 model and significantly decreased the channel velocities. A few channel sections within Reaches 1140 and 1148 still had velocities that exceeded 5 ft/s and required grade control to reduce velocities below the threshold.

Option 3 has the largest required channel corridors because there is no peak flows reduction as part of this option.

Option 4 incorporates LID in developed areas of the watershed to provide water quality and minor flow reduction. Option 4 also incorporates the existing detention ponds within this drainageway as well as two proposed EURV basins. With these detention improvements, Option 4 significantly reduces peak runoff, but not enough to bring velocities below 5 ft/s without the aid of grade control structures.

Major Drainageway 1200

Option 1 was considered infeasible because velocities exceeded 5 ft/s. Thus, improvements were needed to ensure the reach is stable under future conditions.

Option 2 had no proposed detention ponds in this drainageway. The existing detention pond (Raindance Reservoir #2) was included in the model and significantly decreased downstream velocities. A portion of Reaches 1232 and 1240 had velocities greater than 5 ft/s, but detention did not seem feasible due to the recently developments in the area. Grade control was added to these sections, which brought their velocities below the threshold.

Option 3 has the largest required channel corridors because there is no peak flows reduction as part of this option.

Option 4 incorporates LID in developed areas of the watershed to provide water quality and minor flow reduction. Option 4 also incorporates one EURV basin as well as the existing detention pond within this drainageway. With these detention improvements, Option 4 significantly reduces peak runoff, but not enough to bring velocities below 5 ft/s without the aid of grade control structures.

Major Drainageway 1300

Option 1 was considered infeasible because velocities exceeded 5 ft/s. Thus, improvements were needed to ensure the reach is stable under future conditions.

Option 2 considered placing a detention basin immediately upstream of the Weld County Road 15 crossing within Reach 1300. This detention basin reduced peak flows enough to decrease the velocity in the downstream links to be below 5 ft/s. The existing Oklahoma Reservoir was included in this model and significantly decreases downstream velocities.

Option 3 has the largest required channel corridors because there is no peak flows reduction as part of this option.

Option 4 incorporates LID in developed areas of the watershed to provide water quality and minor flow reduction. Option 4 also incorporates three EURV basins as well as the existing detention pond (Oklahoma Reservoir) within this drainageway. With these detention improvements, Option 4 reduces peak runoff enough to bring velocities below 5 ft/s.

3.3.5 Alternative Costs

Costs associated with each option were estimated using the MHFD Master Plan Cost version 2.2 workbook. The sections in the cost estimate used in this analysis include:

- Concrete box culverts
- Channel improvements
- Detention/water quality facilities
- Removals
- Landscaping and maintenance improvements
- Special items
- Land acquisition
- Operation and maintenance

The special items category was used for LID options. A user entered unit cost was used for land acquisition and LID items, see Table 3-21 below. All other items used the default unit cost. The construction cost index (CCI) data for the second quarter of 2022 was used to adjust for inflation for GOS and GO while the fourth quarter of 2024 was used for GOR. The published CDOT CCI for 2022 Q2 was 1.67 and the 2024 Q4 was 1.99.

Table 3-21 Special Unit Cost

Item	Unit Cost	Units
Land Acquisition	$19,551	Acre

The cost estimate inputs were based on the proposed geometries calculated in the alternatives analysis. Detention costs were estimated based on the basin volume using the 'complete-in-place' option in the workbook. Earthwork volume was used to estimate channel improvements. The area of the detention basin and/or channel corridor was used to estimate the revegetation area. Culvert removal was assumed to be equal to the length of culvert being installed. Culvert improvements were based on the proposed culvert sizes from the HY-8 model. Land acquisition was based on the detention basin and/or channel corridor area required. LID costs were estimated based on acres of developed land use. For detailed cost estimate inputs see the MHFD MP Cost worksheets in the Appendix E.

Cost estimates associated with land acquisition were based on sales data for Weld County, see Table 3-22. Sale parcel data included in the list was based on multiple factors.

- The parcel had an area of 5 or more acres
- Was brought in the last 5 years

Some parcels were removed due to unrealistic cost/arcs. The listed parcels were within and/or adjacent to the project area, and these parcel sales were used to generate an average cost per acre for acquisition cost estimates.

Table 3-22 Weld County Land Sales Data for Project Area

Parcel No.	Land Type	Area (acre)	Date of Sale	Sale Price	Cost/Acre
095715200018	Agricultural	860	7/8/2024	$17,977,700	$20,909
095705100002	Agricultural	321	12/16/2021	$15,169,500	$47,218
095702000004	Agricultural	989	3/29/2022	$8,500,000	$8,597
095711200003	Agricultural	139	5/9/2024	$2,500,000	$17,946
080734300008	Agricultural	61	10/15/2020	$2,450,700	$40,059
095707200044	Agricultural	155	1/5/2024	$2,400,000	$15,504
095704200043	Residential	18	12/15/2023	$1,000,000	$56,070
095711002010	Agricultural	21	7/21/2021	$900,000	$42,140
095717300025	Agricultural	36	1/5/2023	$808,000	$22,690
095717300026	Agricultural	35	11/10/2021	$600,000	$17,102
095704100010	Agricultural	63	5/25/2021	$515,000	$8,210
095708404004	Commercial	6	9/24/2021	$500,000	$89,758
095704100011	Agricultural	43	7/22/2020	$375,000	$8,683

Table 3-23 summarizes the cost of the alternative options for each major drainageway. The expected capital costs to improve each drainageway for future 100-year flood protection are discussed below.

Major Drainageway 100

The hydraulic analysis showed that existing channel conditions are erosive and thus channel improvements are necessary even if peak flows are reduced to pre-development levels. Because all options require channel improvements, adding detention does not remove the cost of channel improvements causing Options 2 to be more costly than Option 3. Option 4 has the lowest reported costs because distributed LID and EURV costs (both construction and maintenance) are expected to be borne by developers. Option 4 does include detention costs but these regional detention costs will be much less than Options 2 since the upstream distributed facilities lessen the burden.

Major Drainageway 200

The hydraulic analysis showed that existing channel conditions are erosive and thus channel improvements are necessary even if peak flows are reduced to pre-development levels. Because all options require channel improvements, adding detention does not remove the cost of channel improvements causing Options 2 to be more costly than Option 3. Option 4 has the lowest reported costs because distributed LID and EURV costs (both construction and maintenance) are expected to be borne by developers. Option 4 does include detention costs but these regional detention costs will be much less than Options 2 since the upstream distributed facilities lessen the burden.

Major Drainageway 300

No cost is associated with drainageway 300 since no action is necessary.

Major Drainageway 500

Option 3 is the least expensive option that addresses channel stability. Option 2 is the most expensive due to high capital and maintenance costs. Option 4 has lower reported costs than Option 2 because distributed LID and EURV costs (both construction and maintenance) are expected to be borne by developers. Option 4 does include detention costs but these regional detention costs will be much less since the upstream distributed facilities lessen the burden.

Major Drainageway 600

Option 2 is the most expensive due to high capital and maintenance costs. Option 3 has medium costs and only address channel stability. Option 4 has the lowest reported costs because distributed LID and EURV costs (both construction and maintenance) are expected to be borne by developers. Option 4 does include detention costs but these regional detention costs will be much less than Options 2 since the upstream distributed facilities lessen the burden.

Major Drainageway 700

Option 3 is the most expensive due to high capital costs involved with improving the entire length of drainageway and only addresses channel stability. Option 1 has the lowest costs but does not achieve the goals of this study – taking the Do Nothing approach would result in increased risk of future flood damages to people or property within this watershed. Option 4 has slightly lower costs than Option 2 because distributed LID and EURV costs (both construction and maintenance) are expected to be borne by developers.

Major Drainageway 800

Option 1 has the lowest cost but does not achieve the goals of this study – taking the Do Nothing approach would result in increased risk of future flood damages to people or property within this watershed. Options 2 and 3 are the most expensive due to high capital and maintenance costs. Option 2 represents significant investment in multiple regional detention basins, and Option 3 represents significant investment to improve the entire length of drainageway. Option 4 has the lowest expected costs because distributed LID and EURV costs (both construction and maintenance) are expected to be borne by developers. Option 4 does include regional detention costs, but these detention costs will be significantly less than Options 2 since the upstream distributed facilities decrease the required sizes of regional detention facilities.

Major Drainageway 900

No cost is associated with drainageway 900.

Major Drainageway 1000

Option 1 has the lowest cost but does not achieve the goals of this study – taking the Do Nothing approach would result in increased risk of future flood damages to people or property within this watershed. Options 2 and 3 are the most expensive due to high capital and maintenance costs. Option 2 represents significant investment in multiple regional detention basins which will lead to high maintenance costs over the next 50 years. Option 3 requires large amounts of land to be terraformed and crossings to be turned into bridges. Option 4 has the lowest expected costs because distributed LID and EURV costs (both construction and maintenance) are expected to be borne by developers. Option 4 does include regional detention costs, but these detention costs will be significantly less than Options 2 since the upstream distributed facilities decrease the required sizes of regional detention facilities.

Major Drainageway 1100

Option 3 is the least expensive option that addresses channel stability. Option 2 is the most expensive due to high capital and maintenance costs. Option 4 has lower reported costs than Option 2 because distributed LID and EURV costs (both construction and maintenance) are expected to be borne by developers. Option 4 does include detention costs, but these regional detention costs will be much less since the upstream distributed facilities lessen the burden.

Major Drainageway 1200

Option 3 is the least expensive option that addresses channel stability. Option 2 and 4 equal to the same cost, due to the drainageway already being developed over the past years. This means no crossing changes along with no new detentions are required. Option 4 still includes the addition of EURVs which costs (both construction and maintenance) are expected to be borne by developers.

Major Drainageway 1300

Option 3 is the least expensive option that addresses channel stability. This option does not include the cost of maintenance for the Oklahoma Reservoir. Option 2 and 4 are very close with option 2 being the higher cost. Option 2 includes a flood control to help with downstream peaks, while Option 4 includes multiple EURVs which costs (both construction and maintenance) are expected to be borne by developers.

Table 3-23 Alternative Plan Cost Estimate Summary

Major Drainageway	Alternative	Acquisition Capital Cost	Crossing Improvement Capital Cost	Channel Improvement Capital Cost	Regional Detention Capital Cost	Total Capital Cost [a]	50 Year O & M Capital Costs	Total Cost [b]
100	Option 1: Do Nothing except crossing structure upgrades	-	$1,247,712	-	-	$1,713,897	$47,400	$1,761,297
	Option 2: Detention and channel improvements	$476,067	$574,081	$756,960	$2,216,023	$6,719,873	$2,527,450	$9,247,323
	Option 3: Channel only improvements	$479,436	$833,437	$1,504,000	-	$4,661,683	$1,387,650	$6,049,333
	Option 4: LID, detention and channel improvements	$322,244	$574,081	$824,480	$685,368	$3,929,067	$1,402,900	$5,331,967
200	Option 1: Do Nothing except crossing structure upgrades	-	$439,189	-	-	$748,816	$9,500	$758,316
	Option 2: Detention and channel improvements	$336,840.00	$277,221	$219,840	$2,665,320	$5,986,994	$3,272,100	$9,259,094
	Option 3: Channel only improvements	$763,504.00	$359,162	$1,911,000	-	$4,901,781	$1,706,450	$6,608,231
	Option 4: LID, detention and channel improvements	$335,717.00	$270,341	$308,120	$1,294,584	$4,442,663	$2,069,700	$6,512,363
500	Option 1: Do Nothing except crossing structure upgrades	-	$154,718	-	-	$263,796	$8,800	$272,596
	Option 2: Detention and channel improvements	$70,736	$96,410	-	$1,401,197	$2,667,151	$797,900	$3,465,051
	Option 3: Channel only improvements	$103,298	$110,246	$206,720	-	$694,976	$529,000	$1,223,976
	Option 4: LID, detention and channel improvements	$14,596	$96,410	-	$609,216	$1,444,700	$134,050	$1,578,750
600	Option 1: Do Nothing except crossing structure upgrades	-	$518,248	-	-	$883,612	$24,100	$907,712
	Option 2: Detention and channel improvements	$150,455	$319,907	$160,040	$1,614,422	$3,759,507	$1,299,700	$5,059,207
	Option 3: Channel only improvements	$335,717	$470,044	$678,280	-	$2,378,745	$1,130,800	$3,509,545
	Option 4: LID, detention and channel improvements	$77,473	$319,907	$160,000	$533,064	$2,373,880	$485,600	$2,859,480
700	Option 1: Do Nothing except crossing structure upgrades	-	$89,598	-	-	$152,766	$37,200	$189,966
	Option 2: Detention and channel improvements	$17,965	$83,778	$34,515	$497,660	$1,068,165	$237,600	$1,305,765
	Option 3: Channel only improvements	$65,684	$89,598	$504,879	-	$1,079,268	$397,200	$1,476,468
	Option 4: LID, detention and channel improvements	$14,596	$72,138	$34,047	$497,159	$1,043,298	$198,750	$1,242,048
800	Option 1: Do Nothing except crossing structure upgrades	-	$5,855,486	-	-	$9,983,604	$337,700	$10,321,304
	Option 2: Detention and channel improvements	$257,121	$1,830,956	$65,637	$6,511,163	$14,592,347	$2,994,350	$17,586,697
	Option 3: Channel only improvements	$274,637	$5,858,648	$3,462,346	-	$16,166,933	$1,484,000	$17,650,933
	Option 4: LID, detention and channel improvements	$114,526	$1,868,805	$65,637	$4,935,532	$8,578,110	$1,404,850	$9,982,960
1000	Option 1: Do Nothing except crossing structure upgrades	$1,955	$3,558,117	-	-	$6,068,544	$75,600	$6,144,144
	Option 2: Detention and channel improvements	$956,044	$1,162,700	$2,715,812	$15,554,247	$35,900,852	$6,425,600	$42,326,452
	Option 3: Channel only improvements	$2,260,847	$10,620,327	$15,294,408	-	$56,096,213	$2,640,950	$58,737,163
	Option 4: LID, detention and channel improvements	$782,040	$1,039,977	$3,319,304	$14,536,358	$35,414,516	$5,073,750	$40,488,266
1100	Option 1: Do Nothing except crossing structure upgrades	-	$1,213,642	-	-	$2,069,260	$57,900	$2,127,160
	Option 2: Detention and channel improvements	$107,531	-	-	$4,193,379	$7,796,509	$4,765,650	$12,562,159
	Option 3: Channel only improvements	$55,025	$996,172	$397,926	-	$3,231,688	$501,750	$3,733,438
	Option 4: LID, detention and channel improvements	-	-	-	-	$761,108	$4,042,850	$4,803,958
1200	Option 1: Do Nothing except crossing structure upgrades	-	-	-	-	-	$64,200	$64,200
	Option 2: Detention and channel improvements	$21,506	-	$63,984	$2,193	$544,146	$2,325,400	$2,869,546
	Option 3: Channel only improvements	$21,506	-	$65,978	-	$309,180	$366,300	$675,480
	Option 4: LID, detention and channel improvements	$21,506	-	$63,984	$2,193	$544,146	$2,325,400	$2,869,546
1300	Option 1: Do Nothing except crossing structure upgrades	-	$400,006	-	-	$682,010	$4,800	$686,810
	Option 2: Detention and channel improvements	$99,710	$224,045	-	$3,919,815	$7,164,992	$11,699,600	$18,864,592
	Option 3: Channel only improvements	$281,534	$303,108	$1,198,772	-	$2,842,239	$1,122,000	$3,964,239
	Option 4: LID, detention and channel improvements	$99,710	$224,045	-	$3,919,815	$7,164,992	$11,684,650	$18,849,642

a. Total cost also includes mobilization, stormwater management/erosion control, engineering, legal/administration, construction management, and contingency estimates.
b. Costs only reflect Greeley responsibilities; distributed LID and EURV costs are expected to be borne by developers.

3.3.6 Alternative Plans

In addition to the quantitative results presented in previous sections, qualitative aspects of the local area should also be considered when selecting the most appropriate alternatives. Refer to Figure 3-3, Figure 3-4, and Figure 3-5 for potential drainage issues noted during the field assessments. These potential issues can sometimes also be opportunities, especially since specific locations that have notable existing hazards should be prioritized when planning capital projects. See Table 3-24, Table 3-25, and Table 3-26 for a summary of qualitative drainage issues and opportunities in each reach, grouped by GOS, GO, and GOR study areas respectively.

Table 3-24 Potential Drainage Issues and Opportunities GOS

Major Drainageway	Reach Number	Problems	Opportunities
100	Reach 100	Severe erosion downstream of reach (1) Undersized minor roadway crossing structure (1) Missing end sections at crossing structure Stock pond embankment blocks drainageway	Lower channel and private road culvert to reduce downstream erosive forces Improve crossing capacity at private road Protect channel bed at SH-257 Formalize and expand existing stock pond into regional detention
	Reach 134	(1) Undersized major roadway crossing structure	Improve crossing capacity at SH-257
	Reach 150	(1) Undersized major roadway crossing structure Local erosion at edge of channel	Improve crossing capacity at SH-257 Stabilize banks through erosion-resistant materials or flatten bank slope
200	Reach 200	(1) Undersized minor roadway crossing structure (2) Headcuts at tributary confluences Localized bank erosion	Improve crossing capacity at private road Stabilize banks through erosion-resistant materials or flatten bank slope
	Reach 224	Knickpoints (bed instability) Entrenched low-flow channel	Stabilize channel through bed protection, low-flow channel definition, or grade control structures
	Reach 232	Existing embankment blocks drainageway Existing borrow pit in channel Existing berm blocks tributary flows from joining reach	Formalize and expand existing embankments into regional detention
	Reach 244	Existing embankment blocks drainageway Erosion at crossing culvert outlet	Formalize and expand existing embankment into regional detention Protect channel bed downstream of US-34
	Reach 260	Localized bank erosion Erosion at crossing culvert outlet	Stabilize banks through erosion-resistant materials or flatten bank slope Protect channel bed downstream of US-34
500	Reach 500	Concrete debris arresting headcut (1) Undersized railroad crossing structure Localized bank erosion	Formalize erosion protection between Oklahoma Drainageway and GWR Improve crossing capacity at GWR and/or formalize upstream detention Stabilize banks through erosion-resistant materials or flatten bank slope
600	Reach 600	(1) Undersized railroad crossing structure (1) Undersized minor roadway crossing structure Informal embankment blocks drainageway Localized bank erosion	Improve crossing capacity at GWR and private road Formalize detention upstream of private road and/or informal embankment Stabilize banks through erosion-resistant materials or flatten bank slope
	Reach 614	(1) Missing end sections at crossing structure	Protect embankment and channel bed downstream of salvage yard pond

Table 3-25 Potential Drainage Issues and Opportunities GO

Major Drainageway	Reach Number	Problems	Opportunities
700	Reach 700	(2) Undersized minor roadway crossing structures (1) Undersized railroad crossing structure Informal embankment blocks drainageway	Improve crossing capacity at GWR, WCR-60, and Windsong Rd Formalize detention upstream of GWR and/or Windsong Rd embankment
800	Reach 800	Heavy vegetation impeding flows (1) Undersized/corroded minor roadway crossing structure (1) Undersized railroad crossing structure Flared section not connected to pipe outlet	Improve crossing capacity at GWR and Gratitude Ln Formalize detention upstream of Gratitude Ln embankment Repair existing detention basin outlet
	Reach 829	Localized bank erosion Existing detention basin contains sediment and reeds (2) Undersized minor roadway crossing structures Trees in channel impeding flows Headcuts and entrenchment in low-flow channel (5) Scour holes at culvert outlets and drop structures	Stabilize banks through erosion-resistant materials or flatten bank slopes Update Southgate detention basin with maintenance plan and additional forebays Improve crossing capacity at Southgate Dr and Kia Access Rd Stabilize channel profile through bed protection and low-flow channel definition Replace trees with more desirable vegetation Stabilize outlets with erosion-resistant materials and/or formalize scour holes
	Reach 843	(2) Undersized major roadway crossing structures(1) Minor channel and bank erosion upstream of culvert	Improve crossing capacity at US-34 and WCR-17Stabilize banks through erosion-resistant materials or flatten bank slopesStabilize channel profile through bed protection and low-flow channel definition

Table 3-26 Potential Drainage Issues and Opportunities GOR

Major Drainageway	Reach Number	Problems	Opportunities
900	Reach 900	Localized bank erosion	Stabilize banks through erosion-resistant materials or flatten bank slope
1000	Reach 1000	(1) Undersized and aging major roadway crossing structure (1) Unstable pedestrian bridge is safety and and flood hazard Localized bank erosion and bend scour Heavy vegetation and concrete debris impeding flows	Replace bridge at SH-257 Replace or remove the wooden pedestrian bridge Stabilize banks through erosion-resistant materials or flatten bank slope Remove debris and implement vegetation management plan within channel
	Reach 1010	(1) Undersized railroad crossing structure Headcuts at tributary confluences	Improve crossing capacity at GWR Stabilize banks through erosion-resistant materials or flatten bank slope
	Reach 1024	(1) Undersized major roadway crossing structure Severe bank erosion and vertical cut walls	Improve crossing capacity at WCR-17 Stabilize banks through erosion-resistant materials or flatten bank slopes Stabilize channel profile through bed protection and low-flow channel definition
	Reach 1088	(1) Undersized minor roadway crossing structure (1) Undersized embankment crossing structure Severe bank erosion and vertical cut walls	Improve crossing capacity at WCR-60 and private embankment Stabilize banks through erosion-resistant materials or flatten bank slopes Stabilize channel profile through bed protection and low-flow channel definition
1100	Reach 1100	Localized bank erosion and cut walls (2) Private embankments across channel impede flows Heavy downstream vegetation impeding culvert performance	Improve crossing capacity at GWR and Gratitude Ln Formalize and/or improve detention upstream of embankments Improve and maintain low-flow channel to reduce dense reeds
	Reach 1140	Stagnant water in informal pond Heavy downstream vegetation impeding culvert performance Trees and shrubs in channel impeding flows	Improve and maintain low-flow channel to reduce dense reeds and stagnant water Replace trees with more desirable vegetation
	Reach 1148	Headcut erosion where flows enter detention basin Trickle channel within detention basin not visible	Stabilize basin banks through erosion-resistant materials or improved drop structure Perform more maintenance/sediment removal to preserve detention function
1200	Reach 1200	Detention basin full of sediment Undersized roadside ditch for major drainageway	Construct large forebay or implement stricter upstream sediment controls Reserve wider easement to create improved channel
	Reach 1216	No defined channel through agricultural fields	Reserve drainage easement along historic flowpath
	Reach 1232	Tall, dense vegetation impeding culvert performance	Implement regular vegetation management or consider hardened materials next to culverts
	Reach 1240	New lake still under construction Trees and shrubs in channel impeding flows	Monitor inflows into lake for stability and vegetation success Replace trees with more desirable vegetation
	Reach 1256	Localized bank erosion Dense brush impeding flows	Stabilize basin banks through erosion-resistant materials or improved drop structure Replace brush/weeds with more desirable grasses
1300	Reach 1300	Heavy wetland vegetation impeding flows Undersized roadside ditch for major drainageway	Improve and maintain low-flow channel to reduce dense reeds Reserve wider easement to create improved channel
	Reach 1316	(1) Undersized minor roadway crossing structure No defined channel through wetlands Residential structures in historic runoff flowpath	Improve crossing capacity at WCR-15 Improve and maintain continuous low-flow channel to reduce dense reeds and provide defined bypass route around residences
	Reach 1340	No defined drainage channel through agricultural fields, existing ditches are for irrigation purposes	Reserve drainage easement along historic flowpath

3.3.7 Result of Analysis

Benefit Cost Analysis

There are no regulatory floodplains within the study area, and subsequently no habitable structures within a Special Flood Hazard Area. A benefit cost analysis was not completed with this study.

Evaluation of Alternatives

The alternative options were evaluated based on the cost of improvements, hydraulic calculations and future operations and maintenance of the future stream corridors. They were also evaluated on qualitative aspects, including public safety, water quality enhancement, land use context, surrounding land redevelopment potential, and anticipated general acceptance by the community. The feasibility of each alternative with respect to qualitative aspects was evaluated based upon the hydraulic analysis of the 100-year flood. The recommended alternative provides the highest benefit when considering both quantitative and qualitative aspects of the project.

The following eight qualitative aspects were considered in the alternatives analysis:

Constructability	Public Safety
Maintenance	Habitat and Environment
Meets Multiple Objectives	Aesthetics
Water Quality	Criteria Compliance

The listed categories above were used to evaluate each alternative option on a scoring of: 0-no opportunity, 1-minimal opportunity, 2-average opportunity, and 3-high opportunity. Note that “Meets Multiple Objectives” refers to the estimated ability to serve desirable functions other than flood control, such as trails, parks, or other community amenities. A summary of the alternatives screening scores is presented in Table 3-27.

Recommended Plan

The restoration objective for these major drainageways is to promote low maintenance stream geomorphology, which is based on improving the function of reach-scale hydrology, hydraulics, and geomorphology. All of the recommended alternatives include some channel improvements – successful restoration influences many of the other qualitative aspects by reducing maintenance, improving safety, promoting multi-use facilities, indirectly improving water quality, and protecting habitat and the environment. The goal of the proposed alternatives is to improve the function of the riverine system in future conditions, which is expected to undergo significant urbanization and flow alterations. The following discusses the recommended improvements for each major drainageway to best achieve this goal, and a summary of the recommended plan cost estimates is provided in Table 3-28.

Major Drainageway 100

Option 4 (LID, detention and channel improvements) is the recommended alternative. Both Option 2 (detention and channel improvements) and Option 4 scored highly, but Option 4 is expected to have a lower cost, improved constructability, better coverage of water quality, improved public safety, and better aesthetics than Option 2. This is mostly due to the distributed nature of Option 4, implementing watershed-wide practices to increase infiltration, evapotranspiration, and reuse of stormwater allows the greatest amount of flexibility and ability to integrate smoothly with the surrounding developments.

Major Drainageway 200

Option 2 (detention and channel improvements) is the recommended alternative. Both Option 2 and Option 4 (LID, detention and channel improvements) scored highly, but Option 2 is expected to provide slightly more opportunities to meet multiple objectives, better opportunities to improve wildlife habitats, and improved criteria compliance. The regional detention basins at the heart of Option 2 are expected to provide both flood peak mitigation and multiple other objectives for the surrounding communities

Major Drainageway 300

Option 1 (do nothing) is the recommended alternative. This smaller reach does not require drainageway improvements to safely convey the anticipated future flows. However, implementing watershed-wide practices to increase infiltration, evapotranspiration, and reuse of stormwater will help mitigate the runoff that travels downstream to the mainstem Oklahoma Drainageway.

Major Drainageway 500

Option 4 (LID, detention and channel improvements) is the recommended alternative. Both Option 2 (detention and channel improvements) and Option 4 scored highly, but Option 4 is expected to have a lower cost, improved constructability, better coverage of water quality, improved public safety, and better aesthetics than Option 2. This is mostly due to the distributed nature of Option 4, implementing watershed-wide practices to increase infiltration, evapotranspiration, and reuse of stormwater allows the greatest amount of flexibility and ability to integrate smoothly with the surrounding developments.

Major Drainageway 600

Option 2 (detention and channel improvements) is the recommended alternative. Both Option 2 and Option 4 (LID, detention and channel improvements) scored highly. Although Options 2 is expected to have the highest cost, it also is expected to provide more opportunities to meet multiple objectives, better opportunities to improve wildlife habitats, and improved criteria compliance over Option 4. The regional detention basin at the heart of Option 2 is expected to provide both flood peak mitigation and multiple other objectives for the surrounding community.

Major Drainageway 700

Option 4 (LID, detention and channel improvements) is the recommended alternative. Option 2 (detention and channel improvements) scored almost as highly, and since Basin 700 is relatively small Option 2 and Option 4 would likely look similar if implemented. Option 4 gains a slight edge because implementing watershed-wide practices to increase infiltration, evapotranspiration, and reuse of stormwater allows the greatest amount of flexibility and ability to integrate smoothly with the surrounding developments.

Major Drainageway 800

Option 4 (LID, detention and channel improvements) is the recommended alternative. Both Option 2 (detention and channel improvements) and Option 4 scored highly, but Option 4 is expected to have a lower cost, improved constructability, better coverage of water quality, improved public safety, and better aesthetics than Option 2. This is mostly due to the distributed nature of Option 4, implementing watershed-wide practices to increase infiltration, evapotranspiration, and reuse of stormwater allows the greatest amount of flexibility and ability to integrate smoothly with the surrounding developments.

Major Drainageway 900

Option 1 (do nothing) is the recommended alternative. This smaller reach does not require drainageway improvements to safely convey the anticipated future flows. However, implementing watershed-wide practices to increase infiltration, evapotranspiration, and reuse of stormwater will help mitigate the runoff that travels downstream to the mainstem Oklahoma Drainageway.

Major Drainageway 1000

Option 4 (LID, detention and channel improvements) is the recommended alternative. Both Option 2 (detention and channel improvements) and Option 4 received the same weighted average score. Option 2 is expected to provide more opportunities to meet multiple objectives and improve wildlife habitats, but Option 4 is expected to have a lower cost and improved constructability since the proposed regional detention basin upstream of WCR-17 is not required in Option 4. Note that Major Drainageway 1000 is unique – since it is the mainstem Oklahoma Drainageway, it receives flows from all the other (tributary) major drainageways. Any option that relies on reducing peak flows to protect the drainageways assumes that all the proposed upstream drainage improvements have been implemented. For Option 4, this means that the recommended LID, EURV, and flood control detention basins in the upstream tributaries must be built for the Major Drainageway 1000 stream corridor to function as intended.

Major Drainageway 1100

Option 2 (detention and channel improvements) is the recommended alternative. Both Option 2 and Option 4 (LID, detention and channel improvements) scored highly. Although Option 2 is expected to have the highest cost, it also is expected to provide more opportunities to meet multiple objectives, better opportunities to improve wildlife habitats, and improved criteria compliance over Option 4. Major Basin 1100 is the most built-out basin within the Oklahoma Watershed – much of the upstream area has been recently developed. Therefore, this ranking reflects that implementing widespread LID practices will be impractical in neighborhoods that are recently developed. The proposed regional detention basin in the downstream part of Major Drainageway 1100 in Option 2 is expected to provide both flood peak mitigation and multiple other objectives for the surrounding community.

Major Drainageway 1200

Option 4 (LID, detention and channel improvements) is the recommended alternative. Both Option 2 (detention and channel improvements) and Option 4 scored highly, but Option 4 is expected to have slightly better public safety and more opportunities to improve wildlife habitats than Option 2. This is mostly due to the distributed nature of Option 4, implementing watershed-wide practices to increase infiltration, evapotranspiration, and reuse of stormwater allows the greatest amount of flexibility and ability to integrate smoothly with the surrounding developments.

Major Drainageway 1300

Option 4 (LID, detention and channel improvements) is the recommended alternative. Both Option 2 (detention and channel improvements) and Option 4 assume the Oklahoma Reservoir will capture and detain runoff from all upstream areas, leaving smaller quantities of expected flows in the downstream reaches. Option 4 is expected to have a lower cost, improved constructability, and better coverage of water quality than Option 2. This is mostly due to the distributed nature of Option 4, implementing watershed-wide practices to increase infiltration, evapotranspiration, and reuse of stormwater allows the greatest amount of flexibility and ability to integrate smoothly with the surrounding developments.

Table 3-27 Alternatives Evaluation Matrix

Major Drainageway	Alternative	Constructability	Maintenance	Meets Multiple Objectives	Water Quality	Public Safety	Habitat and Environment	Aesthetics	Criteria Compliance	TOTAL WEIGHTED AVERAGE
		20%	15%	15%	Weighting 10%	20%	5%	5%	10%	Score 100%
100	Option 1:Do Nothing except crossing structure upgrades	3	1	0	0	0	2	1	0	0.90
	Option 2: Detention and channel improvements	1	3	3	2	2	3	2	3	2.25
	Option 3: Channel only improvements	2	2	2	0	1	2	3	2	1.65
	Option 4: LID, detention and channel improvements	2	2	2	3	3	2	3	2	2.35
200	Option 1:Do Nothing except crossing structure upgrades	3	1	0	0	0	2	1	0	0.90
	Option 2: Detention and channel improvements	2	3	3	2	2	3	2	3	2.45
	Option 3: Channel only improvements	2	2	2	0	1	2	3	2	1.65
	Option 4: LID, detention and channel improvements	2	2	2	3	3	2	3	2	2.35
300	Option 1:Do Nothing except crossing structure upgrades	3	1	2	1	1	2	1	2	1.70
500	Option 1:Do Nothing except crossing structure upgrades	3	1	0	0	1	2	1	0	1.10
	Option 2: Detention and channel improvements	1	3	3	2	2	3	2	3	2.25
	Option 3: Channel only improvements	2	2	2	0	2	2	3	2	1.85
	Option 4: LID, detention and channel improvements	2	2	2	3	3	2	3	2	2.35
600	Option 1:Do Nothing except crossing structure upgrades	3	1	0	0	1	2	1	0	1.10
	Option 2: Detention and channel improvements	1	3	3	2	2	3	2	3	2.25
	Option 3: Channel only improvements	2	2	2	0	2	2	3	2	1.85
	Option 4: LID, detention and channel improvements	1	2	2	3	3	2	3	2	2.15
700	Option 1:Do Nothing except crossing structure upgrades	3	0	1	1	0	2	1	0	1.00
	Option 2: Detention and channel improvements	2	2	3	3	2	2	2	3	2.35
	Option 3: Channel only improvements	2	3	2	0	2	2	2	2	1.95
	Option 4: LID, detention and channel improvements	2	2	3	3	3	3	2	2	2.50
800	Option 1:Do Nothing except crossing structure upgrades	3	1	1	1	0	2	1	0	1.15
	Option 2: Detention and channel improvements	2	2	3	3	2	2	2	3	2.35
	Option 3: Channel only improvements	2	2	2	0	2	2	2	2	1.80
	Option 4: LID, detention and channel improvements	2	2	3	3	3	3	2	2	2.50
900	Option 1:Do Nothing except crossing structure upgrades	3	2	1	2	2	2	1	2	2.00
1000	Option 1:Do Nothing except crossing structure upgrades	3	1	0	0	0	2	1	0	0.90
	Option 2: Detention and channel improvements	1	2	3	2	3	3	2	3	2.30
	Option 3: Channel only improvements	0	2	2	0	1	2	3	2	1.25
	Option 4: LID, detention and channel improvements	2	2	2	2	3	2	2	3	2.30
1100	Option 1:Do Nothing except crossing structure upgrades	3	1	1	1	0	2	2	0	1.20
	Option 2: Detention and channel improvements	0	3	3	2	3	3	2	3	2.25
	Option 3: Channel only improvements	2	2	2	0	1	2	3	2	1.65
	Option 4: LID, detention and channel improvements	1	2	2	3	3	2	3	2	2.15
1200	Option 1:Do Nothing except crossing structure upgrades	3	1	1	1	0	2	1	0	1.15
	Option 2: Detention and channel improvements	1	2	3	3	2	2	2	3	2.15
	Option 3: Channel only improvements	2	2	2	0	2	2	2	2	1.80
	Option 4: LID, detention and channel improvements	1	2	3	3	3	3	2	2	2.30
1300	Option 1:Do Nothing except crossing structure upgrades	3	1	1	1	0	2	1	0	1.15
	Option 2: Detention and channel improvements	0	2	3	2	2	2	2	3	1.85
	Option 3: Channel only improvements	2	2	2	0	2	2	2	2	1.80
	Option 4: LID, detention and channel improvements	1	2	3	3	2	2	2	3	2.15
		Scoring:	0 - No Opportunity		1 - Minimal Opportunity		2 - Average Opportunity		3 - High Opportunity	

Table 3-28 Recommended Plan Cost Estimate

Major Drainageway	Recommended Alternatives	Acquisition Capital Cost	Crossing Improvement Capital Cost	Channel Improvement Capital Cost	Regional Detention Capital Cost	Total Capital Cost[a]	50 Year O & M Cost	Total Cost[b]
100	Option 4: LID, detention and channel improvements	$322,244	$574,081	$824,480	$685,368	$4,250,458	$1,402,900	$5,653,358
200	Option 2: Detention and channel improvements	$336,840	$277,221	$219,840	$2,665,320	$4,442,663	$3,272,100	$7,714,763
300	Option 1: Do Nothing except crossing structure upgrades	-	$105,325	-	-	$659,947	$8,800	$668,747
500	Option 4: LID, detention and channel improvements	$14,596	$96,410	-	$609,216	$1,444,700	$134,050	$1,578,750
600	Option 2: Detention and channel improvements	$150,455	$319,907	$160,040	$1,614,422	$2,373,880	$1,299,700	$3,673,580
700	Option 4: LID, detention and channel improvements	$14,596	$66,000	$34,047	$494,988	$1,043,298	$198,750	$1,242,048
800	Option 4: LID, detention and channel improvements	$119,017	$1,762,349	$4,759,500	$4,759,500	$11,561,232	$1,454,950	$13,016,182
900	Option 1: Do Nothing except crossing structure upgrades	-	-	-	-	-	-	-
1000	Option 4: LID, detention and channel improvements	$782,040	$1,039,977	$3,319,304	$14,536,358	$35,414,516	$5,073,750	$40,488,266
1100	Option 2: Detention and channel improvements	$107,531	-	-	$4,193,379	$7,796,509	$4,765,650	$12,562,159
1200	Option 4: LID, detention and channel improvements	$21,506	-	$63,984	$2,193	$544,146	$2,325,400	$2,869,546
1300	Option 4: LID, detention and channel improvements	$99,710	$224,045	-	$3,919,815	$7,164,992	$11,684,650	$18,849,642
Study Totals	Study Totals	$1,968,535	$4,465,315	$9,381,195	$33,480,559	$76,696,341	$31,620,700	$108,317,041

a. Total cost also includes mobilization, stormwater management/erosion control, engineering, legal/administration, construction management, and contingency estimates.
b. Costs only reflect Greeley responsibilities; distributed LID and EURV costs are expected to be borne by developers.

3.4 Community Indicators

3.4.1 Funding

This is a long-range drainage planning document, and funding for the recommended alternatives has not been determined to our knowledge. Potential funding sources could include City of Greeley capital improvement budgets, stormwater utility fees, and private developer-paid improvements. Federal grants, such as the Building Resilient Infrastructure and Communities (BRIC) program, are also a potential funding source, but historically it has been challenging to demonstrate a sufficient benefit cost analysis for federal grants in undeveloped areas.

Regarding private development cost sharing, there are multiple ways to include developers to protect and enhance these natural drainageways in the future. Distributed options, such as LID, will likely be directly constructed and maintained by the private developments. For regional improvements such as detention basins and channel improvements the costs should be shared by everyone within the watershed instead of just the property where the facility is located. Major drainageways are vital links for the whole community. Greeley could pursue a development fee-in-lieu program for this purpose to allow specialized designers and builders to facilitate and streamline the process.

CHAPTER 4 - THE HOW

4.1 Plan Development Overview

The City of Greeley reviewed the Alternatives Analysis and Recommended Plan presented in Chapter 3 and decided to proceed with conceptual design alternatives tailored for each study area. For the GO and GOS areas, Option 4: LID, detention, and channel improvements were selected for all study reaches. In the GOR study area, Option 4: LID will be implemented for Drainageways 1000, 1200, and 1300; Drainageway 900 will remain as Option 1: Do Nothing; and Drainageway 1100 will utilize Option 2: Detention improvements. Refer to Appendix A for the Selected Plan letter. The conceptual design, also known as the Master Plan, is based on the following principal elements, goals, and objectives.

4.1.1 Mitigation of Flood Hazards

The major problems identified in the Oklahoma & South Basins are due to the expected significant increase in flows under future conditions without mitigation. The Master Plan aims to minimize future increases in flood hazard risk with a policy of targeted major drainageway protection and maintenance, together with the adoption of distributed best practices such as Low Impact Development (LID) and Excess Urban Runoff Volume (EURV) management as properties within the watershed are developed. The proposed stream management corridors and detention basins keep the highest flood risks within the limits of these drainage features.

The Master Plan also proposes increases in the capacity of road and railroad crossings. All of the existing major crossings in this watershed are undersized for the 100-year storm event. Undersized culverts may become silted and unable to convey more than the low flow condition; potentially endangering properties located immediately upstream of the crossing embankments. The proposed culverts in the Master Plan are sized to safely convey the 100-year future conditions event.

4.1.2 General Recommendations

This report generally recommends the following:

1. Low Maintenance Stream Design: Preserve a stream management corridor and establish a high functioning and low maintenance stream. The low maintenance stream cross-section and stream management corridor shall be designed by a professional trained in fluvial geomorphology.
2. Crossing Improvements: Increase capacity of all major roadway and railroad crossing structures to convey the Master Plan 100-year flow using culvert structures or bridges. Distributed crossing layouts, where low-flows are conveyed separately from overbank flows, should be implemented in downstream reaches. Our analysis assumed that existing embankment and channel thalweg profiles would be preserved, but future projects could examine grade changes at crossings on an individual basis.
3. New land development and publicly funded projects provide to the maximum extent practicable runoff volume control practices. This includes minimizing directly connected impervious areas, employing infiltrating Best Management Practices (BMPs), and constructing EURV basins.
4. All BMPs for all new development, redevelopment, and publicly funded projects provide to the maximum extent practicable a Water Quality Capture Volume (WQCV).
5. The overall layout of a development that incorporates LID, detention facilities, and channel improvements should promote the contiguous overland connection between the various elements and areas to maximize benefits of these spaces and mitigate wildlife/human conflicts.
6. Development should promote the design of communities that incorporate existing topography and topographic features and minimize oversimplified overlot grading to promote and augment existing stormwater conveyance features and areas.
7. Development to promote stormwater conveyance should incorporate separated “undeveloped spaces” to promote the development and/or preservation of environmentally sensitive areas.
8. Natural or architectural forms and native and natural building materials should be utilized to the maximum extent possible to enhance community cohesivity and cultural character. Natural forms should be promoted over maximizing usable space within a parcel which tends to promote an unnatural square or rectangle shape.
9. Consider sun and aspect and the potential impact these may have on design elements. Incorporate and promote the inclusion and incorporation of shade trees to offer further water quality benefits.
10. Designs should consider in situ soils and incorporate considerations for amendments to increase permeability and vegetation establishment success.
11. Native vegetation should be utilized to the maximum extent possible. Successful designs will include the provision of supplemental watering to support efficient native vegetation establishment.
12. Groundwater explorations should further inform design opportunities.

4.2 Master Plan Description

The recommended plan was chosen based on a combination of quantitative and qualitative measurements. The Master Plan will minimize stormwater and flood-related damages to streams, public infrastructure, and private property. In addition, we recommend approaches to protect and enhance water quality, promote opportunities to allow runoff infiltration, and preserve the natural character of the drainageways and their terrestrial and aquatic habitat resources.

The proposed conceptual plan elements are presented in Appendix G. The conceptual design was based on the Selected Plan, and the Master Plan improvements are intended to provide flood hazard protection to the community while adhering to the City of Greeley drainage criteria. The total estimated cost of proposed capital improvements within the Oklahoma & South Basins is $83,654,420.

The Master Plan analysis generally include the following assumptions:

- CUHP version 2.0.1 with DCIA = 1 option was used to calculate the runoff reduction impact of LID practices on future peak flows. Master Plan CUHP inputs and results are provided in Appendix-F.
- MHFD-Detention worksheet version 4.06 was used to size detention basins that reduce 100-year peak flows within each major drainageway. To provide greater flexibility for land and phasing requirements, the required EURV and 100-year flood control basins were modeled separately instead of assuming a single full spectrum detention basin. Output from the detention worksheets is provided in Appendix F-2.

- EPA SWMM version 5.2.4 was used to analyze future channel stability and size recommended floodplain sections. Master Plan SWMM inputs are included in Appendix F-3, and Master Plan SWMM results are provided in Appendix F-4.
- HY-8 version 8.00.2 was used to determine the number and size of culverts required to convey the Master Plan (future conditions) 100-year peak flows. All crossings were sized to provide at least 1-ft of freeboard. Master Plan HY-8 inputs and results are included in Appendix F-6.
- The cost summaries for each major drainageway are provided below in Table 4-1. Detailed cost estimates are provided in Appendix F-7.
    - Estimated earthwork quantities for channel improvements did not assume a balanced earthwork system (where soils removed from one location can be used for fill at another location). Balanced earthwork might not be feasible due to project phasing and multiple landowners within most reaches.
    - Estimated quantities to re-vegetate the channel corridor and embankments were based on the square footage of the minimum stream management corridor.
    - Additional capital improvement costs, including engineering (15% of capital improvement cost subtotal), mobilization (5%), stormwater management and erosion control (5%), legal/administrative (5%), contract administration and construction management (10%) were included in the cost estimates. A substantial contingency cost (25% of capital improvement cost subtotal) was also included, but noted that site-specific costs such as dewatering and traffic control were not explicitly defined for this study.
    - Annual maintenance of culverts, channel, regional detention and hydraulic structures was included in the total costs. Distributed LID and EURV basins are not included in the costs.
    - The construction cost index (CCI) data for the fourth quarter of 2024 was used to adjust for inflation for the whole study area, including GO and GOS. The published CDOT CCI for 2024 Q4 was 1.99.

Table 4-1 Master Plan Cost Estimate Summary

Major Drainage way	Acquisition Capital Cost	Crossing Improvement Capital Cost	Channel Improvement Capital Cost	Regional Detention Capital Cost	Total Capital Cost [a]	50 Year O&M Capital Costs	Total Cost [b]
100	$561,114	$850,519	$989,376	$875,526	$5,190,906	$1,821,550	$7,012,456
200	$584,575	$862,523	$369,744	$1,605,494	$5,422,958	$2,705,800	$8,128,758
500	$25,416	$259,953	-	$729,370	$1,712,212	$158,350	$1,870,562
600	$134,902	$716,614	$192,000	$650,412	$2,793,040	$644,100	$3,437,140
700	$25,416	$86,365	$40,740	$593,585	$1,254,194	$230,300	$1,484,494
800	$207,241	$2,133,112	$78,540	$5,702,964	$13,701,663	$1,712,550	$15,414,213
1000	$1,133,958	$1,864,764	$7,389,412	$7,056,352	$31,851,100	$4,245,750	$36,096,850
1100	$117,306	-	$11,964	$336,000	$1,249,849	$654,250	$1,904,099
1200	$31,282	-	$221,856	$3,190	$824,792	$2,250,800	$3,075,592
1300	$99,710	$224,045	-	$3,919,815	$7,164,992	$11,684,650	$18,849,642
Study Total	$2,920,920	$6,997,895	$9,293,632	$21,472,708	$71,165,706	$26,108,100	$97,273,806

a.Total capital cost also includes mobilization, stormwater management/erosion control, engineering, legal/administration, construction management, and contingency estimates.

b.Total cost includes capital cost plus operations and maintenance cost over 50 years.

4.2.1 Vision Statement, Goals, and Objectives

Vision Statement

The vision for the successful implementation of the Oklahoma & South Basins concept design is of a stormwater conveyance system that utilizes LID, detention, and channel improvements to promote stormwater volume reduction and water quality enhancement while achieving flood protection for the 100-year future conditions storm event.

Goals & Objectives

To achieve the vision for the Oklahoma & South Basins concept design, the following goals and corresponding objectives have been identified:

Goal #1 – Implement LID effectively

Objective #1 – Promote development that weaves in LID to uplift stormwater conveyance improvements as a community amenity.

Objective #2 – Provide guidance on LID design criteria that promotes the effective use of regional materials and supports local cultural practices but allows for creative solutions.

Objective #3 – Support long-term maintenance of LID by determining achievable performance criteria and effective planning and budgeting by LID owners.

Goal #2 – Implement stormwater detention effectively

Objective #1 – Reduce future conditions 100-year peak flows and volumes to existing conditions levels.

Objective #2 - Promote development that provides detention facilities that allow for multiple uses of the facility such as a community use area or as preserved wildlife habitat in combination with the stormwater conveyance to uplift stormwater conveyance improvements as a community amenity.

Objective #3 – Support long-term maintenance of detention facilities by determining achievable performance criteria and effective planning and budgeting by detention facility owners.

Goal #3 – Implement channel improvements effectively

Objective #1 – Safely convey future conditions 100-year flows.

Objective #2 - Promote development that uplifts stormwater conveyance improvements into community amenities by realizing the direct and indirect benefits provided by the healthy ecosystems of natural channel systems.

Objective #3 – Support long-term maintenance of channel improvements by determining achievable performance criteria and effective planning and budgeting by channel landowners.

4.2.2 Concept Design Description

This Master Plan envisions the use of a combination of LID, detention facilities, and channel improvements to achieve long-term success in conveying stormwater safely and efficiently. The proposed LID and detention elements work together to reduce future conditions runoff within the major drainageways to levels similar to existing conditions. A comparison of peak flows at major drainageway outfalls is provided below in Table 4-2, and peak flows and volumes at all design points are included in Appendix F-5. The following sections describe overall guidelines, current elements and practices to employ, definitions of elements, as well as individual guidelines for elements to achieve the concept design.

Table 4-2 Master Plan Peak Flows Summary

Design Point		Drainage Area	Existing Conditions	Future Conditions Do Nothing	Future Conditions Concept Design
Number	Type	(acres)	Q_{100} (cfs)	Q_{100} (cfs)	Q_{100} (cfs)
O_100	OUTFALL	755	1,049	1,460	995
O_220	OUTFALL	1,058	1,401	2,273	1,209
O_300	OUTFALL	157	258	270	267
O_500	OUTFALL	292	378	609	335
O_600	OUTFALL	363	521	945	479
O_708	OUTFALL	90	160	172	111
O_803	OUTFALL	696	1,039	2,072	306
O_909	OUTFALL	446	527	728	728
O_1000	OUTFALL	7,181	9,020	11,827	4,357
O_1107	OUTFALL	854	1,031	1,511	546
O_1263	OUTFALL	1,042	1,340	1,415	741
O_1307	OUTFALL	1,712	2,356	2,697	1,023

LID

LID refers to systems and practices that use or mimic natural processes that result in the infiltration, evapotranspiration, or use of stormwater in order to protect water quality and associated aquatic habitat. This often includes the management of wet weather flows that use these processes, and to refer to the patchwork of natural areas that provide habitat, flood protection, cleaner air, and cleaner water (*Compendium of MS4 Permitting Approaches*, EPA, 2022). LID is the smallest, finest scale of design elements usually implemented successfully at a site-scale. See Figure 4-1 and Figure 4-2 for example sketches from the *Low Impact Design Implementation Manual* (City of Fort Collins, 2017). Maintenance requirements tend to be higher for these elements and are typically owned by an individual owner, Homeowner's Association (HOA), Metropolitan District or similar development group/entity. Operation and maintenance of LID can be split across several beneficiaries which can make for complexity in long-term planning. LID components generally focus on water quality improvements over volume reduction capabilities.



Figure 4-1 LID Single Family Residential Example

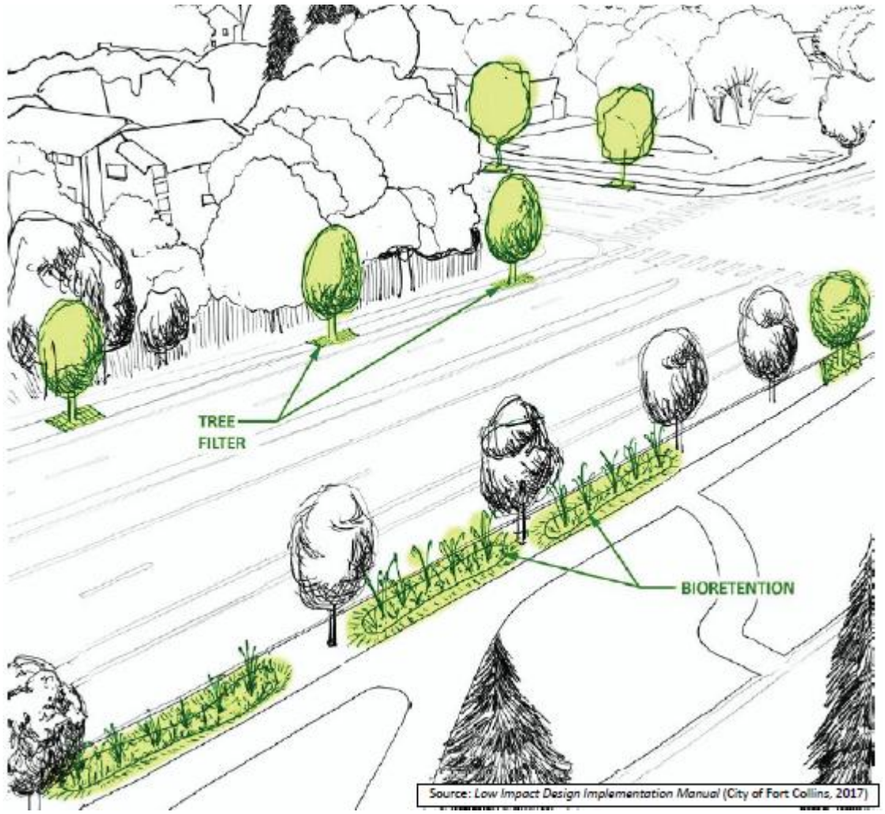


Figure 4-2 LID Street Right of Way Example

The following LID elements are regionally accepted and recommended for use within the Oklahoma Basin:

- **Vegetated buffer:** Areas of natural or established vegetation used to improve stormwater runoff quality by slowing down runoff velocity, promoting infiltration, and catching sediment.
- **Vegetated swale:** Ditches or channels that are densely planted with trees, shrubs, or grasses. It's designed to gather any runoff from impervious surfaces, slowing the velocity of the flow as well as filtering sediment that passes through.
- **Curb cut / no-curb:** Openings in a curb that allows stormwater runoff from impervious surfaces, like roads, to enter areas with infiltration.
- **Trench drain:** A gutter like drainage system that is placed into the ground and covered with a grate. They are used to control any excess surface water and direct it to a more desirable location.
- **Bioretention:** A treatment method, which also goes by the name rain garden or porous landscape design, that uses soil and vegetation to remove sedimentation and contaminants and reduce the volume of stormwater runoff.

- **Rain barrel:** Involves storing rain that lands on a roof in a barrel, decreasing runoff and conserving water to later be used for lawns, gardens, or indoor plants.
- **Green roof:** Involves partially or completely covering a roof with vegetation. This can decrease imperviousness and storm runoff.
- **Green alley:** Alleys that use sustainable materials, such as permeable pavement. This allows stormwater filtering to reduce runoff and improve water quality.
- **Permeable pavement:** Porous, or open space material used in the pavement mix that allows stormwater to flow through, decreasing runoff and improving water quality.
- **Greenway corridor:** Corridor of undeveloped land, used for recreational use as well as environmental protection. Helps protect important habitants as well as improving water quality.
- **Sand filter:** A type of filtration basin featuring a clean sand bed, used to treat stormwater.
- **Tree filter:** A concrete box that is placed around a tree root, allowing the soil and roots to filter stormwater and reduce runoff.
- **Retention ponds/ constructed wetland ponds:** A permanent pond that is designed for additional storage capacity for storm events. It helps treat stormwater through sedimentation and biological processes.

LID Guidelines

1. Each development should employ several and varying LID elements to increase water quality improvement potential and community appeal.
2. Operations and maintenance should be an essential element of the planning and design phase.
3. Performance and maintenance criteria should allow for some LID elements to look less “manicured”, such as by allowing areas to remain unmowed or allowing standing dead vegetation material to remain overwinter, to allow for important ecosystem processes to take place and to support the cultural acceptance of this landscape appeal.
4. Point sources of stormwater found within a development, such as at rain gutter outlets or storm drain inlets, should be focused on to capitalize on this water source.
5. Utilize a mix of Colorado and North American native plant species that will tolerate both periodic flooding and drought. Nonnative plants generally will not survive without irrigation. See Figure 4-3 for an example.
6. Establish minimal distance from adjacent structures, provide a barrier, or amend in situ soils where soils with moderate to high swelling potential are present.



Figure 4-3 LID Vegetation Example

With so many types of available LID elements, implementers can choose the ones that are most suitable for the character of each development. However, not all types of LID are suitable for every application. A general guide to the applicability of each LID for various proposed land uses is provided below in Table 4-3.

Table 4-3 LID Suitability by Land Use

LID Type	Residential							Multi-Use	Civic	Business Improvement District	Commercial	Industrial
	Single Family			Multi-Family								
	Single Lot	Agriculture Holding	Metro / HOA	Multi Unit	Row	Apartment	Metro					
Vegetated buffer	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Vegetated swale	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Curb cut / No-Curb			YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Trench drain	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Bioretention - rain garden	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Bioretention - porous landscape design			YES				YES	YES	YES	YES	YES	YES
Rain barrel	YES	YES	YES		YES		YES					
Green roof	YES	YES	YES	YES	YES	YES	YES	YES			YES	YES
Green alley			YES				YES	YES	YES	YES	YES	YES
Permeable pavement	YES	YES	YES	YES	YES	YES	YES					
Greenway corridor			YES				YES		YES	YES		
Sand filter								YES			YES	YES
Tree filter			YES	YES	YES	YES	YES	YES	YES	YES	YES	
Retention ponds/ constructed wetland ponds			YES				YES		YES	YES		

LID Resources

For more detailed discussions of LID design in this region, please refer to the *Urban Storm Drainage Criteria Manual, Volume 3: Stormwater Quality* (MHFD, 2021), *Ultra-Urban Green Infrastructure Guidelines* (City and County of Denver, 2019), and the *Low Impact Design Implementation Manual* (City of Fort Collins, 2017) for guidelines and performance criteria for LID. For additional guidance on LID practices, the Environmental Protection Agency has developed the following recommended documents:

- *Green Infrastructure in Parks: A Guide to Collaboration, Funding, and Community Engagement*, June 2017;
- *Compendium of MS4 Permitting Approaches*, June 2022;
- *Green Streets Handbook*, March 2021;
- *Saving the Rain Green Stormwater Solutions for Congregations*, May 2020.

Stormwater Detention Facilities

Stormwater detention facilities manage stormwater quantity by attenuating peak flows during flood events. Depending on the design, they can also enhance stormwater quality by incorporating design components to promote sedimentation, infiltration, and biological uptake (MHFD, 2017). For the purposes of this study, EURV and 100-year detention facilities should focus on volume reduction capabilities over water quality improvements. A summary of the Master Plan detention and existing detention sizes and results is provided in Table 4-4 and Table 4-5.

Table 4-4 Master Plan Detention Summary (100-yr Event Results)

Study Area	Detention Facility No.	Reach Location	Contributing Subbasins	Drainage Area (acre)	Future % Imperv.	EURV Ponds				Flood Control Ponds			
						Storage Volume (acre-feet)	Size (acre)	Peak Inflow (cfs)	Peak Outflow (cfs)	Storage Volume (acre-feet)	Size (acre)	Peak Inflow (cfs)	Peak Outflow (cfs)
GOS	D121	N/A (upstream of 118)	122/126	143	37%	6.2	4.0	248	245	-	-	-	-
	D134	134	134/138	137	63%	11.2	6.0	465	376	5.4	1.1	376	210
	D146	N/A (upstream of 142)	146	40	29%	1.1	0.6	48	48	-	-	-	-
	D150	150	150/154	149	40%	7.2	4.2	398	369	4.0	0.8	369	249
	D225	224	226/228	127	43%	6.3	4.1	294	277	-	-	-	-
	D236	N/A (upstream of 232)	236	60	31%	2.1	1.2	104	105	-	-	-	-
	D244	N/A (Upstream of 244)	244	90	54%	5.9	3.5	235	213	-	-	-	-
	D245	244	248/250/252	203	71%	18.8	10.9	679	509	10.3	1.8	509	266
	D256	N/A (Upstream of 239)	256	94	44%	5.0	3.2	180	168	-	-	-	-
	D263	260	264/268	127	62%	9.8	5.0	349	302	6.6	1.1	302	137
	D510	N/A (Upstream of 500)	514/518	168	57%	12.8	7.6	453	382	7.5	1.3	382	210
	D614	N/A (Upstream of 600)	614	100	52%	6.6	4.2	319	284	-	-	-	-
	D618	618	618/622	157	75%	14.2	7.1	544	415	6.8	1.3	415	234
	D810	N/A (Upstream of 800)	810	64	77%	5.8	3.1	199	166	-	-	-	-
	D814	800	814/818	211	65%	28.5	10.1	645	327	2.4	0.6	327	282
GO	D_EURV_711	700	712	90	30%	2.4	0.6	170	155	6.5	1.3	155	111
	D_EURV_820	829	820	81	70%	5.5	1.3	332	240	-	-	-	-
	D_EURV_830	829	830	829	68%	5.6	1.5	293	193	-	-	-	-
	D_EURV_840	843	840	63	77%	5.4	3.1	200	165	-	-	-	-
	D_EURV_842	843	842/850	211	69%	14.3	9.5	646	328	2.4	0.6	328	284
	D_EURV_844	N/A (Upstream of 843)	844	127	76%	9.4	2.3	523	383	-	-	-	-
	D_FC_823	829	820/830/844/842/840	327	73%	-	-	-	-	20.0	5.0	475	261
	D_FC_838	829	844	127	76%	-	-	-	-	17.3	3.3	524	292
GOR	D_EURV_1208	N/A (Trib to 1024)	1208	63	32%	2.0	0.5	104	86	-	-	-	-
	D_EURV_1264	N/A (Trib to 1200)	1264	40	10%	0.3	0.1	47	47	-	-	-	-
	D_EURV_1382	N/A (Trib to 1088)	1382	92	10%	0.9	0.3	87	86	-	-	-	-
	D_FC_1050	1088	Reach 800, 900, and 1300	2,854	36%	-	-	-	-	79.8	8.8	1,894	1,645
	D_EURV_1392	N/A (Trib to 1300)	1388/1392/1394/1396/1398	433	36%	14.8	3.7	666	590	-	-	-	-
	D_EURV_1395	N/A (Trib to 1300)	1396/1398	130	75%	9.5	2.4	405	267	-	-	-	-
	D_EURV_1316	N/A (Trib to 1316)	1320/1322	127	11%	1.2	0.3	220	220	-	-	-	-

Table 4-5 Existing Detention Summary

Study Area	Detention Facility No.	Existing or Proposed	Retention?	Reach Location	Storage Volume (acre-feet)	Drainage Area (acre)	Detention Facility (Q_{100} Future Sizing)		
							Size (acre)	Peak Inflow (cfs)	Peak Outflow (cfs)
GOR	D1141[A]	Existing	No	1140	35	717	6.9	460	301
	D1155[A]	Existing	No	1148	43	461	7.3	499	246
	D1163	Existing	No	1148	32	173	5.9	491	161
	D1170[A]	Existing	No	N/A	21	78	4.6	147	71
	D1233[B,C]	Existing	Yes	1216	62	583	13.1	784	220
	D1340[D]	Existing	Yes	1340	493	919	73.1	1,423	131

[A]Source: *Final Drainage Report for Water Valley South Hill Subdivision Second Filing,* dated May 19, 2016, prepared by TST, Inc. Consulting Engineers.
[B]Source: *Oklahoma Basin Hydrologic Update,*dated July 7, 2023, prepared by Anderson Consulting Engineers, Inc.
[C]Source: *Raindance Reservoir #2 Pump Station Drainage Letter,* dated January 22, 2024, prepared by TST, Inc. Consulting Engineers.
[D]Source: *Oklahoma Lake (Weld County, CO) Dam Safety Inspection,* dated December 20, 2024, prepared by Reno Gazette Journal.

Greeley and Windsor have a semi-arid environment with rain events tending to be high intensity and infrequent resulting in runoff events that are heavy with sediments and other accumulated pollutants that flush out. Therefore, pretreatment is essential to the long-term functionality of detention basins. The various forms of recommended pretreatment are listed below:

- **Forebays:** Natural or artificial reservoirs used to settle out coarse sediment by dissipating the energy and flow from incoming runoff.
- **Presedimentation/Sedimentation basins:** Preliminary treatment process that is used to remove sediment from the source water though settling.
- **Micropools**: Smaller permanent pools that are built in front of the outflow structure, designed to reduce potential clogging of outlets and minimize resuspension of sediment.
- **Infiltration**: The process of water from the surface flowing into the subsurface. Areas with high amount of infiltration reduce stormwater runoff which helps reduce erosion and maintenance costs.
- **Biological uptake:** Removing organic and inorganic constituents by using plants and microbes.
- **Maintenance path access**: Planned pathway for maintenance vehicles and maintenance personnel to be able to easily access structures to routinely clean them out.

<u>On-Site and Sub-Regional Detention</u>

On-site and sub-regional stormwater detention facilities are a small or medium scale design element typically implemented on the neighborhood or singular development (Commercial and Industrial) and are typically owned by an individual owner, Homeowner's Association (HOA), Metropolitan District or similar development group/entity. Operation and maintenance of these can be split across several beneficiaries which can make for complexity in long-term planning. Figure 4-4 shows some natural elements that can be incorporated into offline (located outside of the primary flow channel) detention basins to achieve multiple purposes. The following on-site and sub-regional detention facilities are regionally accepted and recommended for use within the Oklahoma Basin and South Basins.

- Extended Detention Basin;
- Underground Infiltration.

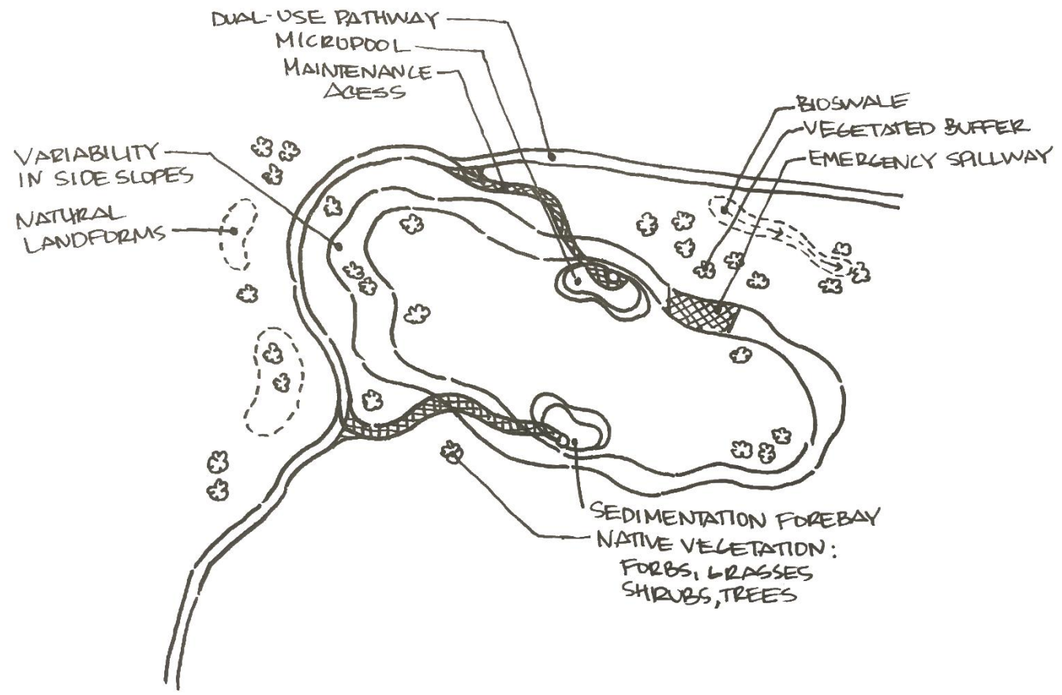


Figure 4-4 Offline basin elements

Regional

Regional stormwater detention facilities are the largest scale design element implemented on a regional level and are typically owned by a municipality. Operation and maintenance of these are typically assumed by the municipality and funded by taxpayer initiatives. Figure 4-5 shows natural elements that can be incorporated into online detention basins (situated within the primary flow channel) to fulfill multiple purposes. The following regional detention facilities are regionally accepted and recommended for use within the Oklahoma and South Basins:

- Standard (100-year flood control only);
- Full-spectrum.

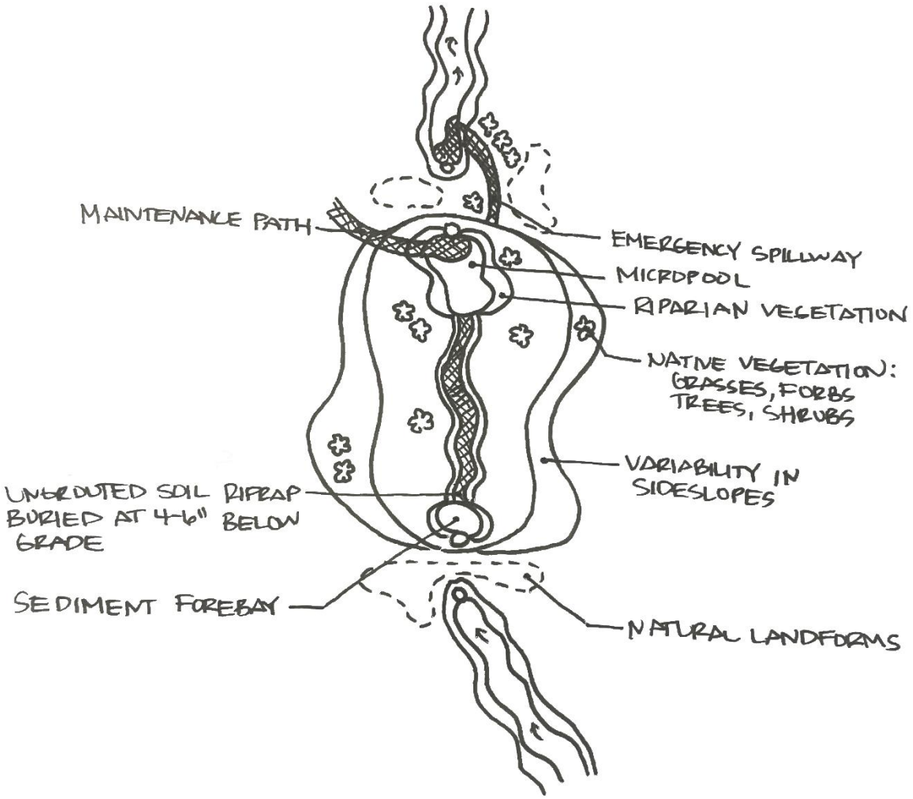


Figure 4-5 Online basin elements

Stormwater Detention Facility Guidelines

Refer to the *Design Criteria and Construction Specifications: Storm Drainage Volume II* (City of Greeley, 2024) and the *Urban Storm Drainage Criteria Manual, Volume 3: Stormwater Quality* (MHFD, 2021) for detailed guidelines and performance criteria of detention facilities. Some additional non-engineering considerations that lead to more pleasing detention spaces are listed below:

1. Stormwater detention facilities should allow for multiple uses of the facility such as a community use area or as preserved wildlife habitat in combination with the stormwater conveyance to uplift stormwater conveyance improvements as a community amenity.
2. Consider the sun and aspect and impacts on detention facility slopes. Consider incorporating elements such as a northern-facing sledding hill as an intentional design feature.
3. Incorporate a natural or architectural form in the forebay, sedimentation bay, and micropool elements.
4. Consideration should be given to water depth and length of time detained. Maximizing water detention depth and length of time thresholds can limit the plant palette opportunities that can survive during periods of extended detention.

Channel Improvements

At the outfall of Reach 700, channel improvements are recommended due to severe erosion observed in this area, which is likely caused by the steep gradient of the channel. This will require further investigation as the inlet side of the outlet is on private property. Channel improvements are also recommended downstream of the culvert at Southgate Dr. Severe erosion was observed in this area, which is likely caused by the steep gradient of the channel going into an existing detention pond.

Channel improvements can be a small to large scale design element implemented on a site to a regional scale, however the major drainageways discussed in this document are regional by nature. Ownership, operation and maintenance of these are typically assumed by the municipality and funded by taxpayer initiatives. In order of decreasing importance, channel improvements can provide flood conveyance, water quality improvements, and volume reduction capabilities. The following channel improvements are regionally accepted and promoted:

- **Constructed wetland channel:** Channel that uses dense vegetation to slow down runoff allowing for biological uptake and sedimentation to occur.
- **Rosgen stream classification:** A system that categorizes streams based on channel morphology.
- **Channel morphology:** Also known as river morphology, is the complete study of the channel from geography to channel fluid dynamics.
- **Multistage Design:** Channels that have multiple stages, with lower stages designed to minimize sediment deposition and provide ecological benefit during frequent storms, while higher stages improve bank stability and provide capacity for larger storms.

- **Grade control structures:** An earthen, wooden, concrete, or other material structure used to prevent gully development and bed erosion. It works by reducing the stream slope and flow velocity which leads to less erosion. Some forms of grade control structures are:
    - **Soil lifts:** Compacted course soil, wrapped with biodegradable fabric, used for erosion control. Usually lined around the stream banks, with the hope that vegetation growth occurs, creating a more stable bank.
    - **Riprap:** A permanent layer of large boulders or stones typically used to stabilize and protect the soil surface against erosion and scour in areas of concentrated flow or wave energy.
    - **Log / rock drop:** Layers of rock or logs placed into a section of a fast-flowing, highly eroded, and largely impermeable streambed to slow down water, recharge water tables, and create healthy riparian habitats. It also has the potential to weaken floods, filter water, sequester carbon, reestablish wetland ecosystems, and regulate microclimates.
    - **Log / rock vane:** Rocks or logs placed in a way that cuts into the stream channel in an upstream direction. These features can slow the rate of water flow significantly, reducing the risk of erosion.
    - **Log / rock toe:** A row of stone or logs are placed at the toe of an eroding bank, parallel to the stream. The toe is considered the bottom of the slope and supports the weight of the bank. This improvement helps with erosion control, preservation of much of the existing vegetation on the bank slope and encourages the growth of additional vegetation as the bank slope stabilizes.

A summary of the Master Plan channel design dimensions and performance is provided in Table 4-6. Note that although the concept design calculations assumed a simple trapezoidal shape to facilitate planning, it is recommended that the major drainageways use multiple stages and variable side slopes to mimic stable natural streams. It is not expected that switching to a more complex section will substantially change the required top widths.

Table 4-6 Master Plan Channel Improvements Summary

Reach	Existing or Proposed	Reach Length	SWMM Link	Bottom Width (ft)	Side Slopes(H:V)	Q_{100} (cfs)	V_{100} (ft/s)	Depth (ft)	Top Width (ft)
100	Proposed	3,379	L_115	118	5.0	811	5	1.3	146
118	Proposed	3,960	L_119	89	2.0	465	5	1.0	99
134	Proposed	1,478	L_138	86	5.0	310	5	0.8	109
142	Proposed	2,059	L_149	80	5.0	249	5	0.6	101
150	Proposed	1,637	L_154	79	5.0	302	5	0.7	101
200	Proposed	2,640	L_221	140	5.0	1,113	5	1.7	172
224	Proposed	3,274	L_225	59	5.0	264	5	0.6	80
232	Proposed	3,432	L_235	190	5.0	770	5	0.9	214
239	Proposed	422	L_239	142	5.0	680	5	1.0	167
241	Proposed	1,056	L_241	99	5.0	561	5	1.3	127
244	Proposed	3,379	L_245	98	5.0	261	5	0.6	119
260	Proposed	3,749	L_263	45	5.0	136	5	0.7	67
300	Existing	2,746	L_314	50	2.0	159	5	0.7	59
500	Existing	3,485	L_513	50	2.0	208	5	0.9	60
600	Existing	3,749	L_613	100	3.0	364	5	0.8	114
614	Existing	1,795	L_617	80	2.0	233	5	0.6	88
618	Proposed	2,006	L_622	101	5.0	350	5	0.7	123
700	Existing	2,429	L_712	106	15.0	170	4	0.4	163
800	Proposed	2,746	L_808	65	3.0	298	3	1.3	82
829	Existing	3,538	L_823	235	5.0	311	2	0.8	258
843	Existing	2,957	L_839	100	10.0	528	3	0.8	146
900	Existing	2,376	L_931	85	4.0	349	4	1.4	108
1000	Proposed	1,531	L_1004	100	5.0	4,337	5	3.3	148
1010	Proposed	2,218	L_1008	200	5.0	3,508	5	1.7	232
1024	Existing	4,963	L_1014	200	5.0	3,087	3	1.7	232
1088	Proposed	3,590	L_1040	150	5.0	1,816	5	1.2	177
1100	Existing	3,643	L_1115	85	5.0	540	3	1.7	117
1140	Existing	3,326	L_1147	25	5.0	271	4	1.9	59
1148	Proposed	3,485	L_1151	10	3.0	184	5	2.2	32
1200	Existing	1,742	L_1217	20	3.0	703	4	5.0	59
1216	Existing	5,755	L_1231	0.001	15.0	315	4	2.6	123
1232	Proposed	2,482	L_1235	25	5.0	150	5	1.0	50
1240	Existing	4,805	L_1273	0.001	4.0	291	3	5.0	52
1256	Existing	1,742	L_1257	4	2.0	158	3	4.0	26
1300	Existing	2,165	L_1315	90	3.0	973	5	2.1	112
1316	Existing	1,320	L_1316	0.001	15.0	362	3	2.7	126
1340	Existing	2,112	L_1340	0.001	15.0	131	3	1.6	93

Channel Guidelines

Refer to the *Design Criteria and Construction Specifications: Storm Drainage Volume II* (City of Greeley, 2024) and the *Urban Storm Drainage Criteria Manual, Volume 3: Stormwater Quality* (MHFD, 2021) for detailed guidelines and performance criteria of channels. For major drainageways, natural multistage channels are strongly preferred, see Figure 4-6 for an example typical section. Additional guidance on these types of channels can be found in *Natural Channel Design: Fundamental Concepts, Assumptions, and Methods* (Rosgen, 2011). Some additional non-engineering considerations that lead to more pleasing stream corridors are listed below:

1. Channel improvements should focus on promoting and incorporating natural system processes to support ecosystem services, the many and varied benefits to humans provided by the natural environment and healthy ecosystems.
2. Improvements to the extent possible should focus on preservation of areas within the natural channels that are in good condition to support efficient establishment of adjacent channel modifications.
3. Channel improvements should focus water quality improvements at point sources such as stormwater outfalls to capitalize on this water source.
4. While improvements should focus on enhancing and preserving natural resources, select areas of community use for nature exploration and nature play should be incorporated at key locations to promote community appeal and education while minimizing wildlife/human conflicts.
5. Culverts and outfalls should be sized and designed in a way to promote safe wildlife (terrestrial or aquatic) passage.

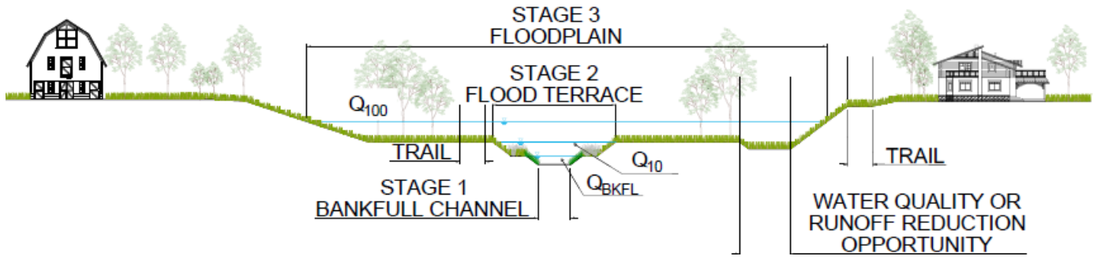


Figure 4-6 Master Plan Channel Typical

Crossing Improvements

Improved major drainageway crossing structures are proposed at all roadway and railroad crossing locations. The Master Plan culverts listed below in Table 4-7 are sized to safely convey the 100-year future conditions event. The concept design calculations assumed simple culverts with existing embankment and channel thalweg profiles to facilitate planning. When more detailed survey information is available during future design, it is recommended that grade changes and distributed layouts (where low-flows are conveyed separately from overbank flows) are explored to implement crossings that minimize maintenance requirements and ecological disruptions.

Table 4-7 Master Plan Crossing Improvements Summary

Study Area	Structure Number	Reach Number	SWMM Node	Design Q100 (cfs)	Structure Size/Type	Outlet Velocity (ft/s)
GOS	101	100	109	995	2 -14'x4' CBC	12.1
	102	100	109	995	Keep Existing	7.9
	103	142	149	249	6'x4' CBC	18.5
	104	134	133	210	6'x3' CBC	14.3
	201	200	O_220	1,209	2 - 11'x4' CBC	15.5
	202	260	268	157	6'x3' CBC	8.4
	203	260	268	157	48" RCP	20.5
	301	300	O_300	267	8'x3' CBC	11.2
	501	500	O_500	335	8'x3' CBC	24.1
	601	600	O_600	479	8'x5' CBC	18.3
	602	600	O_600	479	8'x4' CBC	12.9
	603	614	616	234	7'x3' CBC	13.3
GO	702	700	709	111	48" RCP	20.0
	704	700	711	170	2 - 48" RCP	14.4
	801	843	841	284	2 - 9'x4' CBC	9.9
	804	800	809	299	6'x5' CBC	25.1
	805	800	811	283	8'x3' CBC	14.4
	807	829	831	311	12'x4' CBC	13.3
	808	829	836	292	12'x4' CBC	17.9
	809	843	838	528	10'x4' CBC	21.0
GOR	1001	1000	O_1000	4,354	Keep Existing	4.9
	1002	1010	1006_RR	3,508	3 - 11'x9' CBC	11.8
	1003	1024	1034	1,848	2 - 12'x9' CBC	15.6
	1004	1088	1044	1,708	2 - 10'x7' CBC	18.4
	1005	1088	1046	1,644	2 - 10'x7' CBC	16.4
	1103	1140	Drop_1147	271	Keep Existing	12.5
	1203	1232	1233	497	Keep Existing	7.1
	1204	1240	Drop_1239	326	Keep Existing	13.0
	1205	1240	Drop_1239	326	Keep Existing	11.6
	1206	1240	1273	292	Keep Existing	16.0
	1207	1256	1255	268	Keep Existing	10.8
	1208	1256	1257	159	Keep Existing	11.1
	1301	1316	1316	958	3 - 10'x4' CBC	14.8

4.2.3 Metrics

The three metrics proposed below are intended to achieve the goals of this study.

Low Impact Development: At least 80% of new impervious surface areas shall drain through pervious LID elements before connecting to rapid conveyance elements (gutters, pipes, concrete channels).

Stormwater Detention Facilities: Proposed 100-year peak flows shall be equal to or less than the existing conditions 100-year peaks flows at the outfall.

Channel Improvements: Proposed major drainageways shall be stable during storm events ranging from the low-flow to the future conditions 100-year storm event. Shear stresses in the floodplain fringe should be less than 1 pound/square foot, and the channel section should be designed for the appropriate hydrologic and geomorphic regime.

4.2.4 Major Drainageway 100

Major Drainageway 100 is within the South Basin and is split into five reaches comprising two significant tributaries and the main stem. The hydraulic analysis showed that existing channel conditions are erosive and thus channel improvements are necessary even if peak flows are reduced to pre-development levels. There are four existing crossings, three at SH-257 and one at an access road. No habitable structures are within a regulatory floodplain, but there are two existing homes adjacent to Reach 150.

LID and EURV basins are recommended for all new developments, and two regional 100-year detention ponds are proposed immediately upstream of SH-257 along each tributary. See Table 4-4 for the Master Plan detention sizes.

Channel improvements include preservation and dedication of a stream management corridor, grading of a low maintenance stream, and revegetation of the stream management corridor. See Table 4-6 for the Master Plan channel improvement dimensions.

Crossing improvements include the removal and replacement of three existing culverts. See Table 4-7 for Master Plan crossing improvements. When these culverts are replaced, the appropriate headwalls, wingwalls, aprons, and energy dissipation features should be designed in detail.

The capital cost of these Master Plan improvements is estimated to be $ 5,190,906. The cost of maintenance and operation for 50 years is estimated to be $1,821,550. A detailed cost analysis is provided in Table 4-8.

Table 4-8 Major Drainageway 100 Cost Estimate

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST
Concrete Box Culverts					
Box Culvert Pipe					
Individual Box Span (ft)	Box Height (ft)	No. of Barrels	Length (ft)		
12	4	3	52	L.F.	$5,222.51	$271,570.00
6	5	1	295	L.F.	$1,247.27	$367,945.00
6	5	1	127	L.F.	$1,247.27	$158,404.00
Channel Improvements					
Excavation, Mid Range		20612	C.Y.	$48.00	$989,376.00
Detention/Water Quality Facilities					
Detention (Complete-in-Place)					
Detention Facility 1 (Complete-in-Place)		5	AC-FT	$90,922.00	$454,610.00
Detention Facility 2 (Complete-in-Place)		4	AC-FT	$90,922.00	$363,688.00
Removals					
Removal of culvert pipe (48"<D<84")		526	L.F.	$100.00	$52,600.00
Landscaping and Maintenance Improvements					
Reclamation & seeding (native grasses)		29	ACRE	$1,994.00	$57,228.00
Land Acquisition					
Easement/ROW Acquisition		28.70	ACRE	$19,551.00	$561,114.00

Master Plan Capital Improvement Cost Summary			
Capital Improvement Costs			
Pipe Culverts and Storm Drains			$0.00
Concrete Box Culverts			$797,919.00
Hydraulic Structures			$0.00
Channel Improvements			$989,376.00
Detention/Water Quality Facilities			$818,298.00
Removals			$52,600.00
Landscaping and Maintenance Improvements			$57,228.00
Special Items (User Defined)			$0.00
Subtotal Capital Improvement Costs			**$2,715,421.00**
Additional Capital Improvement Costs			
Dewatering		L.S.	$0.00
Mobilization	5%		$135,771.00
Traffic Control		L.S.	$0.00
Utility Coordination/Relocation		L.S.	$0.00
Stormwater Management/Erosion Control	5%		$135,771.00
Subtotal Additional Capital Improvement Costs			**$271,542.00**
Land Acquisition Costs			
ROW/Easements			$561,114.00
Subtotal Land Acquisition Costs			**$561,114.00**
Other Costs (percentage of Capital Improvement Costs)			
Engineering	15%		$448,044.00
Legal/Administrative	5%		$149,348.00
Contract Admin/Construction Management	10%		$298,696.00
Contingency	25%		$746,741.00
Subtotal Other Costs			**$1,642,829.00**
Total Capital Improvement Costs			**$5,190,906.00**

Master Plan Operation and Maintenance Cost Summary				
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, e	474	L.F.	$2.00	$948.00
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	7450	L.F.	$4.00	$29,800.00
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal, st	1.9	ACRE	$2,991.00	$5,683.00
Total Annual Operation and Maintenance Cost				**$36,431.00**
Effective Interest Rate				0.00%
Total Operation and Maintenance Costs Over 50 Years				**$1,821,550.00**

4.2.5 Major Drainageway 200

Major Drainageway 200 is within the Oklahoma Basin and is split into seven reaches comprising three significant tributaries and the main stem. The hydraulic analysis showed that existing channel conditions are erosive and thus channel improvements are necessary even if peak flows are reduced to pre-development levels. There are three existing crossings, one at US-34 and two at access roads. No habitable structures are within a regulatory floodplain.

LID and EURV basins are recommended for all new developments, and two regional 100-year detention ponds are proposed near where each tributary crosses the US-34 corridor. See Table 4-4 for the Master Plan detention sizes.

Channel improvements include preservation and dedication of a stream management corridor, grading of a low maintenance stream, and revegetation of the stream management corridor. See Table 4-6 for the Master Plan channel improvement dimensions.

Crossing improvements include the removal and replacement of three existing culverts. See Table 4-7 for Master Plan crossing improvements. When these culverts are replaced, the appropriate headwalls, wingwalls, aprons, and energy dissipation features should be designed in detail.

The capital cost of these Master Plan improvements is estimated to be $5,422,958. The cost of maintenance and operation for 50 years is estimated to be $2,705,800. A detailed cost analysis is provided in Table 4-9.

Table 4-9 Major Drainageway 200 Cost Estimate

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST
Concrete Box Culverts					
Box Culvert Pipe					
Individual Box Span (ft)	Box Height (ft)	No. of Barrels	Length (ft)		
8	6	2	30	L.F.	$3,013.18	$91,812.00
4	3	2	145	L.F.	$1,543.46	$223,801.00
4	3	2	327	L.F.	$1,543.46	$504,710.00
Channel Improvements					
Excavation, Mid Range		7703	C.Y.	$48.00	$369,744.00
Detention/Water Quality Facilities					
Detention (Complete-in-Place)					
Detention Facility 1 (Complete-in-Place)		7	AC-FT	$90,922.00	$636,454.00
Detention Facility 2 (Complete-in-Place)		10	AC-FT	$90,922.00	$909,220.00
Removals					
Removal of culvert pipe (48"<D<84")		422	L.F.	$100.00	$42,200.00
Landscaping and Maintenance Improvements					
Reclamation & seeding (native grasses)		30	ACRE	$1,994.00	$59,820.00
Land Acquisition					
Easement/ROW Acquisition		29.90	ACRE	$19,551.00	$584,575.00

Master Plan Capital Improvement Cost Summary			
Capital Improvement Costs			
Pipe Culverts and Storm Drains			$0.00
Concrete Box Culverts			$820,323.00
Hydraulic Structures			$0.00
Channel Improvements			$369,744.00
Detention/Water Quality Facilities			$1,545,674.00
Removals			$42,200.00
Landscaping and Maintenance Improvements			$59,820.00
Special Items (User Defined)			$0.00
Subtotal Capital Improvement Costs			**$2,837,761.00**
Additional Capital Improvement Costs			
Dewatering		L.S.	$0.00
Mobilization	5%		$141,888.00
Traffic Control		L.S.	$0.00
Utility Coordination/Relocation		L.S.	$0.00
Stormwater Management/Erosion Control	5%		$141,888.00
Subtotal Additional Capital Improvement Costs			**$283,776.00**
Land Acquisition Costs			
ROW/Easements			$584,575.00
Subtotal Land Acquisition Costs			**$584,575.00**
Other Costs (percentage of Capital Improvement Costs)			
Engineering	15%		$468,231.00
Legal/Administrative	5%		$156,077.00
Contract Admin/Construction Management	10%		$312,154.00
Contingency	25%		$780,384.00
Subtotal Other Costs			**$1,716,846.00**
Total Capital Improvement Costs			**$5,422,958.00**

Master Plan Operation and Maintenance Cost Summary				
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, e	95	L.F.	$2.00	$190.00
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	11313	L.F.	$4.00	$45,252.00
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal, st	2.9	ACRE	$2,991.00	$8,674.00
Total Annual Operation and Maintenance Cost				**$54,116.00**
Effective Interest Rate				0.00%
Total Operation and Maintenance Costs Over 50 Years				**$2,705,800.00**

4.2.6 Major Drainageway 300

Major Drainageway 300 is within the Oklahoma Basin and only comprises one reach. The hydraulic analysis showed that existing channel conditions are stable. There is one existing crossing at the Great Western Railway. Note that existing landowners did not allow access to this area, so we were unable to confirm existing channel or culvert dimensions in the field. No habitable structures are within a regulatory floodplain.

4.2.7 Major Drainageway 500

Major Drainageway 500 is within the Oklahoma Basin and only comprises one reach. The hydraulic analysis showed that existing channel conditions are fairly stable but channel improvements may be necessary if peak flows increase with development. There is one existing crossing at the Great Western Railway. No habitable structures are within a regulatory floodplain, but there are two existing homes near the downstream drainageway.

LID and EURV basins are recommended for all new developments, and one regional 100-year detention pond is proposed near the confluence of two smaller upstream tributaries. See Table 4-4 for the Master Plan detention sizes.

Channel improvements include preservation and dedication of a stream management corridor, grading of a low maintenance stream, and revegetation of the stream management corridor. See Table 4-6 for the Master Plan channel improvement dimensions.

Crossing improvements include the removal and replacement of one existing culvert. See Table 4-7 for Master Plan crossing improvements. When these culverts are replaced, the appropriate headwalls, wingwalls, aprons, and energy dissipation features should be designed in detail.

The capital cost of these Master Plan improvements is estimated to be $1,712,212. The cost of maintenance and operation for 50 years is estimated to be $158,350. A detailed cost analysis is provided in Table 4-10.

Table 4-10 Major Drainageway 500 Cost Estimate

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST
Concrete Box Culverts					
Box Culvert Pipe					
Individual Box Span (ft)	**Box Height (ft)**	**No. of Barrels**	**Length (ft)**		
8	5	2	88	L.F.	$2,854.02	$251,153.00
Detention/Water Quality Facilities					
Detention (Complete-in-Place)					
Detention Facility 1 (Complete-in-Place)		8	AC-FT	$90,922.00	$727,376.00
Removals					
Removal of culvert pipe (48"<D<84")		88	L.F.	$100.00	$8,800.00
Landscaping and Maintenance Improvements					
Reclamation & seeding (native grasses)		1	ACRE	$1,994.00	$1,994.00
Land Acquisition					
Easement/ROW Acquisition		1.30	ACRE	$19,551.00	$25,416.00

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains				$0.00
Concrete Box Culverts				$251,153.00
Hydraulic Structures				$0.00
Channel Improvements				$0.00
Detention/Water Quality Facilities				$727,376.00
Removals				$8,800.00
Landscaping and Maintenance Improvements				$1,994.00
Special Items (User Defined)				$0.00
Subtotal Capital Improvement Costs				**$989,323.00**
Additional Capital Improvement Costs				
Dewatering		L.S.		$0.00
Mobilization	5%			$49,466.00
Traffic Control		L.S.		$0.00
Utility Coordination/Relocation		L.S.		$0.00
Stormwater Management/Erosion Control	5%			$49,466.00
Subtotal Additional Capital Improvement Costs				**$98,932.00**
Land Acquisition Costs				
ROW/Easements				$25,416.00
Subtotal Land Acquisition Costs				**$25,416.00**
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%			$163,238.00
Legal/Administrative	5%			$54,413.00
Contract Admin/Construction Management	10%			$108,826.00
Contingency	25%			$272,064.00
Subtotal Other Costs				**$598,541.00**
Total Capital Improvement Costs				**$1,712,212.00**

Master Plan Operation and Maintenance Cost Summary				
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs	88	L.F.	$2.00	$176.00
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal,	1	ACRE	$2,991.00	$2,991.00
Total Annual Operation and Maintenance Cost				**$3,167.00**
Effective Interest Rate				0.00%
Total Operation and Maintenance Costs Over 50 Years				**$158,350.00**

4.2.8 Major Drainageway 600

Major Drainageway 600 is within the Oklahoma Basin and comprises three reaches. The hydraulic analysis showed that existing channel conditions are fairly stable but channel improvements may be necessary if peak flows increase with development. There are three existing crossings, one at the Great Western Railway, one at an access road, and one at the edge of a salvage yard. No habitable structures are within a regulatory floodplain, but there are two existing homes near the downstream drainageway.

LID and EURV basins are recommended for all new developments, and one regional 100-year detention pond is proposed near the existing salvage yard. See Table 4-4 for the Master Plan detention sizes.

Channel improvements include preservation and dedication of a stream management corridor, grading of a low maintenance stream, and revegetation of the stream management corridor. See Table 4-6 for the Master Plan channel improvement dimensions.

Crossing improvements include the removal and replacement of three existing culverts. See Table 4-7 for Master Plan crossing improvements. When these culverts are replaced, the appropriate headwalls, wingwalls, aprons, and energy dissipation features should be designed in detail.

The capital cost of these Master Plan improvements is estimated to be $2,793,040. The cost of maintenance and operation for 50 years is estimated to be $644,100. A detailed cost analysis is provided in Table 4-11.

Table 4-11 Major Drainageway 600 Cost Estimate

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST
Concrete Box Culverts					
Box Culvert Pipe					
Individual Box Span (ft)	Box Height (ft)	No. of Barrels	Length (ft)		
8	4	2	120	L.F.	$2,694.85	$323,382.00
8	6	1	41	L.F.	$1,506.59	$61,770.00
6	5	1	234	L.F.	$1,247.27	$291,862.00
Channel Improvements					
Excavation, Mid Range		4000	C.Y.	$48.00	$192,000.00
Detention/Water Quality Facilities					
Detention (Complete-in-Place)					
Detention Facility 1 (Complete-in-Place)		7	AC-FT	$90,922.00	$636,454.00
Removals					
Removal of culvert pipe (48"<D<84")		396	L.F.	$100.00	$39,600.00
Landscaping and Maintenance Improvements					
Reclamation & seeding (native grasses)		7	ACRE	$1,994.00	$13,958.00
Land Acquisition					
Easement/ROW Acquisition		6.90	ACRE	$19,551.00	$134,902.00

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains				$0.00
Concrete Box Culverts				$677,014.00
Hydraulic Structures				$0.00
Channel Improvements				$192,000.00
Detention/Water Quality Facilities				$636,454.00
Removals				$39,600.00
Landscaping and Maintenance Improvements				$13,958.00
Special Items (User Defined)				$0.00
Subtotal Capital Improvement Costs				**$1,559,026.00**
Additional Capital Improvement Costs				
Dewatering		L.S.		$0.00
Mobilization	5%			$77,951.00
Traffic Control		L.S.		$0.00
Utility Coordination/Relocation		L.S.		$0.00
Stormwater Management/Erosion Control	5%			$77,951.00
Subtotal Additional Capital Improvement Costs				**$155,902.00**
Land Acquisition Costs				
ROW/Easements				$134,902.00
Subtotal Land Acquisition Costs				**$134,902.00**
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%			$257,239.00
Legal/Administrative	5%			$85,746.00
Contract Admin/Construction Management	10%			$171,493.00
Contingency	25%			$428,732.00
Subtotal Other Costs				**$943,210.00**
Total Capital Improvement Costs				**$2,793,040.00**

Master Plan Operation and Maintenance Cost Summary				
Description	Quantity	Unit	Unit Cost	Total Annual Cost
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs	515	L.F.	$2.00	$1,030.00
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	1991	L.F.	$4.00	$7,964.00
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal,	1.3	ACRE	$2,991.00	$3,888.00
Total Annual Operation and Maintenance Cost				**$12,882.00**
Effective Interest Rate				0.00%
Total Operation and Maintenance Costs Over 50 Years				**$644,100.00**

4.2.9 Major Drainageway 700

Major Drainageway 700 is within the Oklahoma Basin and only comprises one reach. The hydraulic analysis showed that existing channel conditions are fairly stable, but channel improvements may be necessary if peak flows increase with development. There are two existing crossings, one next to the Great Western Railway, and one at Windsong Rd

LID and EURV basins are recommended for all new developments. See Table 4-4 for the Master Plan detention sizes.

Riprap is recommended near the outfall of 700 due to significant erosion and steep slopes that result in high water velocities. For the cost estimate, the riprap has been categorized as Type M soil riprap.

Channel improvements include preservation and dedication of a stream management corridor, grading of a low maintenance stream, and revegetation of the stream management corridor. See Table 4-6 for the Master Plan channel improvement dimensions.

Crossing improvements include the removal and replacement of two existing culverts. See Table 4-7 for Master Plan crossing improvements. When these culverts are replaced, the appropriate headwalls, wingwalls, aprons, and energy dissipation features should be designed in detail. Note, existing structure 701 (while not included) should be investigated in the future as it could have a direct impact on outfall 708.

The capital cost of these Master Plan improvements is estimated to be $1,254,194. The cost of maintenance and operation for 50 years is estimated to be $230,300. A detailed cost analysis is provided in Table 4-12.

Table 4-12 Major Drainageway 700 Cost Estimate

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST
Pipe Culverts and Storm Drains						
Circular Pipes						
Diameter (in)	Length (ft)	No. of Barrels				
48-inch	97	1	97	L.F.	$287.00	$27,839.00
48-inch	89	2	178	L.F.	$287.00	$51,086.00
Channel Improvements						
Soil Riprap, Type M			291	C.Y.	$140.00	$40,740.00
Detention/Water Quality Facilities						
Detention (Complete-in-Place)						
Detention Facility 1 (Complete-in-Place)			6.5	AC-FT	$90,922.00	$590,993.00
Removals						
Removal of culvert pipe (D<48")			186	L.F.	$40.00	$7,440.00
Landscaping and Maintenance Improvements						
Reclamation & seeding (native grasses)			1.3	ACRE	$1,994.00	$2,592.00
Land Acquisition						
Easement/ROW Acquisition			1.30	ACRE	$19,551.00	$25,416.00

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains				$78,925.00
Concrete Box Culverts				$0.00
Hydraulic Structures				$0.00
Channel Improvements				$40,740.00
Detention/Water Quality Facilities				$590,993.00
Removals				$7,440.00
Landscaping and Maintenance Improvements				$2,592.00
Special Items (User Defined)				$0.00
Subtotal Capital Improvement Costs				**$720,690.00**
Additional Capital Improvement Costs				
Dewatering		L.S.		$0.00
Mobilization	5%			$36,035.00
Traffic Control		L.S.		$0.00
Utility Coordination/Relocation		L.S.		$0.00
Stormwater Management/Erosion Control	5%			$36,035.00
Subtotal Additional Capital Improvement Costs				**$72,070.00**
Land Acquisition Costs				
ROW/Easements				$25,416.00
Subtotal Land Acquisition Costs				**$25,416.00**
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%			$118,914.00
Legal/Administrative	5%			$39,638.00
Contract Admin/Construction Management	10%			$79,276.00
Contingency	25%			$198,190.00
Subtotal Other Costs				**$436,018.00**
Total Capital Improvement Costs				**$1,254,194.00**

Master Plan Operation and Maintenance Cost Summary				
Description	Quantity	Unit	Unit Cost	Total Annual Cost
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs,	359	L.F.	$2.00	$718.00
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal,	1.3	ACRE	$2,991.00	$3,888.00
Total Annual Operation and Maintenance Cost				**$4,606.00**
Effective Interest Rate				0.00%
Total Operation and Maintenance Costs Over 50 Years				**$230,300.00**

4.2.10 Major Drainageway 800

Major Drainageway 800 is within the Oklahoma Basin and comprises three reaches. The hydraulic analysis showed that existing channel conditions are fairly stable, but channel improvements may be necessary if peak flows increase with development. There are 6 existing crossings across three reaches.

LID and EURV basins are recommended for all new developments. See Table 4-4 for the Master Plan detention sizes. Note that the largest single improvement cost involves the restoration of function and improvement for the existing Southgate detention basin in Windsor. This study has provided a conservative cost estimate for planning purposes, but there may be opportunities to identify and execute targeted, less costly improvements at this critical stormwater facility during design phases.

Riprap is recommended near the entrance of the existing detention pond, due to significant erosion and steep slopes that result in high water velocities. For the cost estimate, the riprap has been categorized as Type M soil riprap.

Channel improvements include preservation and dedication of a stream management corridor, grading of a low maintenance stream, and revegetation of the stream management corridor. See Table 4-6 for the Master Plan channel improvement dimensions.

Crossing improvements include the removal and replacement of six existing culverts. See Table 4-7 for Master Plan crossing improvements. When these culverts are replaced, the appropriate headwalls, wingwalls, aprons, and energy dissipation features should be designed in detail. Note that we have treated Culvert 805 the same as the other crossings (provide future 100-year conveyance under the roadway), but since this appears to be more of a driveway than a public roadway, we recommend considering smaller solutions that allow overtopping during design phases.

The capital cost of these Master Plan improvements is estimated to be $13,701,663. The cost of maintenance and operation for 50 years is estimated to be $1,712,550. A detailed cost analysis is provided in Table 4-13.

Table 4-13 Major Drainageway 800 Cost Estimate

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST
Concrete Box Culverts						
Box Culvert Pipe						
Individual Box Span (ft)	Box Height (ft)	No. of Barrels	Length (ft)			
6	5	1	90	L.F.	$1,247.27	$112,254.00
8	3	2	62	L.F.	$2,494.54	$154,662.00
12	4	1	80	L.F.	$1,740.84	$139,267.00
12	4	1	527	L.F.	$1,740.84	$917,421.00
9	4	2	74	L.F.	$2,888.76	$213,768.00
10	4	1	304	L.F.	$1,542.53	$468,930.00
Channel Improvements						
Soil Riprap, Type M			561	C.Y.	$140.00	$78,540.00
Detention/Water Quality Facilities						
Detention (Complete-in-Place)						
Detention Facility 1 (Complete-in-Place)			43	AC-FT	$90,922.00	$3,918,738.00
Detention Facility 2 (Complete-in-Place)			17	AC-FT	$90,922.00	$1,545,674.00
Detention Facility 3 (Complete-in-Place)			2	AC-FT	$90,922.00	$218,213.00
Removals						
Removal of culvert pipe (D<48")			62	L.F.	$40.00	$2,480.00
Removal of culvert pipe (48"<D<84")			905	L.F.	$100.00	$90,500.00
Concrete Box Culvert			170	L.F./CELL	$199.00	$33,830.00
Landscaping and Maintenance Improvements						
Reclamation & seeding (native grasses)			10	ACRE	$1,994.00	$20,339.00
Land Acquisition						
Easement/ROW Acquisition			10.60	ACRE	$19,551.00	$207,241.00

Master Plan Capital Improvement Cost Summary			
Capital Improvement Costs			
Pipe Culverts and Storm Drains			$0.00
Concrete Box Culverts			$2,006,302.00
Hydraulic Structures			$0.00
Channel Improvements			$78,540.00
Detention/Water Quality Facilities			$5,682,625.00
Removals			$126,810.00
Landscaping and Maintenance Improvements			$20,339.00
Special Items (User Defined)			$0.00
Subtotal Capital Improvement Costs			**$7,914,616.00**
Additional Capital Improvement Costs			
Dewatering		L.S.	$0.00
Mobilization	5%		$395,731.00
Traffic Control		L.S.	$0.00
Utility Coordination/Relocation		L.S.	$0.00
Stormwater Management/Erosion Control	5%		$395,731.00
Subtotal Additional Capital Improvement Costs			**$791,462.00**
Land Acquisition Costs			
ROW/Easements			$207,241.00
Subtotal Land Acquisition Costs			**$207,241.00**
Other Costs (percentage of Capital Improvement Costs)			
Engineering	15%		$1,305,912.00
Legal/Administrative	5%		$435,304.00
Contract Admin/Construction Management	10%		$870,608.00
Contingency	25%		$2,176,520.00
Subtotal Other Costs			**$4,788,344.00**
Total Capital Improvement Costs			**$13,701,663.00**

Master Plan Operation and Maintenance Cost Summary				
Description	Quantity	Unit	Unit Cost	Total Annual Cost
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs	1273	L.F.	$2.00	$2,546.00
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal,	10.6	ACRE	$2,991.00	$31,705.00
Total Annual Operation and Maintenance Cost				**$34,251.00**
Effective Interest Rate				0.00%
Total Operation and Maintenance Costs Over 50 Years				**$1,712,550.00**

4.2.11 Major Drainageway 900

Major Drainageway 900 is within the Oklahoma Basin and only comprises one reach. The hydraulic analysis showed that existing channel conditions are stable. There is no existing crossing.

4.2.12 Major Drainageway 1000

Major Drainageway 1000 serves as the mainstem drainageway for the Oklahoma Basin, receiving flow from nearly all other drainageways in the area. Hydraulic analysis indicates that current channel conditions are relatively stable. However, channel improvements are recommended to manage potential increases in peak flows and address high velocities. There are five major existing structures along this drainageway. Of these, four require improvements to their crossings.

LID and EURV basins are recommended for all new developments, and one regional 100-year detention pond is proposed at the upstream end of Major Drainageway. This location, at the confluence of Major Drainageways 800, 900, and 1300, already contains an existing small lake that does not appear to serve storm detention purposes. Note that this concept design detention basin (D_FC_1050) was significantly downsized from the original version presented in the Alternatives Analysis. This was changed because it seemed more feasible to slightly increase downstream proposed channel widths instead of installing a massive detention facility. Detailed design and coordination at this detention basin will be required to see if the existing lake can be used as retention to further reduce the required size. See Table 4-4 for the Master Plan detention sizes.

Eight drop structures are proposed: four within Reach 1088, two immediately downstream of County Road 17 and two near the end of the drainageway. Calculations using water depth and discharge rates were conducted to design each structure to reduce flow velocity to below 5 feet per second.

Channel improvements include preservation and dedication of a stream management corridor, grading of a low maintenance stream, and revegetation of the stream management corridor. Note that concept design corridor widths are different from the Alternatives Analysis recommended widths because the upstream hydrology changed. The concept design widths were also adjusted to reduce drastic changes in corridor widths at transitions between reaches. See Table 4-6 for the Master Plan channel improvement dimensions.

Crossing improvements include the removal and replacement of four existing culverts. Two are locations near Weld County Rd 60, one located Weld County Rd 17, and the last one goes underneath the GWR track. See Table 4-7 for Master Plan crossing improvements. When these culverts are replaced, the appropriate headwalls, wingwalls, aprons, and energy dissipation features should be designed in detail.

The capital cost of these Master Plan improvements is estimated to be $31,851,100 The cost of maintenance and operation for 50 years is estimated to be $4,245,750. A detailed cost analysis is provided in Table 4-14.

Table 4-14 Major Drainageway 1000 Cost Estimate

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST
Concrete Box Culverts						
Box Culvert Pipe						
Individual Box Span (ft)	Box Height (ft)	No. of Barrels	Length (ft)			
11	9	3	123	L.F.	$7,111.67	$874,736.00
12	9	2	113	L.F.	$5,122.42	$578,834.00
10	7	2	43	L.F.	$3,990.06	$171,573.00
10	7	2	49	L.F.	$3,990.06	$195,513.00
Hydraulic Structures						
Sloping Drop Structures						
Height (ft)	Bottom Width (ft)	Yn (ft)				
2.5	78	1.6	2	EA	$222,773.26	$445,547.00
3	49	1.1	1	EA	$146,937.13	$146,937.00
3	47	2.8	2	EA	$175,983.46	$351,967.00
3	47	2.9	1	EA	$177,993.60	$177,994.00
1	100	1.9	1	EA	$251,881.45	$251,881.00
3	100	3.3	1	EA	$321,064.02	$321,064.00
Channel Improvements						
Excavation, Mid Range			147007	C.Y.	$48.00	$7,056,352.00
Detention/Water Quality Facilities						
Detention (Complete-in-Place)						
Detention Facility 1 (Complete-in-Place)			80	AC-FT	$90,922.00	$7,273,760.00
Removals						
Removal of culvert pipe (D>84")			172	L.F.	$150.00	$25,800.00
Concrete Box Culvert			92	L.F./CELL	$199.00	$18,308.00
Landscaping and Maintenance Improvements						
Reclamation & seeding (native grasses)			58	ACRE	$1,994.00	$115,652.00
Special Items (User Defined)						
Bridge maintenance	<----User Defined Items		1	EA	$10,000.00	$10,000.00
Land Acquisition						
Easement/ROW Acquisition			58.00	ACRE	$19,551.00	$1,133,958.00

Master Plan Capital Improvement Cost Summary			
Capital Improvement Costs			
Pipe Culverts and Storm Drains			$0.00
Concrete Box Culverts			$1,820,656.00
Hydraulic Structures			$1,695,390.00
Channel Improvements			$7,056,352.00
Detention/Water Quality Facilities			$7,273,760.00
Removals			$44,108.00
Landscaping and Maintenance Improvements			$115,652.00
Special Items (User Defined)			$10,000.00
Subtotal Capital Improvement Costs			**$18,015,918.00**
Additional Capital Improvement Costs			
Dewatering		L.S.	$0.00
Mobilization	5%		$900,796.00
Traffic Control		L.S.	$0.00
Utility Coordination/Relocation		L.S.	$0.00
Stormwater Management/Erosion Control	5%		$900,796.00
Subtotal Additional Capital Improvement Costs			**$1,801,592.00**
Land Acquisition Costs			
ROW/Easements			$1,133,958.00
Subtotal Land Acquisition Costs			**$1,133,958.00**
Other Costs (percentage of Capital Improvement Costs)			
Engineering	15%		$2,972,627.00
Legal/Administrative	5%		$990,876.00
Contract Admin/Construction Management	10%		$1,981,751.00
Contingency	25%		$4,954,378.00
Subtotal Other Costs			**$10,899,632.00**
Total Capital Improvement Costs			**$31,851,100.00**

Master Plan Operation and Maintenance Cost Summary				
Description	Quantity	Unit	Unit Cost	Total Annual Cost
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs)	408	L.F.	$2.00	$816.00
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)	8	EA	$997.00	$7,976.00
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	12301	L.F.	$4.00	$49,204.00
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal)	9	ACRE	$2,991.00	$26,919.00
Total Annual Operation and Maintenance Cost				**$84,915.00**
Effective Interest Rate				0.00%
Total Operation and Maintenance Costs Over 50 Years				**$4,245,750.00**

4.2.13 Major Drainageway 1100

Major Drainageway 1100 is located within the Oklahoma Basin and consists of three reaches. The hydraulic analysis indicates that the existing channel conditions are relatively stable, as much of the drainageway has already been developed. However, channel improvements may be necessary if peak flows increase. All major crossings within the drainageway are stable under a 100-year flow event.

Drainageway 1100 has multiple existing detention facilities that help stabilize flows. In the alternatives, a large detention was proposed but was removed during the concept design phase due to the minimal impact it had on the downstream Reach 1100. See Table 4-4 for the Master Plan detention sizes.

Five drop structures are proposed: Two near Pelican Farms Park, one near Hilltop Drive, and two at the end of the drainageway. Calculations were performed using water depth and discharge rates to design each structure to reduce flow velocity to below 5 feet per second.

Channel improvements include preservation and dedication of a stream management corridor, grading of a low maintenance stream, and revegetation of the stream management corridor. Note that concept design corridor widths are different from the Alternatives Analysis recommended widths because of the removal of the proposed detention. This requires Reach 1100 needing significant improvements in the future. See Table 4-6 for the Master Plan channel improvement dimensions.

Drainageway 1100 has a single existing culvert, located in Pelican Farms residential neighborhood, which does not require any improvements. See Table 4-7 for Master Plan crossing improvements.

Drainageway 1100 already includes a significant amount of recent drainage infrastructure near Pelican Farms residential neighborhood, leading to most of the drainageway not needing any improvements. The remaining improvements needed is located in the downstream sections (Reach 1100) which are located near Ravina neighborhoods.

The capital cost of these Master Plan improvements is estimated to be $1,249,849. The cost of maintenance and operation for 50 years is estimated to be $654,250. A detailed cost analysis is provided in Table 4-15.

Table 4-15 Major Drainageway 1100 Cost Estimate

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST
Hydraulic Structures					
Sloping Drop Structures					
Height (ft)	Bottom Width (ft)	Yn (ft)			
5	5.5	2.2	2	EA	$66,433.11	$132,866.00
4	5.5	2.2	1	EA	$62,318.85	$62,319.00
3	8	2	2	EA	$60,550.24	$121,100.00
Channel Improvements					
Excavation, Mid Range		7000	C.Y.	$48.00	$336,000.00
Landscaping and Maintenance Improvements					
Reclamation & seeding (native grasses)		6	ACRE	$1,994.00	$11,964.00
Land Acquisition					
Easement/ROW Acquisition		6.00	ACRE	$19,551.00	$117,306.00

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains				$0.00
Concrete Box Culverts				$0.00
Hydraulic Structures				$316,285.00
Channel Improvements				$336,000.00
Detention/Water Quality Facilities				$0.00
Removals				$0.00
Landscaping and Maintenance Improvements				$11,964.00
Special Items (User Defined)				$0.00
Subtotal Capital Improvement Costs				**$664,249.00**
Additional Capital Improvement Costs				
Dewatering			L.S.	$0.00
Mobilization	5%			$33,212.00
Traffic Control			L.S.	$0.00
Utility Coordination/Relocation			L.S.	$0.00
Stormwater Management/Erosion Control	5%			$33,212.00
Subtotal Additional Capital Improvement Costs				**$66,424.00**
Land Acquisition Costs				
ROW/Easements				$117,306.00
Subtotal Land Acquisition Costs				**$117,306.00**
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%			$109,601.00
Legal/Administrative	5%			$36,534.00
Contract Admin/Construction Management	10%			$73,067.00
Contingency	25%			$182,668.00
Subtotal Other Costs				**$401,870.00**
Total Capital Improvement Costs				**$1,249,849.00**

Master Plan Operation and Maintenance Cost Summary				
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)	5	EA	$997.00	$4,985.00
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	2025	L.F.	$4.00	$8,100.00
Total Annual Operation and Maintenance Cost				**$13,085.00**
Effective Interest Rate				0.00%
Total Operation and Maintenance Costs Over 50 Years				**$654,250.00**

4.2.14 Major Drainageway 1200

Major Drainageway 1200 is located within the Oklahoma Basin and consists of five reaches. The hydraulic analysis indicates that the existing channel conditions are relatively stable, as much of the drainageway has already been developed. However, channel improvements may be necessary if peak flows increase. Nearly all existing major crossings—except one—will require upgrades

LID and EURV basins are recommended for all new developments. See Table 4-4 for the Master Plan detention sizes.

A drop structure is proposed near the west side of Raindance Reservoir to help reduce high flow velocities. Calculations were performed using the water depth and discharge rates to design a structure capable of reducing the velocity to below 5 feet per second.

Channel improvements include preservation and dedication of a stream management corridor, grading of a low maintenance stream, and revegetation of the stream management corridor. See Table 4-6 for the Master Plan channel improvement dimensions.

Crossing improvements include the removal and replacement of a single existing culvert. See Table 4-7 for Master Plan crossing improvements. When these culverts are replaced, the appropriate headwalls, wingwalls, aprons, and energy dissipation features should be designed in detail.

Drainageway 1200 already includes a significant amount of recent and proposed drainage infrastructure with most of the remaining improvements needed are in the downstream sections of the drainageway.

The capital cost of these Master Plan improvements is estimated to be $824,792. The cost of maintenance and operation for 50 years is estimated to be $2,250,800. A detailed cost analysis is provided in Table 4-16.

Table 4-16 Major Drainageway 1200 Cost Estimate

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST
Hydraulic Structures						
Sloping Drop Structures						
Height (ft)	Bottom Width (ft)	Yn (ft)				
5	9	4.1	2	EA	$120,178.15	$240,356.00
Channel Improvements						
Excavation, Mid Range			4622	C.Y.	$48.00	$221,856.00
Landscaping and Maintenance Improvements						
Reclamation & seeding (native grasses)			2	ACRE	$1,994.00	$3,190.00
Land Acquisition						
Easement/ROW Acquisition			1.60	ACRE	$19,551.00	$31,282.00

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains				$0.00
Concrete Box Culverts				$0.00
Hydraulic Structures				$240,356.00
Channel Improvements				$221,856.00
Detention/Water Quality Facilities				$0.00
Removals				$0.00
Landscaping and Maintenance Improvements				$3,190.00
Special Items (User Defined)				$0.00
Subtotal Capital Improvement Costs				**$465,402.00**
Additional Capital Improvement Costs				
Dewatering		L.S.		$0.00
Mobilization	5%			$23,270.00
Traffic Control		L.S.		$0.00
Utility Coordination/Relocation		L.S.		$0.00
Stormwater Management/Erosion Control	5%			$23,270.00
Subtotal Additional Capital Improvement Costs				**$46,540.00**
Land Acquisition Costs				
ROW/Easements				$31,282.00
Subtotal Land Acquisition Costs				**$31,282.00**
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%			$76,791.00
Legal/Administrative	5%			$25,597.00
Contract Admin/Construction Management	10%			$51,194.00
Contingency	25%			$127,986.00
Subtotal Other Costs				**$281,568.00**
Total Capital Improvement Costs				**$824,792.00**

Master Plan Operation and Maintenance Cost Summary				
Description	Quantity	Unit	Unit Cost	Total Annual Cost
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)	2	EA	$997.00	$1,994.00
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	960	L.F.	$4.00	$3,840.00
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal,	13.1	ACRE	$2,991.00	$39,182.00
Total Annual Operation and Maintenance Cost				**$45,016.00**
Effective Interest Rate				0.00%
Total Operation and Maintenance Costs Over 50 Years				**$2,250,800.00**

4.2.15 Major Drainageway 1300

Major Drainageway 1300 is within the Oklahoma Basin and comprises three reaches. The hydraulic analysis showed that existing channel conditions are fairly stable, but channel improvements may be necessary if peak flows increase with development. There is one existing crossing in the drainageway.

LID and EURV basins are recommended for all new developments. See Table 4-4 for the Master Plan detention sizes.

Channel improvements include preservation and dedication of a stream management corridor, grading of a low maintenance stream, and revegetation of the stream management corridor. See Table 4-6 for the Master Plan channel improvement dimensions.

Crossing improvements include the removal and replacement of a single existing culvert. See Table 4-7 for Master Plan crossing improvements. When these culverts are replaced, the appropriate headwalls, wingwalls, aprons, and energy dissipation features should be designed in detail.

The capital cost of these Master Plan improvements is estimated to be $7,164,992. The cost of maintenance and operation for 50 years is estimated to be $11,684,650. A detailed cost analysis is provided in Table 4-17.

Table 4-17 Major Drainageway 1300 Cost Estimate

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST
Concrete Box Culverts					
Box Culvert Pipe					
Individual Box Span (ft)	Box Height (ft)	No. of Barrels	Length (ft)		
10	4	3	48	L.F.	$4,627.60	$222,125.00
Detention/Water Quality Facilities					
Detention (Complete-in-Place)					
Detention Facility 1 (Complete-in-Place)		43	AC-FT	$90,922.00	$3,909,646.00
Removals					
Removal of culvert pipe (D<48")		48	L.F.	$40.00	$1,920.00
Landscaping and Maintenance Improvements					
Reclamation & seeding (native grasses)		5	ACRE	$1,994.00	$10,169.00
Land Acquisition					
Easement/ROW Acquisition		5.10	ACRE	$19,551.00	$99,710.00

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains				$0.00
Concrete Box Culverts				$222,125.00
Hydraulic Structures				$0.00
Channel Improvements				$0.00
Detention/Water Quality Facilities				$3,909,646.00
Removals				$1,920.00
Landscaping and Maintenance Improvements				$10,169.00
Special Items (User Defined)				$0.00
Subtotal Capital Improvement Costs				**$4,143,860.00**
Additional Capital Improvement Costs				
Dewatering			L.S.	$0.00
Mobilization	5%			$207,193.00
Traffic Control			L.S.	$0.00
Utility Coordination/Relocation			L.S.	$0.00
Stormwater Management/Erosion Control	5%			$207,193.00
Subtotal Additional Capital Improvement Costs				**$414,386.00**
Land Acquisition Costs				
ROW/Easements				$99,710.00
Subtotal Land Acquisition Costs				**$99,710.00**
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%			$683,737.00
Legal/Administrative	5%			$227,912.00
Contract Admin/Construction Management	10%			$455,825.00
Contingency	25%			$1,139,562.00
Subtotal Other Costs				**$2,507,036.00**
Total Capital Improvement Costs				**$7,164,992.00**

Master Plan Operation and Maintenance Cost Summary				
Description	Quantity	Unit	Unit Cost	Total Annual Cost
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs	48	L.F.	$2.00	$96.00
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal,	78.1	ACRE	$2,991.00	$233,597.00
Total Annual Operation and Maintenance Cost				**$233,693.00**
Effective Interest Rate				0.00%
Total Operation and Maintenance Costs Over 50 Years				**$11,684,650.00**

4.3 Prioritizing and Phasing

Any downstream flood controls and EURVs in the developed portions of the basin should be prioritized before the upstream undeveloped regions. For undeveloped regions, improvements will generally be constructed commensurate with development. There is not currently a visible stream (or obvious low flow channel) in some upstream portions of the study area. Any upstream improvements, particularly along the Highway 34 corridor, will need to take this into account.

Detention and LID (runoff reduction) improvements should be prioritized due to the impact of these structural and non-structural measures on downstream channel stability and flood risk. If detention elements are not implemented, wider stream management corridors than those presented in this document may be required to protect properties from larger peak flows.

4.4 Water Quality Impacts

As the majority of the Oklahoma upper region is historically agricultural or natural land uses, it will be important to protect the major drainageways from urban pollutants as development occurs. This comprehensive drainage plan addresses these water quality concerns through multiple methods. Foremost is the recommendation that LID practices be implemented throughout the watersheds. LID BMPs both reduce runoff and capture pollutants by intercepting, slowing down, and infiltrating surface flows that come from impervious sources such as roadways, buildings, and parking lots.

The Master Plan also recommends the widespread implementation of EURV basins and 100-year detention ponds. These larger scale options are primarily targeted at runoff reduction – not just peak flow reductions but also volume reductions. These controls result in a proposed system that more closely mimics the flow durations and frequencies of a natural system.

4.5 Operations and Maintenance

Regular stream management is recommended to:

1. Maintain channel/culvert/hydraulic structure conveyance by removing sediment, trash and debris, which could restrict flow;

2. Manage noxious weeds and invasive plant species.

Ongoing maintenance of low maintenance streams, detention ponds, and floodplain culverts is required to protect infrastructure and people. Maintenance is recommended at regular intervals and on an as-needed basis (after significant flood events or growth of invasive species). Critical crossings structures and detention basins may need to be cleaned out on a more frequent basis to maintenance system functionality.

Regarding detention, the regional 100-year detention basins maintained by the City of Greeley and the Town of Windsor will require much less maintenance if the upstream distributed LID and EURV basins are functioning properly. While the maintenance burden of these smaller drainage features will be held by the private owners, it is recommended that Greeley and Windsor implement a regular inspection program to ensure that all components of the Master Plan drainage system are kept in satisfactory condition. Overall, implementation of the improvements to provide 100-year capacity should result in reduced maintenance costs after major flood events.

4.6 Environmental and Safety Assessment

The holistic approach described in this Master Plan will result in improved environmental outcomes compared to a standard piecemeal development process. Each major drainageway should be considered as a connected system. The widespread adoption of LID practices should create a proposed system that more closely matches the natural ecosystem. Incorporating natural system processes into detention basins and stream corridors where possible will also support a healthy ecosystem, which in turn provides many health benefits to humans.

The flood control improvements described in this Master Plan will result in improved safety within the Oklahoma and South Basins. The LID practices, EURV basins, 100-year detention ponds work together to reduce runoff, which can lessen the impacts of flood hazards to property and humans during large storm events. The stream management corridors improvements will also improve safety by stabilizing channels and more clearly defining the conveyance areas that should be avoided during floods. Lastly, the proposed crossing improvements will explicitly improve safety by conveying storm flows up to the 100-year event through culverts instead of allowing the roadway and railroad embankments to overtop.

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APPENDIX A – PROJECT CORRESPONDENCE

Masterplan Storm Drainage Conceptual Design Services - Oklahoma & South Basin
Project Kickoff Meeting Agenda
ZOOM Conference Call
March 30, 2022
9:00 to 10:00 AM

Key: City of Greeley notes in blue, *Matrix meeting notes in green italics*, *action items indicated in underlined red italics*

1. Introductions and Contacts

i. City of Greeley
   1. **Interim Project Manager – Andrew Fisher (here)
   2. Project Manager – Florian Fiebig
   3. Stormwater Manager – Karen Reynolds (here)
   4. Water Quality and Regulations Manager – Brian Hathaway (here)

ii. Consultant – Matrix Design Group
   1. Principal in Charge – Graham Thompson (here)
   2. Project Manager – Drew Beck (here)
   3. Project Engineer – Megan Sawyer (here)
   4. Hydrology and Hydraulics – Ben Liu (here)

**Florian will return in late April to resume PM duties

Andrew may stay on project through May. DB asked if we should wait to correspond with Florian until he gets back, AF said yes wait until he returns. Group went through introductions.

Contract received by City from Matrix 3/29. Contract still requires approval by the City.

2. PM/Contract/Correspondence Expectations

1. Progress meetings – biweekly in contract, virtual. In person progress meetings may be scheduled in lieu of two virtual progress meetings. Additional coordination not requiring a meeting encouraged.
   i. *AF expects that we will not need biweekly meetings throughout the project, and that most meetings will be online. DB proposed that we set all meetings as virtual and adjust as needed. AF noted two virtual meetings can be swapped for 1 in person meeting, as budgets allow.*
   ii. *Matrix to set first progress meeting for 4/20 at 9am virtually.*
2. Matrix will provide meeting minutes within 14 days for City approval.
   i. *AF noted that timely meeting minutes will be critical since there will be a PM handoff on this project.*
   ii. *It is okay to record virtual meetings which helps with meeting minutes.*
3. Provide 48 hours notice prior to mobilization of survey/pothole efforts. Approval in writing required prior to survey on private property or secured City property. Contact with some property owners can be a challenge.
   i. *AF wants to know if anyone will be out, some farmers may not welcome visitors. He noted that Sharktooth project had difficulties completing survey on private property. RK reminded everyone to wear reflective vests on all site visits.*
   ii. *If personnel are approached by citizens/landowners the team should direct them to AF.*
   iii. *DB noted Matrix has drone capacity for visualization of areas we do not have foot access to.*
   iv. *Matrix will provide a work plan for field data collection prior to commencing work.*
4. City has adopted a Master Plan guideline. Expectation for Master Plan to adhere to this as much as feasible without sacrificing MHFD approach
   i. Matrix will document deviations
   ii. *Matrix will be test subjects in this process, Matrix will document deviations and Greeley welcomes feedback.*
   iii. *Windsor did master plan in this area 19 years ago, Doug Roth has been AF's contact. AF to provide his contact info to Matrix.*
5. Matrix expectations on City correspondence to Matrix personnel:
   i. Provide Stakeholders
   ii. Free flow of communication
   iii. CC Drew Beck on any conversation
   iv. Follow up phone call conversations with emails
   v. Allow recording of progress meetings
   vi. *DB said phone calls will typically be followed up by emails.*
   vii. *DB asked if Greeley had preference on recording virtual meetings. KR and AF noted this would be helpful for Florian transition.*
   viii. *AF noted they have an excellent media coordinator who the project will likely need to collaborate once we get closer to the stakeholder engagement portion of the project this summer.*

3. Project Scope Review

1. Why are we doing this?
   i. Pressure for development in Greeley is moving west, including Delantero.
      1. *AF to send Matrix documentation for Delantero.*
      2. *Historically, Greeley has been very pro-developer.*
      3. *KR noted new western developments will be first impression driving into Greeley, and the City wants to move towards more thoughtful development with amenities.*
   ii. Provide guide for development
      1. *Lessons learned that recommendations are not always strong enough – developer wanted to put arterial street on Sharktooth Draw (convert it to pipe), they want to*

better communicate expectations. They do have one developed who recognizes the value of stream corridors as an amenity.

2. *KR said management has high expectations for what future development will look like, Greeley wants to give them ideas/vision of what things should be.*
3. *Greeley is more amenable to take on regional detention facilities than previously, tired of "ugly ponds."*

iii. City is moving to increase barrier of development and have higher standards and provide more ideas to shape development in line with newer vision
iv. City more amenable to regional detention facilities
v. City is tired of ugly ponds
vi. Drew mentioned lessons learned that the maintenance of large facilities is a big deal
vii. Karen mentioned that City Council recently released their Strategic Plan. Sill be shared with Matrix as appropriate

4. Project Priorities/Goals

1. Coordinate with adopted and draft Master Plans
2. Stabilize drainageways
3. Reduce flood losses
4. Improve Water Quality

i. *AF would like to consider regional detention ponds in this MDP.*
ii. *KR noted that new philosophy is proactive, try to plan ahead and identify recommended facilities.*
iii. *AF would like to see us on the high side of concept design instead of us shrinking down recommendations to fit a budget.*
iv. *Lessons learned from another regional pond is that they should have included regional conveyance – developers chose to put in small ponds instead of providing flood conveyance through their sites.*
v. *DB asked if annexations in this West side could include fees to support regional storm infrastructure, KR thought it was possible, AF said Paul (Public Works Director) said similar.*

5. Schedule and Deliverables

1. Monthly meetings – Determine DOW and time.
2. By April 7, 2022 - Data Collection (Survey and Field Assessment)
3. Baseline Hydrology April 14-June 15
    i. **June 15 - Draft Baseline Hydrology Report
    ii. **July 6 – Final Hydrology Report
4. Alt Analysis - July 7-Oct 19 – Alternative Analysis
    i. **Sept 28 - Draft Alternatives Report
    ii. **Oct 19 – Final Alternatives Report
5. Concept Design - October 29-Dec 21
    i. **November 23 – Draft Concept Design Report
    ii. **Dec 14 – Final Concept Design Report
    iii. **Dec 21 – Final TSDC

Plan for survey in within 4-6 weeks

First stakeholder meeting in mid-end June

6. City Deliverables

Source	Title	Delivered
Anderson Consulting Engineers (2003)	Town of Windsor Comprehensive Drainage Plan (Oklahoma/South included	LINK
City of Greeley	GIS Online Maps.	LINK
City of Greeley	2060 Comprehensive Plan	LINK
City of Greeley (2022)	2022 Draft Comprehensive Transportation Plan documents	
City of Greeley (2021)	Master Plan Procedures/Preparations Guide	LINK
City of Greeley, Colorado, Public Works (2015)	Design Criteria and Construction Specifications, Volume I (Streets)	LINK
City of Greeley, Colorado, Public Works (2008)	Design Criteria and Construction Specifications, Volume II (Stormwater)	LINK
City of Greeley, Colorado, Public Works (2008)	Design Criteria and Construction Specifications, Volume III (Water/Sewer)	LINK
City of Greeley, Colorado, Public Works (2011)	2035 Comprehensive Transportation Plan	LINK
Colorado Department of Transportation (2019)	Standard Specifications for Road and Bridge Construction.	LINK
Design Workshop (2016)	City of Greeley Parks, Trails and Open Lands Master Plan	LINK
Mile High Flood District (2016)	Urban Storm Drainage Criteria Manual	LINK
U.S. Federal Highway Administration (2009)	Hydraulic Engineering Circular No. 22, Urban Drainage Design Manual, 3rd Ed.	LINK
U.S. Department of Agriculture Natural Resources Conservation Service (2013)	Web Soil Survey	LINK

- *AF wants to see H&H report discuss changes from Windsor MDP. Delantero is now including some residential instead of the commercial shown in the land use plan.*
- *KR said she may be able to share the new Strategic Plan to inform team of Greeley's desired direction.*
- *AF said Greeley expects new Transportation Plan by August, draft shows new arterial near 4th Street (will require crossings). AF also noted that draft arterial typical only includes one lane each direction (same ROW), may create opportunities for storm or water quality improvements.*
- *AF noted that this MPD should include Public Engagement Summary per new guide. DB asked if Matrix would have to address/brief Council, AF confirmed that he would do that with Matrix support.*
- *Revised water/sewer design criteria about to be released.*

Notes:

- Delanatero: LINK. Please note these are not final or accepted at this time.
  - *South side of Hwy 34 Bypass and Hwy 257, developer shows detention ponds at downstream side. Intends to start grading early next year.*
- Transportation Master Plan will be finalized by August 2022, draft documents will be provided
- City's Master Plan/Procedures/Preparations Guide may not fit well with MHFD but please follow as much as feasible.
- City's Volume III (Water/Sewer) manual nearly has completed revision
- City's Volume II (Stormwater) is being revised be RESPEC now. Only intro section have been revised thus far
  - *BH said they are on schedule to complete by end of year or next year, have good draft with Sections 1 and 2, water quality section to be send to stakeholders soon.*
  - *Will require coordination with Florian to ensure Matrix's assumptions for drainage criteria are consistent with the ideas in the new unpublished manual.*
- City's Volume I (Streets) will likely be revised but has not been initiated
- Note: Original draft of Agenda included outdated Comprehensive Plan

7. Action Items – Prior to next meeting

Next meeting scheduled: *Wed April 20 every other week 9-10*

MATRIX

- *Send biweekly progress meeting invitations at 9am starting on Wednesday, April 20. Please include Karen Reynolds and Brian Hathaway in these invitations*
- *Download reference documentation from meeting minutes and let Andrew know when completed.*
- *Review materials provided by the City and contact Andrew with any questions*
- *Download applicable GIS shapefiles from City IT website. Contact Andrew if you need any assistance. Matrix to provide ideas on deliverables and format for MDP.*

CITY

- *Provide draft Stakeholder register*
- *Provide contacts with the Town of Windsor*
- *Provide updates on Standards and Specifications, Transportation Master Plan and Delantero development as appropriate*
- *Provide City Council Strategic Plan as appropriate.*

8. Matrix Questions/Requests/Ideas

Masterplan Storm Drainage Conceptual Design Services - Oklahoma & South Basin
Progress Meeting Notes
ZOOM Conference Call
April 20, 2022
9:00 to 10:00 AM

Key: *Meetings notes in green italics*, *action items indicated in underlined red italics*

1. Introductions/Attendees:

Andrew Fisher, Karen Reynolds, Brian Hathaway (Greeley)

Megan Sawyer, Ben Liu (Matrix)

2. Previous Action Items

MATRIX

- *Send biweekly progress meeting invitations at 9am starting on Wednesday, April 20. Please include Karen Reynolds and Brian Hathaway in these invitations* *Completed*
- *Download reference documentation from meeting minutes and let Andrew know when completed.* *Completed*
- *Review materials provided by the City and contact Andrew with any questions* *Completed*
- *Download applicable GIS shapefiles from City IT website. Contact Andrew if you need any assistance. Matrix to provide ideas on deliverables and format for MDP.* *Completed*

CITY

- *Provide draft Stakeholder register* *Completed*
- *Provide contacts with the Town of Windsor* *Completed*
- *Provide updates on Standards and Specifications, Transportation Master Plan and Delantero development as appropriate* *Completed*
- *Provide City Council Strategic Plan as appropriate.* *Completed*

3. Schedule/Upcoming Activities

1. Reschedule next progress meeting (May 4 conflicts with MHFD Symposium)
    i. *Rescheduled for Thursday May 5, 11:00 AM*
2. Data Collection (Survey and Field Assessment)
    i. Structure Survey *AF will meet 4/21/22 with real estate manager then communicate with parcel owners. Plan on 1st week of May or later, Matrix will wait to hear from AF.*
    ii. Utility Locates *Utility Locates in road ROW okay w/o access permissions. Utility locate sub-contractor (separate from survey) scheduled to go out May 2.*
    iii. GIS data request *Greeley GIS is very short-staffed right now*
        1. *Current (existing) zoning is available as shapefile.*
            a. *Don't have direct impervious/impervious layer. Sidewalks, driveways, roadway, water, etc. available.*
            b. *Watershed boundary available.*
        2. *Do not have future land use shapefile. AF suggests digitizing from Imagine Greeley pdf.*
        3. *CWCB has 2018 or 2020 LiDAR (CHAMP, made available recently), let AF know if Matrix cannot acquire it – BL will follow up with Chris Martin to see if we have access. Aerials available for 2016 and 2018 but are lower quality, Greeley will send best available aerial to Matrix.*
        4. *Development Boundaries – Delantero is only identified planned area, Greeley does not have additional shapefiles but AF will check for future developments.*
        5. *Oil and Gas* – Should be available from COCCD, Weld County, or Windsor (parcel data).
        6. City Boundary and Long term expected growth layer has been requested from Greeley GIS.
        7. *Existing trails layer available, but not many trails in this area. No future trails shapefile, only have master trail PDF.*
        8. *Shurview property is now dedicated open space, comprises South Basin and east part of Oklahoma Basin. AF believes it is shown in parcel data (Trust for Public Land).*
        9. *Expect GIS data in ~1 week. Matrix will wait to digitize non-available data until GIS data is received from Greeley.*
    iv. Stream field assessments
        1. *Matrix plans to use REMs to help identify areas to visit.*
        2. *Schedule – Will start REM soon. Matrix to send Greeley field access plans for stream assessments.*
3. Relative Elevation Modeling *Matrix only needs surface data, can start soon.*
4. Baseline Hydrology April 14-June 15
    i. June 15 - Draft Baseline Hydrology Report
        1. Review proposed report sections and structure *MS summarized review of MHFD vs Greeley Master Plan requirements. AF wants to use Greeley format as much as possible, BL suggested using Greeley format for introductory sections and keep each major milestone (Baseline Hydrology, Alternatives Analysis, Concept Design) as a self-contained section.*
        2. *AF said to plan for ~2 week turn around on comments*
    ii. July 6 – Final Hydrology Report
5. First stakeholder meeting in mid-end June

i. *Awareness of issues found, getting input from stakeholders. Will not have alternatives.*
ii. *AF to coordination communication plan with communication department.*

4. Other Questions/Requests/Ideas

5. Action Items – Prior to next meeting

CITY

- *Provide GIS layers*
- *Inform Matrix when structure survey can commence.*

MATRIX

- *Send meeting invite for May 5.*
- *Send stream assessment access plan to AF*
- *Acquire CHAMP 2018/2020 surface data from CWCB*
- *Review parcel data for Shurview property and oil/gas wells*

Masterplan Storm Drainage Conceptual Design Services - Oklahoma & South Basin
Progress Meeting Agenda
ZOOM Conference Call
May 5, 2022
11:00 AM to 12:00 PM

Key: *Meetings notes in green italics*, *action items indicated in underlined red italics*

1. Introductions

Andrew Fisher, Drew Beck, Ben Liu, Megan Sawyer

2. Previous Action Items

MATRIX

- *Send meeting invite for May 5* *Completed*
- *Send stream assessment access plan to AF* *Pending REM Model*
- *Acquire CHAMP 2018/2020 surface data from* *CWCB Completed*
- *Review parcel data for Shurview property and oil/gas wells*

  AF suggest pulling from COGCC – does Matrix have access?

CITY

- *Provide GIS Layers* *Completed*
- *Inform Matrix when structure survey can commence*

  Letters sent out Tuesday 5/3/22, owners have until Friday 5/13/22 to respond. AF thinks week of 16th is likely timeframe. AF will provide surveyors with a form to carry. BL asked if we can access Shurview property without restrictions for railroad crossings, AF said we need to ask City (not fully conveyed, but City has access control). *AF to coordinate directly with Natural Areas department.*

3. Schedule/Upcoming Activities

1. Review of CWCB vs. 2013 LiDAR

   MS proposed that use the 2013 LiDAR since the 2018 CWCB was similar but more jagged. Only notable differences are on private property outside of drainageways.
2. Relative Elevation Modeling timeline (week of May 9th)
   i. Discuss Hydraulic Models

   BL said REMs required flowlines and cross sections, asked if we intended to complete HEC-RAS models for these drainageways. AF said yes that was his expectations. DB explained different options (RAS, FlowMaster, SWMM, 2D). Group agreed on 1D RAS model w/o formal floodplain model, and Matrix would spend more time developing REM model cross sections to easily transition to 1D RAS Model.

   SWMM models will use trapezoidal (not irregular) cross sections with measured lengths.

3. Data Collection (Survey and Field Assessment)
   i. Structure survey/utility locate access
   ii. Stream assessment week of May 16th, pending access

   DB out of town week of May 16th, stream assessment will likely occur the following week. DB intends to be on site for stream assessment.

4. Baseline Hydrology April 14-June 15
   i. June 15 - Draft Baseline Hydrology Report
      1. Review proposed report sections and structure
   ii. July 6 – Final Hydrology Report
5. First stakeholder meeting in mid-end June

   AF reminded that Greeley's public outreach team should be involved, he is reaching out. DB mentioned that public feedback would hopefully reinforce the desired direction (open channels instead of pipes, etc.)

4. Other Questions/Requests/Ideas

- *DB brought up lessons learned from MHFD symposium; especially what Greeley wants to do differently from Sharkstooth Bluff. AF said Greeley likely does not have funds to pre-stabilize channel reaches. Team discussed possibility of quantifying cutoff for flows which would cause destabilization in current reaches, and quantifying needed regional infrastructure to calculate cost for development. AF said Greeley is open to possible solutions after hydrologic/hydraulic analysis.*
- *Should we meet with Greeley planners before digitizing Imagine Greely? AF will contact Community Development.*
- *BL asked if AF had date of aerial imagery provided – he did not but said the 2018 aerials looked browner. Matrix will investigate further.*
- *AF asked if June 15 deadline is still realistic, Matrix thought it could happen but a 1-2 week delay is more likely since we prefer to visit the field before finalizing the hydrology.*

5. Action Items – Prior to next meeting

Masterplan Storm Drainage Conceptual Design Services - Oklahoma & South Basin
Progress Meeting Notes
ZOOM Conference Call
May 18, 2022
9:00 AM to 10:00 AM

Key: *Meetings notes in green italics*, *action items indicated in underlined red italics*

1. Introductions

Andrew Fisher, Kallasandra Moran (Greeley)

Ben Liu, Megan Sawyer (Matrix)

2. Previous Action Items

MATRIX

- Send stream assessment access plan to AF *Pending REM. AF has already sent request for access to properties likely to be accessed for stream assessment.*
- Acquire and oil/gas well data from COGCC *acquired*
- Review aerials provided by city *Matrix provided aerials preferred*

CITY

- Provide Matrix with form to carry in field for survey and stream assessment.

  Access acquired for Shurview and Alexia, AF to coordinate with Justin

  7 properties have not responded.

  Can contact within the next week via phone to encourage to respond to letter. Can also provide with letter to bring on site.

  Do not approach Schmerge property without permission.

  Allow KM until Friday to contact, KM to notify AF of status, AF to notify Matrix.
- Coordinate with Natural Areas department about access to Shurview

3. Schedule/Upcoming Activities

1. Data Collection (Survey and Field Assessment)
   i. Utility locates complete
   ii. Matrix hydraulic structures field survey 5/16-5/18 with office analysis to follow
   iii. Stream assessment week of May 23rd, pending access
   Week of May 30th is preferred to give time to KM to coordinate access
2. Relative Elevation Modeling timeline (week of May 16th)
3. Baseline Hydrology April 14 – June 29
   i. Started delineations this week
   ii. June 29 - Draft Baseline Hydrology Report
   iii. July 20 – Final Hydrology Report
4. First stakeholder meeting in late June

4. Other Questions/Requests/Ideas

1. Aerial imagery (sample below)



   i. Unable to determine vintage (2018?) AF agreed that above image looks like 2018 aerials, has swaths at different resolution/vintage
   ii. Matrix can pull recent imagery from NearMap
2. Oil and Gas sites
   i. 157 sites within project area
   ii. 9 sites within 200 ft of proposed flowlines
   Matrix to check if abandoned
3. Land Use
   i. Digitized from Imagine Greeley

AF to send preliminary PUDs (Shurview and Delantero).
Another development on the south portion of the basin
West of 257 likely to see development, which is shown as open space in the Imagine Greeley plan. AF to follow-up with Development Review regarding future land use.

4. Progress Meetings: AF raised concerns of lengthening schedule and more progress meetings than planned. Group discussed holding meeting less frequently or limiting to 30 min in length.

5. Action Items – Prior to next meeting

AF and KM to acquire permission to access and communicate with Matrix

Matrix to evaluate budget and make recommendation for adjusting progress meetings

AF to communicate with Development Review about land use

Masterplan Storm Drainage Conceptual Design Services - Oklahoma & South Basin
Progress Meeting Notes
ZOOM Conference Call
June 1, 2022
10:00 AM to 11:00 AM

Key: *Green italicized text is meeting notes*, *red italicized underlined text is action items*.

6. Introductions *Andrew, Karen, James Redmond from Greeley. Drew, Ben, Megan from Matrix.*

1. Previous Action Items

MATRIX

- Evaluate budget and make recommendation for adjusting progress meetings
  Matrix will evaluate the need for each progress meeting (vs emails) on the Monday preceding each planned progress meeting. Most meetings will be virtual, with in-person meetings limited to collaborative sessions.

CITY

- Acquire permission to access and communicate with Matrix
  Andrew had focused letters near RR, will need more time to reach out to upstream parcels (next week not feasible. Drew said this stream assessment work is not holding up other work yet, but if we do not complete field work by mid-July it could affect alternatives analyses. Andrew agreed to July timeframe.
- Coordinate with Development Review about future land use
  Andrew sent Excel spreadsheet with available data (plus Imagine Greeley) today. Drew asked if we could use West Greeley as a typical future land use. Andrew said there was a push at City Council level towards denser development. Drew also asked if there is a required min open space % to be maintained. Andrew said yes check code.

2. Schedule/Upcoming Activities

1. Data Collection update
   i. Stream assessments week of June 3, 13, or 20 *Week of June 20 is earliest possible, target week of June 27.*
2. Relative Elevation Modeling update *Drew provided update of progress so far, intention to take more field measurements at reaches that are in decent condition and we wish to preserve, not go further with small, degraded tributaries. Andrew asked if South watershed is blending with Sharktooth watershed, Matrix said the separation seemed distinct.*
3. Baseline Hydrology April 14 – July 20
   i. Draft delineations complete (43 subbasins ranging from 4 ac to 212 ac)
   Andrew preferred to keep small basins next to RR, Drew mentioned grouping the small ones together for concept planning.
   ii. Discuss naming convention
   Matrix to review Windsor Report for established names (Anderson report). *Andrew mentioned they typically name waterways based on prominent landowner, Andrew will ask around at Greeley.* Drew asked about RFP requirement that Greeley be allowed to change/choose basin names. Andrew said this was a remnant from the Sharktooth Bluff study, and was not needed for this study.
   iii. June 29 - Draft Baseline Hydrology Report
   iv. July 20 – Final Hydrology Report

Ben proposed calculating a composite future land use instead of micro-dividing geographically, Matrix will develop a draft land use assumption for approval by Greeley.

4. First stakeholder meeting in late June? *Drew said first meeting is really an introduction, does not recommend getting into any numbers at this first meeting. Andrew said this might help facilitate parcel agreements (legitimize the project). James said avoid Tues, community preference is Wed or Thurs. He also said that if majority of stakeholders have professional interest in area, a day meeting may be preferred. Drew suggested June 29. James suggested reaching out to Community Development department to contact potential developers, letters would go out to landowners. James said they could create a stub to direct people, will look into whether they have Zoom account. Greeley will develop meeting notifications, Matrix will develop meeting slides by June 15. Andrew do reach out to management about type of property owners, which will determine if an AM or PM meeting.*

3. Other Questions/Requests/Ideas

1. Adjust progress meeting frequency/length? *See previous action items.*
2. Map Formats
   i. Interactive or multiple maps?*Andrew worried about size of interactive exhibit and having to flatten files for easier distribution, multiple maps could be more resilient.* *Andrew will ask Community Development and get back to Matrix with preference by June 15.*
   ii. Within report or appendices? *Andrew said follow Master Plan guidelines, or follow MHFD if no other guidance.*

4. Action Items – Prior to next meeting

See red text above.

Masterplan Storm Drainage Conceptual Design Services - Oklahoma & South Basin
Progress Meeting Notes
Teams Conference Call
June 24, 2022
9:00 AM to 10:00 AM

Key: *Green italicized text is meeting notes*, *red italicized underlined text is action items*.

5. Introductions *Andrew, April Tamburelli, James Redmond from Greeley. Drew, Ben from Matrix*

April introduced as Stormwater staff to lead next Masterplan

1. Previous Action Items

MATRIX

- Matrix to review Windsor Report for established names (Anderson report) Used numbers, do not need to replicate since the study scales are so different
- Matrix will develop public meeting slides by June 15 Completed

CITY

- Greeley to ask staff about watercourse names No new direction
- Greeley to ask Community Development about interactive exhibits Yes to interactive
- Greeley to create a website stub to direct people Has been setup, link included in owner invitations
- Greeley to look into whether they have Zoom account for hosting public meeting Andrew setup Zoom, will try to have practice run next Wed 9am
- Greeley will develop public meeting notifications Went out last week, been receiving responses.
- Greeley to reach out to management about type of property owners and determine meeting time Targeting developers and property owners that could be directly impacted (smaller group than normal), general public will be able to view presentation and ask questions later.

2. Schedule/Upcoming Activities

1. Data Collection update
   i. Stream assessments 1st or 2nd week of July
   ii. Discuss any remaining access issues
2. Baseline Hydrology April 14 – July 20
   i. CUHP and SWMM models setup
   ii. June 29 - Draft Baseline Hydrology Report
   iii. July 20 – Final Hydrology Report
3. First stakeholder meeting June 29 4pm-6pm
   i. Discuss format
      1. James says we should target ~15 min for recording. He can cut parts out of recording, but please give transitions 3 s pause to help with this
      2. Consider creating video loop for down time?
      3. Expecting few (less than 10) participants
      4. Drew suggested we set fixed number of presentation times (every half hour)
   ii. Discuss content (slides)
      1. Vicinity map highlight highways, zoom out
      2. Keep constraints/opportunities in study area map
      3. Discuss distinction between flood hazards vs nuisance issues (Same thing? Opposites? Simply scale?)
      4. April asked if we are prepared to discuss Cache la Poudre floodplain if asked, Andrew will handle
      5. Consider image/map for study phases slide
      6. Discussion on end product of Concept Design – Drew explained that this project ends at Concept. Matrix has also been trying to move away from showing detailed designs since past experience has shown that developers want to directly take these concepts and build off the shelf, or CIP projects have run into trouble by other departments (like Parks) objecting to what appears to be an advanced design.
      7. April asked if report would have discussion of how to handle variances from recommendations, Andrew said it would come later in this process (Alternatives Analysis). Sheep Draw was brought up as example, and Andrew noted that Sheep Draw has different detention requirements than rest of Greeley basins.
      8. Two photos used agreed to be appropriate
   iii. Discuss speakers
      1. Andrew will start: slides 1-3 and 8
      2. Matrix will take over at slide 4-7
   iv. Drew asked how we will record attendees; Andrew thinks Zoom will handle this
      1. Ben suggested having our intern act as a participant at dry run

3. Other Questions/Requests/Ideas

4. Action Items – Prior to next meeting

1. Andrew and Ben to prepare speeches for dry run next Wed 9am
2. Non-public meeting topics were deferred to next progress meeting (possibly during public meeting if there is downtime) due to time

Masterplan Storm Drainage Conceptual Design Services - Oklahoma & South Basin
Progress Meeting Notes
Teams Conference Call
July 20, 2022
8:30 AM to 9:30 AM

Key: *Green italicized text is meeting notes*, *red italicized underlined text is action items*.

1. Introductions
Andrew (Greeley), Drew, Ben (Matrix)

2. Previous Action Items
- Andrew and Ben to prepare speeches for public meeting — Completed

3. Schedule/Upcoming Activities
1. Data Collection update
   i. Stream assessments July 15: Reaches 100, 200, 500, 600, 800 — Ben summarized last Friday's field visit and the group reviewed some of the data (two teams, stream walks with observations and photos, culverts were measured but no survey-grade measurements were made). Field observations will be incorporated into the Alternatives Analysis section of the report.
   ii. Discuss whether Reach 300 and small culverts require additional visit — Group agreed that Matrix will go back out if Schmerge and Feilmeier grant access to Reach 300, but Greeley will not invest more effort in obtaining access. Small culverts/reaches along the railroad are not big enough to warrant an additional field day alone.
2. Baseline Hydrology: April – August
   i. July 20 - Draft Baseline Hydrology Report — Matrix to submit report ASAP. Ben noted that this draft will contain numerous blank sections since the Baseline Hydrology is the only first part of a larger report.
   ii. August 17 – Final Baseline Hydrology Report — Matrix would like to see Greeley's comments on the report format with the initial drafts.
3. First stakeholder meeting June 29 4pm-6pm
4. Alternatives Analysis: August – October — Baseline Hydrology is a month behind, but Matrix hopes to catch up to original schedule during Alternatives Analysis.

4. Other Questions/Requests/Ideas
1. Proposed eliminating next week's progress meeting, next meeting will be August 10

5. Action Items – Prior to next meeting
See red inline items above.

Masterplan Storm Drainage Conceptual Design Services - Oklahoma & South Basin
Progress Meeting Notes
Teams Conference Call
August 10, 2022
9:00 AM to 10:00 AM

Key: Green italicized text is meeting notes, red text is action items.

1. Introductions

Andrew, Brian (Greeley), Ben (Matrix)

2. Previous Action Items

- Matrix to submit Draft Baseline Hydrology Report ASAP — Done
- Greeley to provide comments on the report format with the initial drafts — Getting close
- Field observations will be incorporated into the Alternatives Analysis section of the report — In progress

3. Schedule/Upcoming Activities

1. Baseline Hydrology: April – August
    i. Jul 21 - Draft Baseline Hydrology Report
    ii. Aug 18 – Final Baseline Hydrology Report
        1. Discuss whether hydrology report revisions can be incorporated into Alternatives Analysis instead of separate submittal — Andrew said we can incorporate revisions into Alternatives Analysis
        2. Discuss existing crossing structures analysis — Ben summarized status of 18 existing crossing structures, said we do not have inverts for most but did not expect the culvert hydraulics to depend on pipe slope. Group discussed doing a bounds analysis but agreed that it wouldn't be necessary unless the culvert performance was very sensitive.
        3. Ben to check if Greeley sent official logo, Andrew to check preferred color/formatting
        4. Andrew questioned if Table 3-3 was necessary and why the total did not add up to 100%, Ben said it's a standard table (MHFD) and converting a 1-hr depth to a 2-hr hyetograph would not result in the exact same total precipitation.
        5. Andrew asked if we saw active (irrigated) agriculture in field, Ben said they only saw in Basin 800 but there could be more away from the study reaches. Andrew mentioned in other areas they were dealing with increased runoff from irrigated areas.
        6. Andrew asked if main Oklahoma Tributary was included in study, Ben said no. Hydrograph analyses of the main tributary are outside the current scope, but may be desirable if regional detention is recommended with this study.
        7. Andrew asked if we knew difference between COGCC "Abandoned" versus "Plugged and Abandoned", Matrix will look for more definitions.
2. Alternatives Analysis: August – October
    i. Sept 28 - Draft Alternatives Report
        1. Andrew said that he expects 1D HEC-RAS models for the study reaches. Matrix will do that but suggests excluding Reach 800 (due to no existing channel).
        2. Brian reminded that Director wants regional (instead of piecemeal) water quality facilities where possible.
    ii. Oct 26 – Final Alternatives Report — Early November (to incorporate public comments)
    iii. Discuss Second Public Meeting: Nov 2? — Perhaps October 26 or week before? Andrew will reach out to James and Greeley PR team.
3. Concept Design: November – December
    i. Nov 23 – Draft Concept Design Report
    ii. Dec 21 – Final Concept Design Report

4. Other Questions/Requests/Ideas

5. Action Items – Prior to next meeting

See red text above

Masterplan Storm Drainage Conceptual Design Services - Oklahoma & South Basin
Progress Meeting Notes
Teams Conference Call
September 7, 2022
9:00 AM to 10:00 AM

Key: Green italicized text is meeting notes, red text is action items.

1. Introductions

Andrew, Karen (Greeley) Ben, Drew (Matrix)

2. Previous Action Items

- Matrix to check if Greeley sent official logo — Matrix did not receive official logo, but downloaded an image from the website
- Greeley to confirm preferred logo color/formatting — Logo used looks appropriate
- Matrix will look for more COGCC "Abandoned" definitions — AL means the well was never drilled (permit was abandoned), will exclude from exhibit
- Andrew will reach out to James and Greeley PR team — Pending

3. Schedule/Upcoming Activities

1. Baseline Hydrology: April – September
    i. Draft Baseline Hydrology Report Select Comment Discussion:
        1. Add additional public engagement sections to Chapter 2? — Identify/document key themes and priorities from our public meetings
        2. Many drainageways have likely experienced instability? — Change text to discuss risks or local instabilities
        3. Tri-Pointe/Promontory metro district? — Greeley will check with community development to confirm or deny. Matrix provided statewide database link: https://data.colorado.gov/Local-Aggregation/Metro-Districts-in-Colorado/knbf-ggf2
        4. Shur View acreage? — Andrew says news reports 975 acres, add to our text
        5. Did we study upstream reaches of 100 and 140? — No, excluded upstream reaches with contributing area < 130 ac
        6. Add CGOCC standard definitions? — Yes, see above

AL	ABANDONED LOCATION: PERMIT VACATED; PER OPERATOR: WELL HAS NOT BEEN SPUD.

2. Alternatives Analysis: August – November — discuss project schedule
    i. Sept 28 - Draft Alternatives Report — Could push one week if needed
        1. Discuss what this will include — Ben said many of the alternatives will be hydrologic (detention) options, could have upstream detention to keep stable flows for downstream channels, or could separate WQ/EURV distributed basins from larger, 100-yr regional detention basins. Andrew would like us to discuss both options in text. Karen says Greeley management team is leaning towards regional solutions (not confident in HOAs maintaining facilities) but wary of the additional cost. Karen said it would be desirable to see cost comparison of both options. Greeley is wrestling with private vs public definition. Drew presented an alternatives screening matrix that MHFD uses and suggested that we modify it for Greeley's needs. He briefly discussed each of the criteria: constructability, maintenance, implementation with planned improvements, regional trail connectivity, multi-uses, water quality, public safety, habitat and environment, aesthetics, criteria compliance, agency acceptance, public acceptance. Drew suggests that we add more technical criteria to help differentiate. Andrew requested that Matrix send the example to Greeley and they will provide guidance/comments.
        Karen mentioned that their water quality department recently drafted a water efficiency document. Drew agreed and said that slowing water down/infiltration could be an additional category. Karen will send document to Andrew.
        2. Discuss types of expected alternatives — Drew proposed that we consider 5 types of alternatives:
            a. Do nothing
            b. Traditional detention
            c. Distributed WQ/EURV and peak shaving detention
            d. Natural/open channels
            e. Storm drains and culverts
                i. Do we want to set a threshold (like 130 ac) where piped flows are allowed? Andrew was concerned that developers were taking advantage of vague definitions in Sharkstooth.

        Andrew said they just released new street criteria. Drew said we anticipate looking at 100-yr capacity culverts for this planning document.

    ii. Oct 26 – Second Public Meeting?
    iii. Nov 9 – Final Alternatives Report — Matrix documents recommended plan at this submittal
    iv. Will Greeley authorize a Selected Plan? — Yes
3. Concept Design: November – January
    i. Dec 14 – Draft Concept Design Report
    ii. Jan 18 – Final Concept Design Report

Group agreed that project running through January was realistic and acceptable.

4. Other Questions/Requests/Ideas

Drew referenced the 2060 Greeley Comprehensive Plan and how it preserved a very large region (the downstream fingers of each reach) within this project area, was this realistic? Andrew will look at this and provide additional guidance.

Drew asked for more lessons learned from previous drainage master plans. Andrew said Greeley had trouble enforcing the documented best practices/intent (e.g., developers wanted to put excessive flows in the streets, which was technically meeting criteria). Says we should incorporate Community Development department as a stakeholder to get buyoff. Drew suggested we could provide more performance-based requirements, specifically for the open channel alternatives.

5. Action Items – Prior to next meeting

See red text above

Masterplan Storm Drainage Conceptual Design Services - Oklahoma & South Basin
Progress Meeting Notes
Teams Conference Call
September 28, 2022
9:00 AM to 10:00 AM

Key: Green italicized text is meeting notes, red text is action items.

1. Introductions

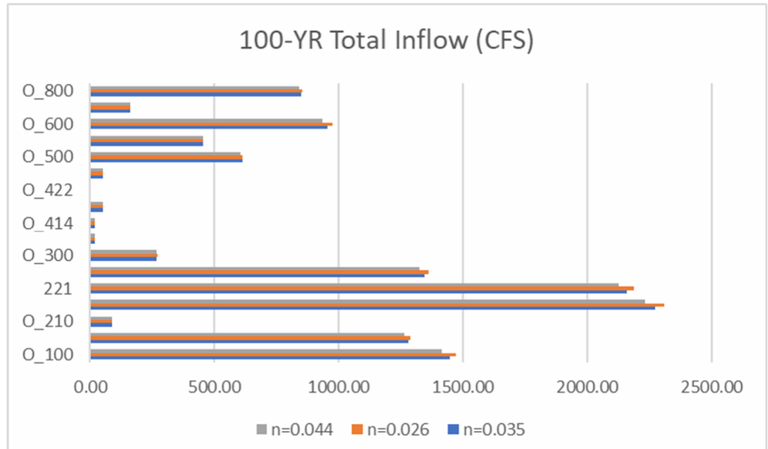
Andrew (Greeley), Ben (Matrix)

2. Previous Action Items

- Andrew will reach out to James and Greeley PR team re: public meeting Pending
- Matrix to send alternatives screening matrix example to Greeley Completed
- Greeley to provide comments/revisions of alternatives screening matrix Greeley getting feedback from new hire (Brian Fischer), hopes to send it tomorrow
- Karen to send water efficiency document to Andrew Pending, received but no file access yet
- Greeley will check with community development to confirm Tri-Pointe/Promontory metro district Development Review confirmed that it is a metro district
- Andrew to confirm whether we should use preservation areas shown in 2060 Greeley Comprehensive Andrew will confirm, Matrix to continue using

3. Schedule/Upcoming Activities

1. Baseline Hydrology: April – September
2. Alternatives Analysis: August – November
    i. Oct 5 - Draft Alternatives Report New target is Oct 7
        1. Discuss types of alternatives
            a. Do nothing
            b. Detention
            Ben proposed using single detention option to simplify options since simple detention vs WQ+peak shaving detention results in very similar numbers/scoring, can explore different kinds of detention in Concept Design
            c. Channel Improvements Ben noted their channel improvement options were coming out pretty wide due to limiting velocity < 5 ft/s with simple trapezoidal shapes, Andrew expressed hope that more complicated channel shapes/profiles could be explored in the future.
            d. LID/Green Infrastructure? Yes, Greeley is interested. Matrix will incorporate LID alternatives using CUHP
            e. Storm drains (outside of crossings)? Andrew asked if storm drains would be needed anywhere to address channel stability/steepness issues, Ben didn't think there were clearcut existing locations like that. Will talk about this option in report.
        2. Discuss desired report tables Plan to have summary tables only in report, appendix will have more complicated tables
        3. Discuss desired alternatives maps Andrew thinks pdf hyperlinks isolating each alternative type would be good
        4. Discuss sensitivity analysis Ben suggested keeping n=0.035 for hydrology and hydraulic models (increasing roughness values by 25% results in Q100 increasing by up to 2% and Volume100 decreasing by <1%), Andrew agreed.



    ii. Oct 26 – Second Public Meeting? Andrew will verify date and whether it will be online
    iii. Nov 9 – Final Alternatives Report
3. Concept Design: November – January
    i. Dec 14 – Draft Concept Design Report
    ii. Jan 18 – Final Concept Design Report

4. Other Questions/Requests/Ideas

Agreed to cancel Oct 7 progress meeting, next one will be Oct 19.

Ben asked if Andrew received email notification when he added agenda to Outlook invite, Andrew said no and requested a separate email with agenda moving forward.

5. Action Items – Prior to next meeting

See red text above

Masterplan Storm Drainage Conceptual Design Services - Oklahoma & South Basin
Progress Meeting Notes
Teams Conference Call
October 19, 2022
9:00 AM to 10:00 AM

Key: Green italicized text is meeting notes, red text is action items.

1. Introductions

Drew Beck, Ben Liu (Matrix), Andrew Fisher (Greeley)

2. Previous Action Items

- Andrew will reach out to James and Greeley PR team re: public meeting They met this week, best to move public meeting to Nov 9 (4-6pm)
- Greeley to provide comments/revisions of alternatives screening matrix Greeley had preliminary discussion, still needs to refine weighting, will send to Matrix by Oct 28
- Karen to send water efficiency document to Andrew Received, not relevant
- Matrix to incorporate LID alternatives into report Completed

3. Schedule/Upcoming Activities

1. Baseline Hydrology: April – September Completed
2. Alternatives Analysis: August – November
   i. Oct 7 - Draft Alternatives Report Submitted Oct 12, expect comments by Nov 2
      1. Discuss review Nothing major so far, wanted more clarification on who will be responsible for costs (developer vs City). DB said Colorado Springs looks at drainage costs for the whole watershed, then distributes that burden based on area or some other metric. AF said City had momentum to transfer regional drainage maintenance responsibilities to City but it is uncertain at this point. Sharkstooth example has seen many constructed channels in very poor condition. DB mentioned that distributed approach like LID may have less risk since it doesn't rely on an HOA to properly maintain facilities.
      2. Discuss screening matrix and recommendations
   ii. Oct 26 – Second Public Meeting? Nov 9, Greeley to send out meeting notifications/invites
      1. Discuss presenters AF = introduction and screening matrix, BL = alternatives categories, analysis and exhibits
      2. Discuss content Discussed whether to show screening matrix. Consider showing matrix and asking for public's opinion for weightings – DB has used a tool called Menti to collect responses, will research if tool can also be used after meeting. Matrix will prepare draft presentation by Nov 1.
   iii. Nov 9 – Final Alternatives Report Nov 16
3. Concept Design: November – January
   DB mentioned that concept design usually involves a lot of design/drafting, but this rural existing setting may not require as much. AF said that he can review efficiently over holidays, but other staff may not be responsive during that time.
   i. Dec 14 – Draft Concept Design Report
   ii. Jan 18 – Final Concept Design Report

4. Other Questions/Requests/Ideas

5. Action Items – Prior to next meeting

See red text above

Masterplan Storm Drainage Conceptual Design Services - Oklahoma & South Basin
Progress Meeting Notes
Teams Conference Call
November 9, 2022
9:00 AM to 10:00 AM

Key: Green italicized text is meeting notes, red text is action items.

1. Introductions

Drew Beck, Ben Liu (Matrix), Andrew Fisher (Greeley)

2. Previous Action Items

- Greeley to send public meeting invites Completed
- Greeley to provide comments/revisions of alternatives screening matrix Sent to Matrix Nov 8
- Greeley to provide comments on Draft Alternatives Report Sent to Matrix Nov 8
- Matrix will research if Menti tool can also be used after Zoom meeting Only useful live, would need separate method to collect comments outside of the presentation
- Matrix will prepare draft presentation Sent to Greeley Nov 1

3. Schedule/Upcoming Activities

1. Baseline Hydrology: April – September Completed
2. Alternatives Analysis: August – November
   i. Oct 7 - Draft Alternatives Report
      1. Discuss review comments Minor comments, Matrix will address
      2. Discuss screening matrix and recommendations
         a. Drop agency acceptance (Greeley is only stakeholder)
         b. Drop public acceptance
         c. Andrew said he was trying to reduce # of scoring criteria
         d. Andrew wants to keep standards compliance criteria
         e. Condense 3 (planned improvements, trail connectivity, multiuse facility) to multi-objective criteria
         f. Matrix will produce blank screening template for Greeley approval
   ii. Oct 26 – Second Public Meeting: Nov 16
      1. Discuss content
         a. Add photos of typical feature, highlight detention
         b. Add LID slide (with photo)
         c. Add engineered channel photo
         d. Add blank scoring matrix (no weightings)
            i. Allow public feedback/scoring of alternatives
            ii. Andrew to check how to operate polls/private feedback
         e. Matrix to send updated PowerPoint by Nov 15
   iii. Nov 9 – Final Alternatives Report: Nov 23?
      1. Matrix will score alternatives after public meeting, send to Greeley for feedback before next report submittal
3. Concept Design: December – January
   i. Dec 23 – Draft Concept Design Report
   ii. Jan 27 – Final Concept Design Report

4. Other Questions/Requests/Ideas

5. Action Items – Prior to next meeting

See red text above

Masterplan Storm Drainage Conceptual Design Services -
Oklahoma & South Basin
Progress Meeting Notes
Teams Conference Call
December 14, 2022
9:00 AM to 10:00 AM

Key: Green italicized text is meeting notes, red text is action items.

1. Introductions

Andrew Fisher (Greeley), Ben Liu (Matrix)

2. Previous Action Items

- Matrix will produce blank screening template for Greeley approval Completed
- Andrew to check how to operate polls/private feedback Completed
- Matrix to send updated PowerPoint by Nov 15 Completed
- Matrix will score alternatives after public meeting, send to Greeley Completed

3. Schedule/Upcoming Activities

1. Baseline Hydrology: April – September Completed
2. Alternatives Analysis: August – December Completed
    i. Oct 26 – Second Public Meeting: Nov 16
        1. Discuss feedback No public comments
    ii. Nov 9 – Final Alternatives Report: Submitted Dec 9
        1. Discuss review comments Pending, Greeley will respond by Dec 30
        2. Discuss recommended plan
            a. Reviewed scoring Matrix and discussed sensitivity analysis (which categories did specific options always score highest), since scores are very close Andrew will meet with Greeley decision makers regarding LID vs regional detention preferences
            b. Matrix will proceed with Regional Detention for Drainageways 2 and 6
3. Concept Design: December – February
    i. Jan 18 – Draft Concept Design Report Schedule looks ok so far, will revisit in January
        1. Discuss any changes from alternatives analysis
            a. Will not show pipe designs
            b. Concept will show full composite typical section (profiles not required)
            c. Prepare a single rough grading sheet for detention basins
            d. LID prepare list of potential options
    ii. Feb 22 – Final Concept Design Report

4. Other Questions/Requests/Ideas

5. Action Items – Prior to next meeting

See red text above

Masterplan Storm Drainage Conceptual Design Services - Oklahoma & South Basin
Progress Meeting Notes
Teams Conference Call
January 11, 2023
9:00 AM to 10:00 AM

Key: Green italicized text is meeting notes, red text is action items.

1. Introductions

Andrew Fisher, Brian Hathaway (Greeley), Ben Liu, Drew Beck (Matrix)

2. Previous Action Items

- Andrew will meet with Greeley decision makers regarding LID vs regional detention preferences Completed, Greeley prefers LID everywhere except Reach 244 (Delantero)
- Greeley will provide Final Alternatives Analysis comments by Dec 30 Pending
- Matrix will proceed with Regional Detention for Drainageways 2 and 6 Proceeded, will have to revisit Drainageway 2

3. Schedule/Upcoming Activities

1. Baseline Hydrology: April – September Completed
2. Alternatives Analysis: August – December Completed
    i. Nov 9 – Final Alternatives Report: Submitted Dec 9
        1. Discuss review comments Andrew would check
        2. Discuss recommended plan
            a. Select regional detention for Reach 244 LID everywhere else
            b. Other changes Drainageway 6 should also utilize LID
            c. Greeley will provide a formal selected plan letter. Does not have to be overly formal, or even have a signature.
3. Concept Design: December – Mar
    i. Feb 8 – Draft Concept Design Report
        1. Discuss any changes from alternatives analysis
            a. Will not show pipe designs
            b. Concept will show full composite typical section (profiles not required)
            c. Prepare a single rough grading sheet for detention basins
            d. LID prepare list of potential options
            e. Greeley would appreciate clear LID guidelines (since it is new), asked if we could do a training/familiarization effort for city staff
                i. Drew mentioned that MHFD Vol 3 has some good performance criteria that we should utilize (spreadsheet-based checks).
                ii. Drew also said that SWMM has LID capabilities; we could require more detailed SWMM models to prove the LID performance. Group talked about scale to require SWMM, for example Delantero (280 ac) did not complete a SWMM model. Andrew said he's only seen one SWMM model included for development.
            f. Brian mentioned design standards required for standard MS4 compliance, suggested that we prioritize control measures that could meet MS4 requirements. Drew thought this would involve a treatment train approach, LID can provide a volume reduction but would not eliminate the need for other BMPs.
            g. Drew asked what a helpful concept design for LID would look like. Andrew said we should not get site specific with recommendations. Brian brought up a treatment train. Drew suggested laying out potential components (but not spatially). Matrix will involve our Ecological Services group (ecologists, environmental scientists, landscape architect) to help flesh out the more artistic/holistic side of these recommendations.
    ii. Mar 8 – Final Concept Design Report

4. Other Questions/Requests/Ideas

5. Action Items – Prior to next meeting

See red text above

Masterplan Storm Drainage Conceptual Design Services - Oklahoma & South Basin
LID Concepts Meeting Notes
Teams Conference Call
January 23, 2023

1. Previous Discussions

1. Draft Concept Design Report due Feb 8
2. Greeley selected LID for all drainageways except Reach 244
    i. We modeled the runoff reduction by setting DCIA = 1 in CUHP
3. Greeley would appreciate clear LID guidelines (since it is new), asked if we could do a training/familiarization effort for city staff.
4. Start with MHFD Vol 3 (has some good performance criteria) (spreadsheet-based checks).
5. Greeley prefers that we prioritize control measures that could meet MS4 requirements. Drew thought this would involve a treatment train approach, LID can provide a volume reduction but would not eliminate the need for other BMPs.
6. Recommendations from *Determination of Runoff Reduction Method Equations (UIA to RPA) based on Multivariable SWMM Analysis LID Concept Discussion* (MHFD, 2018)
    i. Area < 1 ac, Slopes < 10%, UIA: RPA <= 3:1
    ii. Regression equation
    $$Q = C_0 + C_1(0.95 - P_2) + C_2(Area) + C_3(L{:}W) + C_4(Slope) + C_5(UIA/Area) + C_6(UIA$$
7. Josh mentioned MHFD web-based plans (Enginuity). Also stressed impact of high frequency storms (Marcy Gulch example) – we should strive for full spectrum approach

LID Concept Discussion

7. What should the report include?
    a. Text?
    b. Charts/Tables?
    c. Maps?
    d. Graphics/Sketches?
8. Who will produce these products?
9. Should we require the use of native soils?
10. Could we limit turf grass (reduce urban drool)?
11. WWE (Jane Cleary) part of group studied long-term maintenance costs
12. Drew drew some example lot layouts – can we require buffers or pervious areas around each impervious source? We should create a Hierarchal flowchart:
    a. Infiltration rate
    b. Land use
    c. Can we incentivize lot by lot approach (vs with fee reductions?
13. PERFORMANCE CRITERIA:
    a. Can we normalize a volume reduction per watershed?
    b. Target impervious: pervious ratios
    c. Infiltration based options
14. Place constraints on end of pipe (e.g. 3’ max depth), shape/form
15. Advocate pollinators
16. What are the tools available and which landuses do they apply to?
    a. Look at combinations and min/max scenarios

Masterplan Storm Drainage Conceptual Design Services - Oklahoma & South Basin
Progress Meeting Notes
Teams Conference Call
February 1, 2023
11:00 AM to 12:00 PM

Key: Green italicized text is meeting notes, red text is action items.

1. Introductions

Andrew Fisher, Greeley
Ben Liu, Megan Sawyer, Drew Beck, Matrix

2. Previous Action Items

- Greeley will provide a formal selected plan letter Pending resolutions of Alternatives update
- Matrix will involve Ecological Services group to flesh out the more artistic/holistic side of LID recommendations Started

3. Schedule/Upcoming Activities

1. Baseline Hydrology: April – September Completed
2. Alternatives Analysis: August – December Completed
    i. Nov 9 – Final Alternatives Report: Submitted Dec 9
1. Discuss review comments No anticipated additional review comments from Greeley.
2. Discuss recommended plan
    a. Greeley selected LID everywhere except regional detention for Reach 244
    b. Discuss corrections to the LID hydrologic results (see attached charts)
    c. Review sample alternative plan for Drainageway 500
    Example Drainageway 500 – Provide sub-regional EURV.
    4. Developers can do multiple, distributed EURV ponds
    5. Treatment train – LID upstream, reduce WQCV by 40%.
    6. Provides partial detention of Q100
    7. For larger, more complex drainageways, we may need peak shaving facility

    Andrew: Are any of these regional ponds >130 acres? Triggers ownership questions. Ben: No, subbasins delineated are <130 acres.
    Drew: Say in MDP, intent is sub-regional detention, not regional.

    Ben: MHFD ignores private EURV Ponds for hydrology. Drew: That's for mapped floodplain reasons. This area does not have mapped floodplain/floodway, and downstream flows will still be in the same channels. For channel design purposes, flow reduction caused by EURV ponds will exist and we want to consider actual outflow.

    Andrew: Greeley needs to know which basins would be considered privately maintained. Drew: Greeley would only be responsible for regional peak-shaving facilities. Noted that maintenance requirements for peak shaving ponds should be much less than full spectrum ponds.

    Andrew: If EURV basins are nested within the peak shaving ponds, this would be City Maintained. Need to note in policy language of MDP. Ben: Does Greeley want to establish a maintenance program for these facilities w/ cost-sharing? Andrew: Unsure, policy is in flux.

    Megan: What flow regime do we want to design to? Drew: We can increase up to what the existing channel can handle, but for MDP consideration, keep below existing flow rates. Ben: We believe LID is underestimated with our calculations tools. In future if calculations improve and LID can be better quantified by developer, that can be utilized to reduce their needed detention.
    a. Discuss what new evaluation/decision is required
    Andrew: significant change, have we re-ranked the Matrix? Not yet.
    Andrew: What is confidence for this approach? Need to discuss with board but want firmer information on approach. Drew: Unsure, Basins 100 and 200 are more complicated with different concerns on stream stability. These reaches may have different approaches. Ben: We can provide more information next week.
2. Concept Design: December – Mar
    i. Feb 8 – Draft Concept Design Report will need to extend schedule.
        1. Discuss any changes from alternatives analysis
            a. Will not show pipe designs
            b. Concept will show full composite typical section (profiles not required)
            c. Prepare a single rough grading sheet for detention basins
            d. LID prepare list of potential components and performance criteria
            Examples of LID-conscious layout ideas (see attached charts)
            Andrew: Have colors be consistent, choose colors other than red/green
            Ben: We would appreciate review of LID concepts, will likely be an iterative process. Matrix to update concept LID layouts with revision.
    ii. Mar 8 – Final Concept Design Report

8. Other Questions/Requests/Ideas

9. Action Items – Prior to next meeting

Matrix to prepare concept feasibility for new LID/Sub-regional EURV ponds for all reaches.

Masterplan Storm Drainage Conceptual Design Services - Oklahoma & South Basin
Progress Meeting Notes
Teams Conference Call
February 1, 2023
11:00 AM to 12:00 PM

Key: Green italicized text is meeting notes, red text is action items.

1. Introductions

Andrew Fisher, Greeley
Ben Liu, Megan Sawyer, Drew Beck, Matrix

2. Previous Action Items

- Greeley will provide a formal selected plan letter Pending resolutions of Alternatives update
- Matrix will involve Ecological Services group to flesh out the more artistic/holistic side of LID recommendations Started

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    4. Developers can do multiple, distributed EURV ponds
    5. Treatment train – LID upstream, reduce WQCV by 40%.
    6. Provides partial detention of Q100
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    Ben: MHFD ignores private EURV Ponds for hydrology. Drew: That's for mapped floodplain reasons. This area does not have mapped floodplain/floodway, and downstream flows will still be in the same channels. For channel design purposes, flow reduction caused by EURV ponds will exist and we want to consider actual outflow.

    Andrew: Greeley needs to know which basins would be considered privately maintained. Drew: Greeley would only be responsible for regional peak-shaving facilities. Noted that maintenance requirements for peak shaving ponds should be much less than full spectrum ponds.

    Andrew: If EURV basins are nested within the peak shaving ponds, this would be City Maintained. Need to note in policy language of MDP. Ben: Does Greeley want to establish a maintenance program for these facilities w/ cost-sharing? Andrew: Unsure, policy is in flux.

    Megan: What flow regime do we want to design to? Drew: We can increase up to what the existing channel can handle, but for MDP consideration, keep below existing flow rates. Ben: We believe LID is underestimated with our calculations tools. In future if calculations improve and LID can be better quantified by developer, that can be utilized to reduce their needed detention.
    a. Discuss what new evaluation/decision is required
    Andrew: significant change, have we re-ranked the Matrix? Not yet.
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            Andrew: Have colors be consistent, choose colors other than red/green
            Ben: We would appreciate review of LID concepts, will likely be an iterative process. Matrix to update concept LID layouts with revision.
    ii. Mar 8 – Final Concept Design Report

8. Other Questions/Requests/Ideas

9. Action Items – Prior to next meeting

Matrix to prepare concept feasibility for new LID/Sub-regional EURV ponds for all reaches.

KICK-OFF MEETING NOTES
Greeley Comprehensive Drainage Plan Oklahoma Basins 700-800
January 31, 2024 at 8am
Teams Meeting

Attendees:

Bhooshan Karnik	City of Greeley	970-573-0331	bhooshan.karnik@greeleygov.com
Aaron Stines	City of Greeley	970-302-0461	aaron.stines@greeleygov.com
Ryan Davis	Bolton & Menk	515-988-8013	ryan.davis@bolton-menk.com
Ben Liu	Matrix Design Group	303-572-0200	ben.liu@matrixdesigngroup.com
Drew Beck	Matrix Design Group	303-572-0200	drew.beck@matrixdesigngroup.com

Key: blue text indicates meeting notes, *red italic underlined text indicates action items*

1. Introductions
- a. Roles
  - i. Bhooshan = Greeley Deputy Director/Chief Engineer, PM of interchange project
  - ii. Aaron = Greeley PM for this study
  - iii. Ryan = Bolton Menk PM for interchange project
    1. ICON is BM stormwater consultant (Craig Jacobsen)
    2. Don Sterna is design manager for BM project
  - iv. Ben = Matrix PM for this study
  - v. Drew = Matrix Director of Water Resources
- b. Contact Information (see above)

2. Contract Status
- a. Matrix will be subconsultant to Bolton & Menk
  - i. *Ryan will send sub-agreement to Greeley today* (under Task 8)
  - ii. *Ryan to send Matrix terms and conditions of sub agreement*
    1. Greeley terms will also apply
  - iii. Probably will be another week before contract is signed
  - iv. Matrix will send invoices directly to Ryan Davis
- b. Initial proposal submitted to Greeley November 2, 2023
- c. Notice to Proceed received December 19, 2023
- d. Revised proposal submitted to Bolton & Menk January 9, 2024

3. Project Purpose
- a. Sponsor goals and objectives
  - i. Greeley wants to see accurate crossing sizings based on future developments
  - ii. Greeley wants to see regional storm approach instead of driven by individual developers, piecemeal approach in other areas has resulted in more flow/sediment than expected at downstream components
- b. How this ties into other projects
  - i. US34/CR17 intersection project going on now, may turn into interchange in ~20 yrs
  - ii. Already in discussions with Delantero/Roache developments, they seem open to regional drainage approach. Delantero would like their plans approved this summer with construction in late 2024, Roache would like to start in 2025
- c. Include Town of Windsor and/or Weld County?
  - i. Windsor is trying to do drainage study (Wilson & Company, Dan Evans) of WCR-17 crossing – *Ben to reach out, Aaron to send contacts*
  - ii. Windsor and Weld County are not sponsors/formal stakeholders
  - iii. Greeley long-range area extends to WCR-17

4. Project Schedule

Drainageways 700/800 Schedule		2024						
TASK		Jan	Feb	Mar	Apr	May	Jun	Jul
1	PROJECT MANAGEMENT & COORDINATION							
2	PROGRESS MEETINGS							
5	DATA COLLECTION							
6	BASELINE HYDROLOGY AND HYDRAULICS							
	Greeley Review							
7	ALTERNATIVES ANALYSIS: DWYS 700/800							
	Greeley Review							
8	CONCEPTUAL DESIGN REPORT: DWYS 700/800							
	Greeley Review							
	Final Deliverable							

- a. Who will review and can they be done in 2 weeks?
  - i. Aaron will review and can complete reviews in less than 2 weeks
  - ii. Submittals should go through Bolton Menk
  - iii. Suggest scheduling meeting with Delantero/Roache after Alternatives Analysis
- b. *Aaron will get back to us on parcel access timeline*
- c. Group accepted above schedule as appropriate
  - i. Ben noted that we are currently one week behind due to lengthy contracting process, Matrix cannot submit deliverable until contract is enacted

5. Project Deliverables
- a. Parcel access maps submitted to Greeley November 30, 2023
- b. Draft land use maps submitted to Greeley January 25, 2024
  - i. Aaron says they look reasonable, and also conform to Windsor plans
- c. Project Status
  - i. Ben provided update on hydrology progress
  - ii. Initial modeling expected to be complete this week
- d. Future deliverables:
  - i. Baseline Hydrology Report
  - ii. Alternatives Analysis Report
  - iii. Conceptual Design Report
- e. Each deliverable report will build on the last

6. Data Gathering

a. Site survey access
   i. We already have access to any property that touches US-34, ¼ mi south and 1/2 mi north that touch WCR-17 (*Ryan will send their access map*)
b. Are utility locates desired? Not needed for this study
c. Known existing studies:
   i. Imagine Greeley Comprehensive Plan (2018)
   ii. Windsor Master Drainage Plan (2003)
   iii. Windsor Comprehensive Plan (2016)
      1. Windsor is in middle of updating, draft expected in a week
      2. Our study area is unlikely to change
   iv. Windsor Open Space and Trails Strategic Plan (2022)
   v. Weld County Property Portal (online)
   vi. Delantero preliminary drainage report
d. Other sources?

7. Additional Topics

a. Copy Ryan on all emails, can also copy Bhooshan

WINDSOR/GREELEY COORDINATION MEETING NOTES
Greeley Comprehensive Drainage Plan Oklahoma Basins 700-800
February 12, 2024 at 10am
Teams Meeting

Attendees:

Dan Evans	Wilson & Company	Daniel.Evans@wilsonco.com
Aaron Stines	City of Greeley	aaron.stines@greeleygov.com
Ryan Davis	Bolton & Menk	ryan.davis@bolton-menk.com
Ben Liu	Matrix Design Group	ben.liu@matrixdesigngroup.com
Doug Roth	Town of Windsor	droth@windsorgov.com

- Anderson did an analysis/report on this area last July (focus was on WCR-17 crossing)
- During reviews, Doug identified different routing from 2003 Windsor MDP
  - Potential overtopping at WCR-17
  - This triggered Dan's involvement to update Master Plan model
- Windsor needs WCR-17 concept crossing cost estimates by June/July
  - Wilson will have updated models in Mar/Apr
  - They are primarily interested in the upstream part of watershed
- New Windsor comprehensive plan coming out, Doug posted draft link: https://plan.konveio.com/draft-town-windsor-comprehensive-plan
- Aaron confirmed that Greeley is looking to update hydrology for the full Oklahoma Basin
  - CDOT should be involved in SH-257 discussion
- Which detention ponds should be modeled in hydrology/master plan?
  - Ben said their conservative practice was to only count regional or public-maintained facilities
  - Dan says Ft Collins followed FEMA requirements (ponds modeled as full)
  - Doug says maintenance agreements for developer ponds are required, should result in better conditions

Matrix will send Oklahoma Basins 700 & 800 hydrology to Wilson

US 34/WCR 17 Progress Mtg May 23, 2024

- City is using Western States (Kerri Allison, kallison@ws-ls.net) for any field access
- Pinyon likely to perform wetland delineation (2-4 mo approval process)
-

Oklahoma Master Basin Study
Project Kickoff Meeting Agenda
Teams Conference Call
October 16, 2024
3:30 to 4:30 PM

Key: *blue italic text indicates meeting notes*, *red italic underlined text indicates action items*

1. Introductions and Contacts

1. City of Greeley (City)
    i. Project Manager – Aaron Stines
    ii. Stormwater Manager – Karen Reynolds
    iii. Stormwater Engineer – Florencio Guzman Diaz
2. Consultant – Matrix Design Group
    i. Principal in Charge – Drew Beck (not present)
    ii. Project Manager – Ben Liu
    iii. Project Engineer – Sabastian Ortega
    iv. GIS Lead – Chris Martin
3. Other Stakeholders
    i. Windsor?
    ii. Loveland?
    iii. Weld County?

    For this project, **Windsor** should be the only necessary neighbor to contact. Karen will confirm with Greeley before Matrix reaches out.

2. Project Priorities/Goals

1. Why are we doing this?
    i. Greeley is experiencing rapid growth, particularly in its western regions.
    ii. It is essential to establish storm preparedness recommendations prior to the approval of new developments.
    iii. Comprehensive understanding of regional drainage patterns is crucial, particularly at major intersections like US-34. This knowledge enables effective coordination of stormwater management systems across different areas, ensuring seamless integration and optimal performance of drainage infrastructure throughout Greeley.
2. What outcomes will signify a successful project?
    i. Greeley would like the concept design recommendations to be delivered as GIS deliverables by the end of the project.
    ii. Providing Low Impact Development (LID) recommendations and regional detention opportunities are priorities.
3. Should we change anything from previous two Oklahoma studies?
    i. Greeley appreciates the previous recommendations and would like Matrix to continue delivering similar results as seen in the last two reports.
4. Draft goals:
    i. Coordinate with adopted and draft Master Plans
    ii. Stabilize drainageways
    iii. Reduce flood losses
    iv. Improve Water Quality
        1. A WQ Roadmap (probably RESPEC/Otak) is being created and may require coordination.

3. Schedule and Deliverables

1. Monthly meetings sufficient?
    i. Yes –preference is Wednesday 3:30 PM or Monday afternoon with Aaron Stines and Florencio Guzman.
2. Will City turn around reviews in 2 weeks?
    i. Yes.
3. Current Schedule (deemed acceptable):
    i. Data Collection (including Field Assessment): Nov 2024
    ii. Baseline Hydrology: Dec 2024
        1. Draft Baseline Hydrology Report (Only the new portion of the watershed)
    iii. Alternative Analysis: Mar 2025
        1. Draft Alternatives Report (Only the new portion of the watershed)
        2. Public Meeting (timing TBD)
    iv. Concept Design: May 2025
        1. Draft Concept Design Report (entire watershed)
        2. Final Concept Design Report (entire watershed)
        3. Final Data Delivery (entire watershed)
    v. Karen/Aaron will check with Bhooshan if Lind negotiations require a different schedule

4. Data Collection

1. Documents already collected from previous Oklahoma studies:

Source	Title	Delivered
Anderson Consulting Engineers (2003)	Town of Windsor Comprehensive Drainage Plan (Oklahoma/South included)	LINK
City of Greeley	GIS Online Maps.	LINK
City of Greeley	2060 Comprehensive Plan	LINK
City of Greeley (2022)	2022 Draft Comprehensive Transportation Plan documents	
City of Greeley (2021)	Master Plan Procedures/Preparations Guide	LINK
City of Greeley, Colorado, Public Works (2015)	Design Criteria and Construction Specifications, Volume I (Streets)	LINK
City of Greeley, Colorado, Public Works (2008)	Design Criteria and Construction Specifications, Volume II (Stormwater)	LINK
City of Greeley, Colorado, Public Works (2008)	Design Criteria and Construction Specifications, Volume III (Water/Sewer)	LINK
City of Greeley, Colorado, Public Works (2011)	2035 Comprehensive Transportation Plan	LINK
Colorado Department of Transportation (2019)	Standard Specifications for Road and Bridge Construction.	LINK
Design Workshop (2016)	City of Greeley Parks, Trails and Open Lands Master Plan	LINK
Mile High Flood District (2021)	Urban Storm Drainage Criteria Manual	LINK
U.S. Federal Highway Administration (2009)	Hydraulic Engineering Circular No. 22, Urban Drainage Design Manual, 3rd Ed.	LINK
U.S. Department of Agriculture Natural Resources Conservation Service (2013)	Web Soil Survey	LINK

2. New known documents that need to be included:
    i. New Greeley stormwater criteria
    ii. Windsor comprehensive plan/future land use plan
    iii. Greeley streets may be redoing criteria
    iv. Master development drainage plans (pending Greeley approval)
3. Topography
    i. Matrix has 2013 contours (high resolution) that cover entire study area (700/800 used these)
        1. Raindance development does not appear to match contours
    ii. Matrix has 2018 contours that cover parts of study area (GOS used these)
    iii. Windsor has 2023 DEM that covers most of study area (northern portion)
    iv. Aaron prefers to maintain cohesiveness from previous reports. We will be keeping the contours in the first two reports the same as before but will stitch them together with a newer contours where it makes sense.
4. Existing and Future Land Use
5. Field Efforts Update
    i. PTEs mostly collected, Aaron will send Matrix the spreadsheet
    ii. Greeley will follow-up with new Real Estate Management lead to confirm whether properties who did not respond can be accessed
    iii. Plan to visit field end of Oct

5. Baseline Hydrology

1. Do we need to match neighboring major basin boundaries? No, we should make them accurate where possible.
2. Exclude downstream (of GWR or SH-257) area? Greeley to ask Bhooshan
3. Subbasin area target is 100 ac Agreed
4. Routing
    i. Include any existing detention? No unless publicly maintained regional facilities
    ii. Assume wet ponds/reservoirs will be full (ignore detention impacts)? Yes
    iii. Ignore irrigation canals? Yes
5. Major drainageways 900, 1100, 1200, 1300 are mostly poorly defined

6. Other topics

Oklahoma Master Basin Study
Progress Meeting Agenda
Teams Conference Call
December 4, 2024
3:00 to 4:00 PM

Key: *blue italic text indicates meeting notes*, *red italic underlined text indicates action items*

1. Attendance

1. City of Greeley (City): Aaron Stines, Mary Mateo, Florencio Guzman Diaz
2. Matrix Design Group (Matrix): Ben Liu, Sabastian Ortega

2. Previous action items

1. Karen will confirm with Greeley before Matrix reaches out to Windsor COMPLETED
2. Karen/Aaron will check with Bhooshan if Lind negotiations require an advanced schedule COMPLETED
3. Aaron will send Matrix the PTEs spreadsheet COMPLETED
4. Greeley will follow-up with new Real Estate Management lead to confirm whether properties who did not respond can be accessed COMPLETED
5. Greeley to ask Bhooshan if this study can exclude downstream of GWR or SH-257 COMPLETED, this study will end at SH-257

3. Progress since last meeting

1. Field Data Collection
    i. COMPLETED NOV 2024
2. Working on Baseline Hydrology
    i. Plan to submit draft Dec 2024

4. Discussion Topics

1. Switch to include entire Oklahoma study area in all reports
    Greeley agreed
2. Potential existing regional detention locations
    i. 1140 include as regional detention
    ii. 1232/Raindance lake Matrix to research storm function/intent and make recommendation for this waterbody
    iii. Inadvertent detention upstream of WCR-17 do not include in routing
    iv. Research detention in basin 1148 and then decide if it will be included.
3. How to model Oklahoma Reservoir
    i. *Consider modeling as sink Matrix to research intent and designed overflows for this waterbody then make recommendation*
4. Overview of proposed study reaches
    i. *Greeley did not object to proposed study reach extents*

5. Other topics

Oklahoma Master Basin Study
Progress Meeting Notes
Teams Conference Call
February 5, 2025
3:00 to 4:00 PM

Key: *blue italic text indicates meeting notes*, *red italic underlined text indicates action items*

1. Attendance

1. City of Greeley (City): Aaron Stines, Florencio Guzman Diaz
2. Matrix Design Group (Matrix): Ben Liu, Sabastian Ortega

2. Previous action items

1. Matrix to submit draft Baseline Hydrology Dec 2024
   COMPLETED

2. Matrix to research 1232/Raindance lake storm function/intent and make recommendation
   Could not find design documentation, recommend leaving it out of Baseline Hydrology

3. Matrix to research 1148 detention and decide if it will be included
   Found design information in South Hill Drainage Report, but could not verify ownership or maintenance agreements so recommend leaving it out of Baseline Hydrology

4. Matrix to research Oklahoma Reservoir intent and designed overflows and make recommendations

   Could not find design documentation, recommend leaving it out of Baseline Hydrology

3. Progress since last meeting

1. Draft Baseline Hydrology completed Jan 2025
   Received Greeley comments will finish corrections and move on to alternative analysis.

2. Switched to include the entire Oklahoma study area in reports/figures

4. Discussion Topics

1. Baseline Hydrology Comments
   - *i.* Confirm that study ends at SH-257
     We will show the major basin boundary to River in addition to our study area.

   - ii. Information on Cascadia or other near-term developments
     Aaron will send more information on Cascadia developments, and we will include a paragraph in the GOM report.

   - *iii.* Riparian zones map
     Matrix will eliminate unnecessary background colors (Keep it black and white) while just showing the colors of the wetlands and riparian.

2. Expectations for alternatives analysis
   - i. Examine similar improvement options (detention, channel, and LID) as GOS/GO *Greeley agrees with same approach, and would appreciate identifying any significant regional ponds to consider*

   - ii. Reach by reach discussion
     1. Oklahoma mainstem
        LID may have to piggyback on recommendations from tributaries, we will primarily look at detention and channel improvements

     2. 900
        Consider all 3 options
        -Channel Improvements
        -Detention
        -LID

     3. 1100
        Plan to utilize/formalize existing detention where possible and identify need channel, LID may not be the highest scoring alternative

     4. 1200
        Continue exploring the function of new lake, look for most opportunities in downstream 1216 and 1200

     5. 1300
        Continue exploring function of Oklahoma Reservoir, look for most opportunities in middle reach 1340

5. Other topics

1. *Schedule target for alternatives analysis is end of March, Matrix will report to team at next progress meeting if we are on track for that optimistic timeline*

Oklahoma Master Basin Study
Progress Meeting Notes
Teams Conference Call
April 2, 2025
3:00 to 4:00 PM

Key: *blue italic text indicates meeting notes*, *red italic underlined text indicates action items*

1. Attendance

1. City of Greeley (City): *Aaron Stines, Florencio Guzman Diaz*
2. Matrix Design Group (Matrix): *Ben Liu, Sabastian Ortega, Ryan DeGroot*

2. Previous action items

1. Aaron will send more information on Cascadia developments *Complete*
2. Matrix will finish corrections based on Baseline Hydrology comments *Ongoing*

3. Schedule

1. Still working on Alternatives Analysis
2. New target deliverable at end of April

4. Discussion Topics

1. Major crossings review
   - i. Requested additional information from Windsor
   - ii. 1001 (mainstem @ SH-257)
     1. Need bridge dimensions Aaron will check records at City Hall, Matrix will request information from CDOT
   - iii. 1002 (mainstem @ GWR) *No records available, will proceed with field measurements*
   - iv. 1003 (mainstem @ WCR-17)
     1. Windsor/Wilson recommended (2)10'x'10' RCBC, and may raise roadway by 7' to improve sag sight distances

        Aaron will ask public works if they have an opinion on this crossing
   - v. 601 (600 @ WCR-17)
     1. Did not find this crossing in field, suggest rerouting north *Agreed*
   - vi. 1201 (detention basin W of WCR-17)
     1. Recent Cascadia development redirected major drainageway

        Greeley agreed with following Windsor direction on this drainageway reroute, noted that they have a lot of sediment load in other NW areas (Poudre River development)
   - *vii.* 1005 (mainstem @ WCR-60) *Matrix was unable to access in field, will proceed with estimates* Greeley agreed with this approach
   - viii. Many recently constructed crossings within Windsor were designed for 100-yr event, should we reevaluate? *Not needed for new structures outside Greeley jurisdiction*
2. Any (other) locations of importance for Greeley? *No*
3. Public meeting? *Aaron doesn't think it's needed since most of this study is outside Greeley, but he will check with Karen*

5. Other topics

Oklahoma Master Basin Study
Progress Meeting Agenda
Teams Conference Call
May 21, 2025
3:00 to 4:00 PM

Key: *blue italic text indicates meeting notes*, *red italic underlined text indicates action items*

1. Attendance

1. City of Greeley (City): *Aaron Stines, Florencio Guzman Diaz*
2. Matrix Design Group (Matrix): *Ben Liu, Sabastian Ortega*

2. Previous action items

1. SH-257 bridge: Aaron will check records at City Hall *Complete (none available)*
2. SH-257 bridge: Matrix will request information from CDOT *Ongoing (none available yet)*
   Try again CORA request, Aaron will send link
3. WCR-17 culvert: Aaron will ask public works if they have an opinion on this crossing *Complete (Greeley does not have opinion but wants to know if cost sharing would be requested)*
4. Public meeting: Aaron will check with Karen *Complete (not needed)*

3. Schedule

1. Alternatives Analysis submitted May 19
2. Next step: Greeley to choose Selected Plan
3. Target concept design deliverable in July *Confirmed*
4. Next progress meeting July 2? *No, Aaron needed to end this meeting early. Will resume at scheduled June 4 meeting.*

4. Discussion Topics

1. GOM unique considerations:
   i. ALTS we provided single recommendation per reach. GO provided more detailed (by link) alternatives/concepts.
   ii. DETENTION modeled existing detention facilities in both Options 2 and 4
      1. 1100: Four local to regional basins, recently constructed
      2. 1200: One regional basin, in construction
      3. 1300: One regional basin, historic (Oklahoma Reservoir)
   iii. CHANNELS encountered multiple reaches where corridor width was restricted, so proposed grade control improvements. GOS/GO only features corridor widening solutions.
   iv. CROSSINGS mainstem structures near the LREGA
      1. SH-257 requires a bridge, existing span sufficient in Options 2/4
      2. GWR probably requires a bridge (unless raising RR profile is possible). Does this crossing need to have a 100-year structure?
      3. WCR-17 found single 12'x10' RCBC sufficient for Options 2/4, should we propose to match Windsor recommended dual 10'x10' RCBC?
   v. LID recognized that it will be very difficult to enact comprehensive LID practices in Major Basin 1100, and also difficult in Major Basin 1200. Note that 1000 Option 4 relies on upstream peak reductions.
   vi. COSTS
      1. GOM updated cost data index to 2025 and land acquisition estimate to ~$20,000/ac (based on recently sold land in study area). GOS/GO used 2022 cost data index and ~11,000/ac acquisition cost. Should we update GOS/GO costs to match 2025 data?
      2. GOR grade control (drop structures) reaches are more expensive than simply widening corridors
      3. GOR has significant proposed detention. We did not include capital costs for existing flood control detention but did include O&M costs.

5. Other topics

Oklahoma Master Basin Study
Progress Meeting Notes
Teams Conference Call
June 4, 2025
3:00 to 4:00 PM

Key: *blue italic text indicates meeting notes*, *red italic underlined text indicates action items*

1. Attendance

1. City of Greeley (City): *Aaron Stines, Florencio Guzman Diaz*
2. Matrix Design Group (Matrix): *Ben Liu, Sabastian Ortega*

2. Previous action items

1. SH-257 bridge: Aaron will check records at City Hall *Complete (none available)*
   SH-257 bridge: Matrix will request information from CDOT *Ongoing (CORA request made, no response yet)*
2. WCR-17 culvert: Aaron will ask public works if they have an opinion on this crossing *Complete (Greeley does not have opinion but wants to know if cost sharing would be requested)*
3. Public meeting: Aaron will check with Karen *Complete (not needed)*

3. Schedule

1. Alternatives Analysis submitted May 19 *Comments received June 3*
2. Next step: Greeley to choose Selected Plan *Greeley will send email*
3. Target concept design deliverable in July *Confirmed*

4. Discussion Topics

1. Alternatives Analysis Comments:
   i. Downstream of US-34 markups? *Cardinal Direction will be used instead*
   ii. Tbl 3-27 Alts Eval Matrix reweight categories? *Will Keep original weights*
   iii. Fig 2-64 acceptable to add minor structure clarification to Section 2.3.2? *Yes*
   iv. Fig 2-65 acceptable to keep existing page format?
   Yes, possible leader line fixes
   v. Are there new Greeley boundaries (for recent annexations) available?
   Greeley will search and send a shapefile or geodatabase
   vi. Tbl 3-6 acceptable to keep % imperviousness values?
   Yes, will continue using original values and note in the report.
   vii. Can Greeley provide the latest Delantero drainage report(s)?
   Greeley will send latest/approved drainage report(s)
2. GOM unique considerations:
   i. ALTS we provided single recommendation per reach. GO provided more detailed (by link) alternatives/concepts. *Agree*
   ii. DETENTION modeled existing detention facilities in both Options 2 and 4
      1. 1100: Four local to regional basins, recently constructed
      2. 1200: One regional basin, in construction
      3. 1300: One regional basin, historic (Oklahoma Reservoir)
   iii. CHANNELS encountered multiple reaches where corridor width was restricted, so proposed grade control improvements. GOS/GO only features corridor widening solutions.*Agree*
   iv. CROSSINGS mainstem structures near the LREGA
      1. SH-257 requires a bridge, existing span sufficient in Options 2/4
      2. GWR probably requires a bridge (unless raising RR profile is possible). Does this crossing need to have a 100-year structure?
      3. WCR-17 found single 12'x10' RCBC sufficient for Options 2/4, should we propose to match Windsor recommended dual 10'x10' RCBC?
      Match more conservative Windsor sizing for Concept Design, and add additional text why.
   v. LID recognized that it will be very difficult to enact comprehensive LID practices in Major Basin 1100, and also difficult in Major Basin 1200. Note that 1000 Option 4 relies on upstream peak reductions. *Agree*
   vi. COSTS
      1. GOM updated cost data index to 2025 and land acquisition estimate to ~$20,000/ac (based on recently sold land in study area). GOS/GO used 2022 cost data index and ~11,000/ac acquisition cost. Should we update GOS/GO costs to match 2025 data?
      Greeley would like the GO/GOS concept costs updated
      2. GOR grade control (drop structures) reaches are more expensive than simply widening corridors *Agree*
      3. GOR has significant proposed detention. We did not include capital costs for existing flood control detention but did include O&M costs.
      Will modify costs to exclude O&M costs for existing detention

5. Other topics

Matrix will adjust downstream end of Reach 600 to stay East of WCR-17 (and update figures)

Oklahoma Master Basin Study
Progress Meeting Agenda
Greeley Public Works
August 27, 2025
3:00 to 4:00 PM

Key: *blue italic text indicates meeting notes*, *red italic underlined text indicates action items*

1. Attendance

1. City of Greeley (City): *Aaron Stines, Florencio Guzman Diaz*
2. Matrix Design Group (Matrix): *Ben Liu*

2. Previous action items

1. Greeley will send email with Selected Plan *Complete*
2. Greeley will send current Greeley boundaries shapefile/geodatabase *Complete*
3. Greeley will send latest/approved Delantero drainage report(s) *Complete*
4. Matrix will adjust downstream end of Reach 600 to stay East of WCR-17 *Complete*

3. Schedule

1. Concept Design Draft submitted Jul 31
2. Greeley comments received Aug 20
3. Target final deliverables: *November. Matrix will package electronic files with final report pdf*

4. Discussion Topics

1. Concept Design Comments:
    i. (Table 3-20) Values do not appear to match the HY-8 output in Appendix E-3 for GOR culverts *Matrix will investigate and correct*

5. Budget Status/Remaining Work

		Effort	Contract	% Spent
Task 1	PM	$9,083.00	$10,980.00	83%
Task 2	Prog Mtg	$1,930.00	$11,290.00	17%
Task 3	Pub Mtg	$0.00	$6,100.00	0%
Task 4	City Coun	$0.00	$4,280.00	0%
Task 5	Data	$27,987.50	$29,440.00	95%
Task 6	Hydrology	$72,547.50	$69,845.00	104%
Task 7	Alts	$90,365.00	$85,585.00	106%
Task 8	Concept	$47,938.00	$61,855.00	78%
TOTAL		**$249,851.00**	**$279,375.00**	**89%**

1. Will Greeley need City Council session support? *No (Aaron will confirm with Karen)*
2. Will Greeley need any hardcopies? *No*
3. Which electronic files does Greeley need? *Complete*
    i. Baseline Hydrology, ~~*Alternatives*~~, Concept/Master Plan
        a. CUHP models *Yes*
        b. SWMM models *Yes*
        c. HY-8 models *No*
        d. Detention workbooks *No*
        e. Cost estimate workbooks *Yes*
        f. Field photos *Yes (geodatabase and kmzs only)*
    ii. GIS files
        a. Geodatabases *Yes (include Alternatives)*
        b. Map files (most are in ArcMap format) *No*
4. Any other remaining deliverables? *No*

6. Lessons learned

1. *In retrospect, it would have been easier (and cheaper) to do the entire basin at once*
2. *Aaron noticed notable improvements in Matrix deliverables over time*
3. *In retrospect, we went into too much detail with GO*
4. *It would have been nice to include Windsor more formally as stakeholder/sponsor*

7. Other topics

1. *Greeley used to own land west to I-25*
2. *Efforts to make Poudre River corridor more natural (including reintroducing sinuosity)*
3. *ICON doing master plan for No. 3 Ditch (tends to intercept and spill storm flows)*

City of Greeley Comprehensive Drainage Plan
OKLAHOMA & SOUTH BASINS

Public Meeting: June 29, 2022

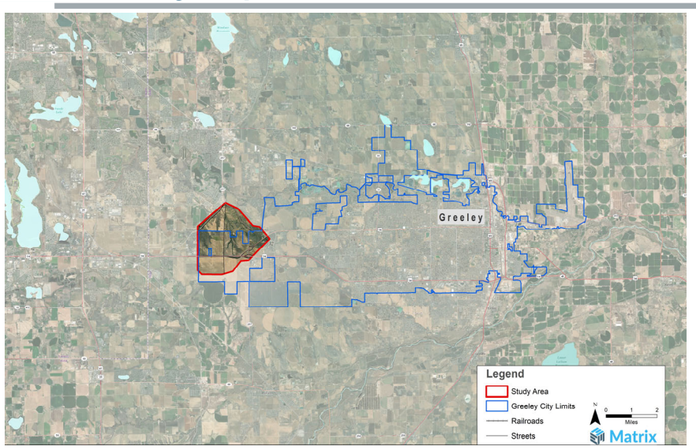


1

Vicinity Map

June 29, 2022

Comprehensive Drainage Plan
OKLAHOMA & SOUTH BASINS



City of Greeley
Colorado

Matrix

2

Study Purpose

June 29, 2022

Comprehensive Drainage Plan
OKLAHOMA & SOUTH BASINS

- **Goals:**
  - Identify major flood and drainage hazards
  - Stabilize drainageways for future runoff
  - Minimize flood hazards for future development
  - Improve water quality and reduce sedimentation
- **NOT included:**
  - Construct improvements
  - Annexation or rezoning
  - Revise the Cache la Poudre River floodplain
  - Address localized nuisance stormwater issues

City of Greeley
Colorado

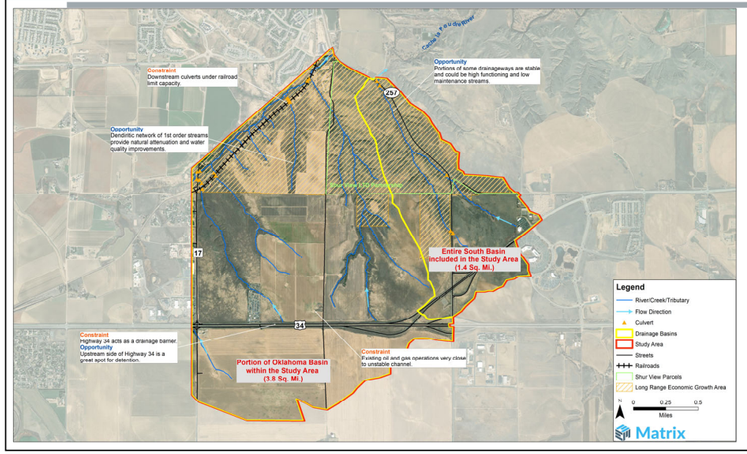
Matrix

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Overview of Study Area

June 29, 2022

Comprehensive Drainage Plan
OKLAHOMA & SOUTH BASINS



City of Greeley
Colorado

Matrix

4

Study Phase 2: Alternatives Analysis

June 29, 2022

Comprehensive Drainage Plan
OKLAHOMA & SOUTH BASINS

- **Identify problems**
- **Develop alternatives**
  - Status Quo
  - Floodplain Preservation
  - Conveyance Improvement
  - Crossing Improvement
  - Channel Stabilization
  - Regional Detention
  - Water Quality
- **Evaluate**
  - Cost
  - Constructability
  - Maintenance
  - Environmental Impact
  - Multiuse Opportunities
  - Public Opinion



City of Greeley Colorado

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6

Study Phases

June 29, 2022

Comprehensive Drainage Plan
OKLAHOMA & SOUTH BASINS

1. **Data Collection**
2. **Baseline Hydrology**
3. **Alternatives Analysis**
4. **Concept Design**



City of Greeley Colorado

Matrix

5

Schedule 2022

June 29, 2022

Comprehensive Drainage Plan
OKLAHOMA & SOUTH BASINS

1. **Data Collection**	**April – July**
▪ Public Meeting #1	June 29
2. **Baseline Hydrology**	**May – July**
3. **Alternatives Analysis**	**July – October**
▪ Public Meeting #2	Late October
4. **Concept Design**	**November – December**

City of Greeley Colorado

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8

Study Phases

June 29, 2022

Comprehensive Drainage Plan
OKLAHOMA & SOUTH BASINS

1. **Data Collection**
2. **Baseline Hydrology**
3. **Alternatives Analysis**
4. **Concept Design**



City of Greeley Colorado

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7

Contact Information and Q & A

June 29, 2022

Comprehensive Drainage Plan
OKLAHOMA & SOUTH BASINS

- **Project Website**
  - https://greeleygov.com/services/pw/projects/oklahoma-basin-drainage-plan
- **Greeley Project Manager**
  - Andrew Fisher andrew.fisher@greeleygov.com
- **Matrix Project Manager**
  - Drew Beck drew.beck@matrixdesigngroup.com
- **Questions and Comments?**

City of Greeley

Matrix

9

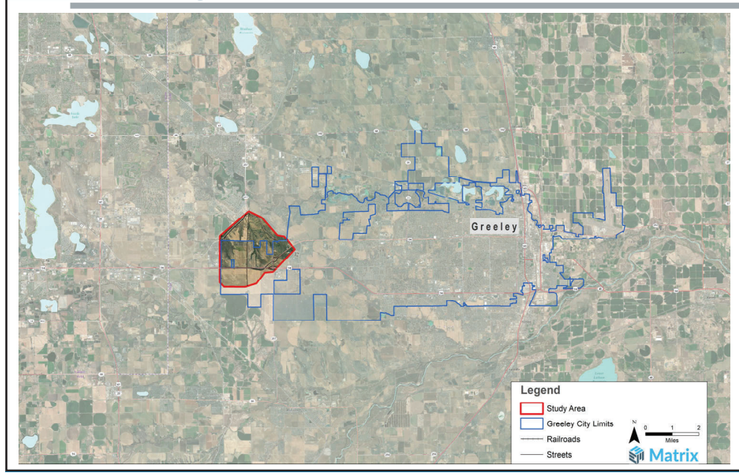
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1

Vicinity Map

November 16, 2022
Comprehensive Drainage Plan OKLAHOMA & SOUTH BASINS



City of Greeley Colorado
Matrix

2

2

Study Purpose

November 16, 2022
Comprehensive Drainage Plan OKLAHOMA & SOUTH BASINS

- **Goals:**
  - Identify major flood and drainage hazards
  - Stabilize drainageways for future runoff
  - Minimize flood hazards for future development
  - Improve water quality and reduce sedimentation
- **NOT included:**
  - Construct improvements
  - Annexation or rezoning
  - Revise the Cache la Poudre River floodplain
  - Address localized nuisance stormwater issues

City of Greeley Colorado
Matrix

3

3

Study Phases & Schedule

November 16, 2022
Comprehensive Drainage Plan OKLAHOMA & SOUTH BASINS

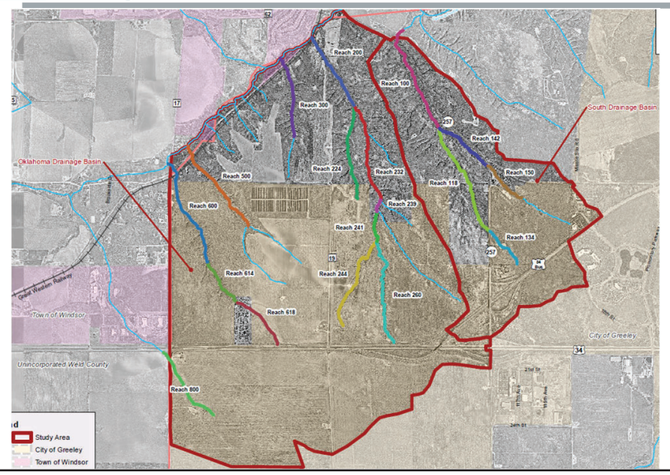
1. Data Collection	**April – July 2022**
▪ Public Meeting #1	June 29
2. Baseline Hydrology	**May – September 2022**
3. Alternatives Analysis	**August – November 2022**
▪ Public Meeting #2	November 16
4. Concept Design	**November – January 2023**

City of Greeley Colorado
Matrix

4

4

Study Reaches



November 16, 2022
Comprehensive Drainage Plan
OKLAHOMA & SOUTH BASINS

5

5

Major Drainageway 100





November 16, 2022
Comprehensive Drainage Plan
OKLAHOMA & SOUTH BASINS

6

6

Major Drainageway 200







November 16, 2022
Comprehensive Drainage Plan
OKLAHOMA & SOUTH BASINS

7

7

Major Drainageway 500





November 16, 2022
Comprehensive Drainage Plan
OKLAHOMA & SOUTH BASINS

8

8

Major Drainageway 600

November 16, 2022

Comprehensive Drainage Plan
OKLAHOMA & SOUTH BASINS





City of Greeley Colorado

Matrix

9

9

Major Drainageway 800

November 16, 2022

Comprehensive Drainage Plan
OKLAHOMA & SOUTH BASINS





City of Greeley Colorado

Matrix

10

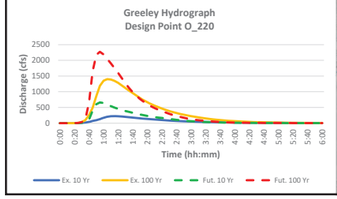
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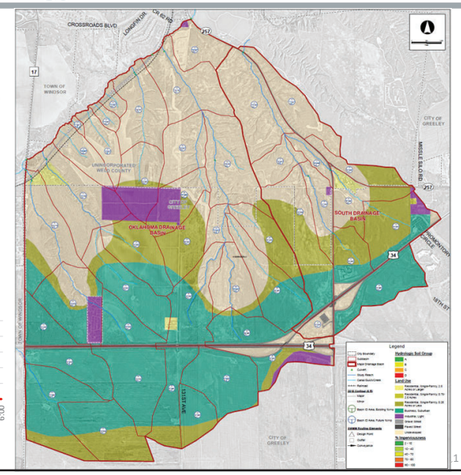
Baseline Hydrology

November 16, 2022

Comprehensive Drainage Plan
OKLAHOMA & SOUTH BASINS

- Delineation: 46 subbasins
- Landuse: existing & future
- Storm events: six
- Calculate: peak flows
- Calculate: peak volumes





City of Greeley Colorado

Matrix

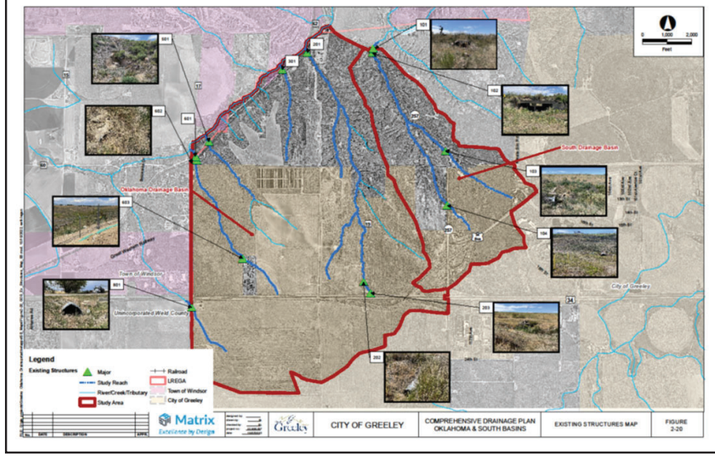
11

11

Crossing Structures

November 16, 2022

Comprehensive Drainage Plan
OKLAHOMA & SOUTH BASINS



- 13 crossings
- Existing capacity
- Future sizing

City of Greeley Colorado

Matrix

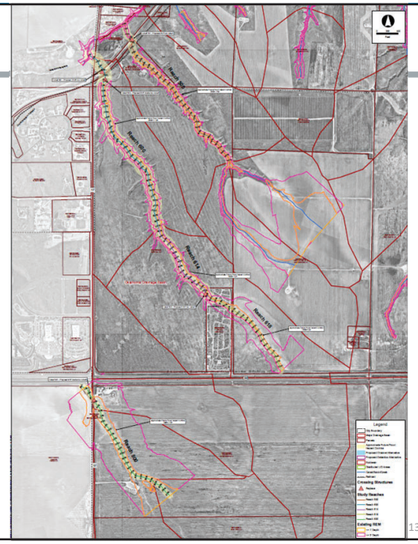
12

12

Alts Analysis

- **Type of Alternatives:**
  - Do Nothing
  - Detention
  - Channel Improvements
  - LID





November 16, 2022

Comprehensive Drainage Plan
OKLAHOMA & SOUTH BASINS

City of Greeley Colorado

Matrix

13

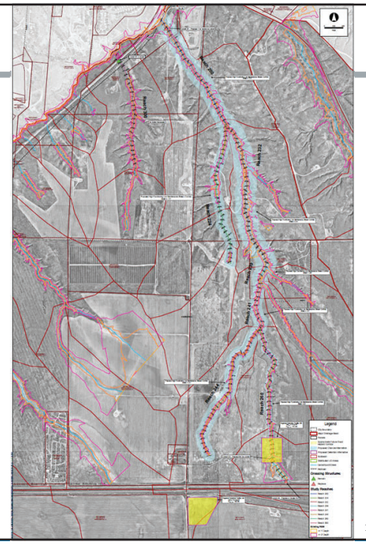
13

Alts Analysis

- **Type of Alternatives:**
  - Do Nothing
  - Detention
  - Channel Improvements
  - LID

Photo from MHFD Urban Storm Drainage Criteria Manual





November 16, 2022

Comprehensive Drainage Plan
OKLAHOMA & SOUTH BASINS

City of Greeley Colorado

Matrix

14

14

Alts Analysis

- **Type of Alternatives:**
  - Do Nothing
  - Detention
  - Channel Improvements
  - LID

Photos from MHFD Urban Storm Drainage Criteria Manual





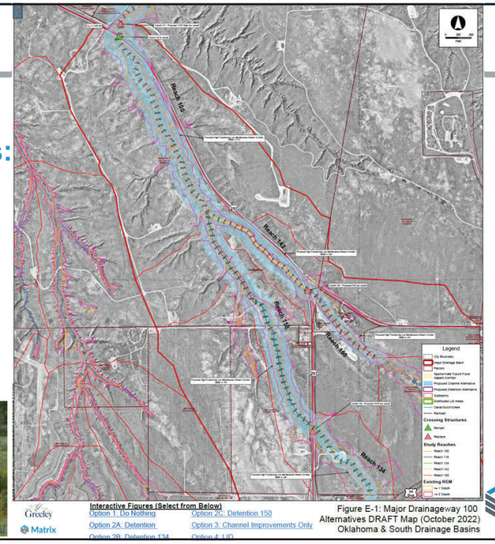


Figure E-1: Major Drainageway 100 Alternatives DRAFT Map (October 2022)
Oklahoma & South Drainage Basins

November 16, 2022

Comprehensive Drainage Plan
OKLAHOMA & SOUTH BASINS

City of Greeley Colorado

Matrix

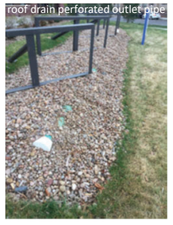
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15

Alts Analysis

- **Type of Alternatives:**
  - Do Nothing
  - Detention
  - Channel Improvements
  - LID (Low Impact Development)

Photos from MHFD Urban Storm Drainage Criteria Manual









November 16, 2022

Comprehensive Drainage Plan
OKLAHOMA & SOUTH BASINS

City of Greeley Colorado

Matrix

16

16

Alternatives Analysis

November 16, 2022
Comprehensive Drainage Plan
OKLAHOMA & SOUTH BASINS

Major Drainageway	Alternative	Constructability	Maintenance	Meets Multiple Objectives	Water Quality	Public Safety	Habitat and Environment	Aesthetics	Criteria Compliance	TOTAL WEIGHTED AVERAGE
		Weighting								Score
100	Option 1: Do Nothing									0.00
	Option 2: Detention									0.00
	Option 3: Channel Improvements									0.00
	Option 4: Distributed LID									0.00
200	Option 1: Do Nothing									0.00
	Option 2: Detention									0.00
	Option 3: Channel Improvements									0.00
	Option 4: Distributed LID									0.00
500	Option 1: Do Nothing									0.00
	Option 2: Detention									0.00
	Option 3: Channel Improvements									0.00
	Option 4: Distributed LID									0.00
600	Option 1: Do Nothing									0.00
	Option 2: Detention									0.00
	Option 3: Channel Improvements									0.00
	Option 4: Distributed LID									0.00
800	Option 1: Do Nothing									0.00
	Option 2: Detention									0.00
	Option 3: Channel Improvements									0.00
	Option 4: Distributed LID									0.00
		Scoring:	0 - no opportunity		1 - minimal opportunity		2 - average opportunity		3 - high opportunity	

Submit your feedback here: https://forms.gle/soBkqfWCXvAbF1eH6

17

17

Contact Information and Q & A

November 16, 2022
Comprehensive Drainage Plan
OKLAHOMA & SOUTH BASINS

- **Project Website**
  - https://greeleygov.com/services/pw/projects/oklahoma-basin-drainage-plan
- **Greeley Project Manager**
  - Andrew Fisher andrew.fisher@greeleygov.com
- **Matrix Project Personnel**
  - Drew Beck drew.beck@matrixdesigngroup.com
  - Ben Liu ben.liu@matrixdesigngroup.com
- **Questions and Comments?**

18

18

Shading indicates PTE status
(as of 2022-07-11)
Blue = Approved access
Yellow = Pending access
Red = No response or access prohibited

257 BEND LLC
HERMANNS FAMILY HOLDINGS CORPORATION
LEWIS JEFFREY B
ABBOTT JAMES L
POUDRE TECH METROPOLITAN DISTRICT
POUDRE TECH METROPOLITAN DISTRICT
ANDERSON CHARLES T (80%)
TAFT VALLEY LLC
Private parking off Hwy 257
STALEY LORI A
FEILMEIER DANIEL R
BRALEXIA LLC
WINDSOR TOWN OF
County Road 17
VIMA PARTNERS LLC
VIMA PARTNERS LLC
VIMA PARTNERS LLC
Private parking off Hwy 257
SHUR VIEW LTD PARTNERSHIP
SHUR VIEW LTD PARTNERSHIP
Walking access along RR
VIMA PARTNERS LLC
WOOLDRIDGE CODY J
VIMA PARTNERS LLC
VIMA PARTNERS LLC
WOOLDRIDGE CODY JOE
SCHMERGE TOM
SCHMERGE TOM
KLIM ALEKSANDER
County Road 19
Missle Silo Rd
County Road 66
EDBLAD DAVID R & JOANNE L TRUSTEES
VOMBAUR BENJAMIN J
KING PAUL
CLARK ROYCE B TRUST
State Hwy 257 Spur
State Hwy 257 Spur
Private parking off County Rd 17
WINDSONG RANCH HOMEOWNERS ASSOC INC
WARNER SCOTT D
Windsong Dr
SILICON RANCH CORPORATION
U S A
USA WESTERN AREA POWER ADMINISTRATION
ROBERT STANLEY ENTERPRISES LLC
STAR ENTERPRISES LLC
NORTHERN COLORADO RV AND BOAT STORAGE LLC
COLBERG DENISE TRUST
MARINELARENA LILIANA I
PHILLIPS RONALD L
Private parking off Hwy 257
Parking Access in CDOT Lot
COLORADO DEPT OF TRANSPORTATION
BANNER HEALTH
HIGH POINTE LLC
KINNISON SARA M
SKYWAY PROPERTIES I LLC
BLANKS BRANDI
FRANKLIN HAL
Unnamed
Promontory Circle
DEPARTMENT OF TRANSPORTATION
DEPARTMENT OF TRANSPORTATION
COZY COW DAIRY LLC
LUNDVALL LLC
Private parking off County Rd 19
Parking off Hwy 257
JDM II SF NATIONAL LLC
JDM II SF NATIONAL LLC
BLASIO ELIZABETH
EXTRACTION OIL & GAS INC
KERR MCGEE OIL & GAS ONSHORE LP
HIGH POINTE LLC
Ramp
US Hwy 34 Bus
CITY CENTER WEST LP
EAGLE CROSSING DEVELOPMENT INC
EAGLE CROSSING DEVELOPMENT INC
HIGH POINTE LLC
Ramp
Ramp
203 5TH AVENUE LLC
WOODWARD INC
GREELEY CITY OF
GREELEY CITY OF
TRIPOINT ACQUISITION GROUP LLC
Private parking off Hwy 34
MAX DEVELOPMENT PROPERTIES LLC
Ramp
Ramp
US Hwy 34
Ramp
State Hwy 257
Ramp
US Hwy 34
Parking off County Rd 17
PUBLIC SERVICE CO OF COLO
NOBLE ENERGY INC
GOLDEN EYE INVESTMENTS LLC
Driveway
HANKINS FARMS LLC
APEX VISTA LLC
APEX VISTA LLC
APEX VISTA LLC
GREELEY CITY OF
GREELEY CITY OF

Legend

- Stream_Centerlines
- Study_Area
- Parcels_clip

Access Map Exhibit

Masterplan Storm Drainage Conceptual Design Services for the
City of Greeley Comprehensive Drainage Plan Oklahoma & South Basins.

Matrix

N

0 500 1,000
Feet

Document Name: GOS_Field_Work
Document Path: G:\gis_projects\Greeley_Oklahoma_Drainage\active\apps\GOS_Field_Work.mxd
User Name: annagrace.howard
Date: 5/25/2022

March 29, 2023

VIA ELECTRONIC MAIL

Matrix Design Group
Ben Liu
707 17th Street Suite 3150
Denver, CO, 80202

Re: Conceptual Alternative Selection – Oklahoma Master Plan

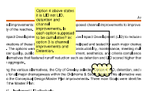
After reviewing the proposed alternatives in the Alternatives Report and associated revisions, please complete the Conceptual Design Report utilizing Alternative 4 – Low Impact Development, Detention, and Channel Improvements for all basins.

Thank you,

Andrew T. Fisher, PE, CFM
Civil Engineer III, Stormwater Management Division
2835 W 10th Street
Greeley, CO 80631
EMAIL: Andrew.Fisher@GreeleyGov.com
OFFICE: (970) 350-9797 CELL: (970) 302-0461

2023-06-30 GOS_ConceptDesign_Report_Draft -COMMENTS.pdf Markup Summary

fischerb (8)



Subject: Contractor
Page Label: 3
Author: fischerb
Date: 10/2/2023 1:36:05 PM
Status:
Color:
Layer:
Space:

Option 4 above states it is LID not LID, detention and channel improvements. Is each option supposed to be cumulative? ie: option 3 is channel improvements and Detention.

Subject: Sticky Note
Page Label: 3
Author: ben_liu
Date: 10/6/2023 8:56:51 AM
Status:
Color:
Layer:
Space:

Yes, each option focuses on a specific measure but may include other measures. Will add clarification sentence.

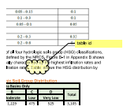


Subject: Contractor
Page Label: 5
Author: fischerb
Date: 10/2/2023 1:44:33 PM
Status:
Color:
Layer:
Space:

Looking at these costs and the next table it is unclear how costs are identified. I see the 50 yr cost matches but what about the CIP cost of 3.9 million, where is that in the table?

Subject: Sticky Note
Page Label: 5
Author: ben_liu
Date: 10/6/2023 9:36:57 AM
Status:
Color:
Layer:
Space:

Total capital cost includes other items like mobilization and administrative costs. Will add a column to table for clarity.



Subject: Contractor
Page Label: 28
Author: fischerb
Date: 10/2/2023 1:21:27 PM
Status:
Color:
Layer:
Space:

table id

Subject: Sticky Note
Page Label: 28
Author: ben_liu
Date: 10/6/2023 3:44:51 PM
Status:
Color:
Layer:
Space:

Will revise.



Subject: Contractor
Page Label: 30
Author: fischerb
Date: 10/2/2023 1:21:52 PM
Status:
Color:
Layer:
Space:

table id

Subject: Sticky Note
Page Label: 30
Author: ben_liu
Date: 10/6/2023 3:45:26 PM
Status:
Color:
Layer:
Space:

Will revise.

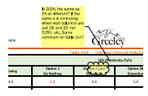


Subject: Contractor
Page Label: 38
Author: fischerb
Date: 10/2/2023 1:24:55 PM
Status:
Color:
Layer:
Space:

Is sentence unfinished or continued below with "Table 3-18..."?

Subject: Sticky Note
Page Label: 38
Author: ben_liu
Date: 10/6/2023 3:50:53 PM
Status:
Color:
Layer:
Space:

Continued with Table 3-18, will remove the odd line return.

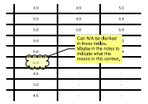


Subject: Contractor
Page Label: 40
Author: fischerb
Date: 10/6/2023 3:51:16 PM
Status:
Color:
Layer:
Space:

Is 2(2A) the same as 2A or different? If the same it is confusing when next columns are just 2B and 2C not 2(2B), etc. Same comment on table 2-17

Subject: Sticky Note
Page Label: 40
Author: ben_liu
Date: 10/6/2023 3:58:27 PM
Status:
Color:
Layer:
Space:

Same. 2A ended up being the best performing Option 2 detention scenario, but will revise to 2A to avoid confusion.

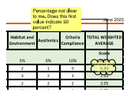


Subject: Contractor
Page Label: 40
Author: fischerb
Date: 10/2/2023 1:27:50 PM
Status:
Color:
Layer:
Space:

Can N/A be clarified in these tables. Maybe in the notes to indicate what this means in this context.

Subject: Sticky Note
Page Label: 40
Author: ben_liu
Date: 10/6/2023 4:05:58 PM
Status:
Color:
Layer:
Space:

N/A meant that proposed improvements were not required at this reach. We will revise to show the actual (same as Do Nothing) values since that is more informative.



Subject: Contractor
Page Label: 51
Author: fischerb
Date: 10/2/2023 1:31:31 PM
Status:
Color:
Layer:
Space:

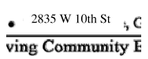
Percentage not clear to me. Does this first value indicate 90 percent?

Subject: Sticky Note
Page Label: 51
Author: ben_liu
Date: 10/6/2023 4:09:34 PM
Status:
Color:
Layer:
Space:

This column is the total weighted score, not percentage. As listed in the bottom key, a 3 is the best possible score (high opportunity).

---

fishera (1)



Subject: Text Box
Page Label: 108
Author: fishera
Date: 4/7/2023 5:23:41 PM
Status:
Color:
Layer:
Space:

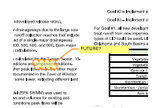
2835 W 10th St

Subject: Sticky Note
Page Label: 108
Author: ben_liu
Date: 10/6/2023 4:12:11 PM
Status:
Color:
Layer:
Space:

Will flatten this pdf comment.

---

stinesa (12)



Subject: Contractor
Page Label: 3
Author: stinesa
Date: 9/28/2023 3:55:28 PM
Status:
Color:
Layer:
Space:

FUTURE?

Subject: Sticky Note
Page Label: 3
Author: ben_liu
Date: 10/6/2023 8:57:36 AM
Status:
Color:
Layer:
Space:

Will revise.

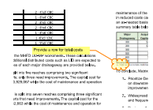


Subject: Contractor
Page Label: 4
Author: stinesa
Date: 9/21/2023 12:43:15 PM
Status:
Color:
Layer:
Space:

Identify the stream/channel/draw

Subject: Sticky Note
Page Label: 4
Author: ben_liu
Date: 10/6/2023 9:02:08 AM
Status:
Color:
Layer:
Space:

Will revise.



Subject: Contractor
Page Label: 5
Author: stinesa
Date: 9/21/2023 12:53:38 PM
Status:
Color:
Layer:
Space:

Provide a row for total costs

Subject: Sticky Note
Page Label: 5
Author: ben_liu
Date: 10/6/2023 9:35:32 AM
Status:
Color:
Layer:
Space:

Will revise.



Subject: Contractor
Page Label: 6
Author: stinesa
Date: 9/21/2023 1:30:12 PM
Status:
Color:
Layer:
Space:

Change chapter titles to be more descripitive of material in chapter

Subject: Sticky Note
Page Label: 6
Author: ben_liu
Date: 10/6/2023 9:41:49 AM
Status:
Color:
Layer:
Space:

We were directed to follow the section titles required by the City of Greeley Master Plan & Preparation Guide.



Subject: Contractor
Page Label: 12
Author: stinesa
Date: 9/22/2023 11:47:41 AM
Status:
Color:
Layer:
Space:

The first part of this sentence should read, "This study includes the entirety of the the South Basin watershed upstream of State Highway (SH) 257, while only including a portion of the Oklahoma Basin, that...

Subject: Sticky Note
Page Label: 12
Author: ben_liu
Date: 10/6/2023 9:44:04 AM
Status:
Color:
Layer:
Space:

Will revise.

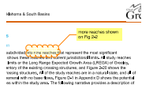


Subject: Contractor
Page Label: 13
Author: stinesa
Date: 9/22/2023 11:57:37 AM
Status:
Color:
Layer:
Space:

show entire drainage basin delineation in addition to study area

Subject: Sticky Note
Page Label: 13
Author: ben_liu
Date: 10/6/2023 3:37:19 PM
Status:
Color:
Layer:
Space:

Will revise. Note that entire drainage basin is already shown in vicinity map.



Subject: Contractor
Page Label: 15
Author: stinesa
Date: 9/22/2023 12:01:48 PM
Status:
Color:
Layer:
Space:

more reaches shown on Fig 2-2

Subject: Sticky Note
Page Label: 15
Author: ben_liu
Date: 10/6/2023 3:39:52 PM
Status:
Color:
Layer:
Space:

Will revise.

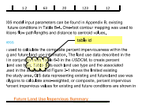


Subject: Contractor
Page Label: 25
Author: stinesa
Date: 9/29/2023 11:41:01 AM
Status:
Color:
Layer:
Space:

missing fig 2-22

Subject: Sticky Note
Page Label: 25
Author: ben_liu
Date: 10/6/2023 3:42:15 PM
Status:
Color:
Layer:
Space:

Parks and Open Space figure was mislabeled, will revise to Figure 2-22



Subject: Contractor
Page Label: 28
Author: stinesa
Date: 9/29/2023 11:46:40 AM
Status:
Color:
Layer:
Space:

table id

Subject: Sticky Note
Page Label: 28
Author: ben_liu
Date: 10/6/2023 3:44:43 PM
Status:
Color:
Layer:
Space:

Will revise.



Subject: Contractor
Page Label: 28
Author: stinesa
Date: 9/29/2023 11:49:20 AM
Status:
Color:
Layer:
Space:

table id

Subject: Sticky Note
Page Label: 28
Author: ben_liu
Date: 10/6/2023 3:44:34 PM
Status:
Color:
Layer:
Space:

Will revise.

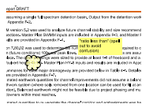


Subject: Contractor
Page Label: 37
Author: stinesa
Date: 9/29/2023 12:13:46 PM
Status:
Color:
Layer:
Space:

Missing beginning of last sentence

Subject: Sticky Note
Page Label: 37
Author: ben_liu
Date: 10/6/2023 3:48:08 PM
Status:
Color:
Layer:
Space:

Will revise.

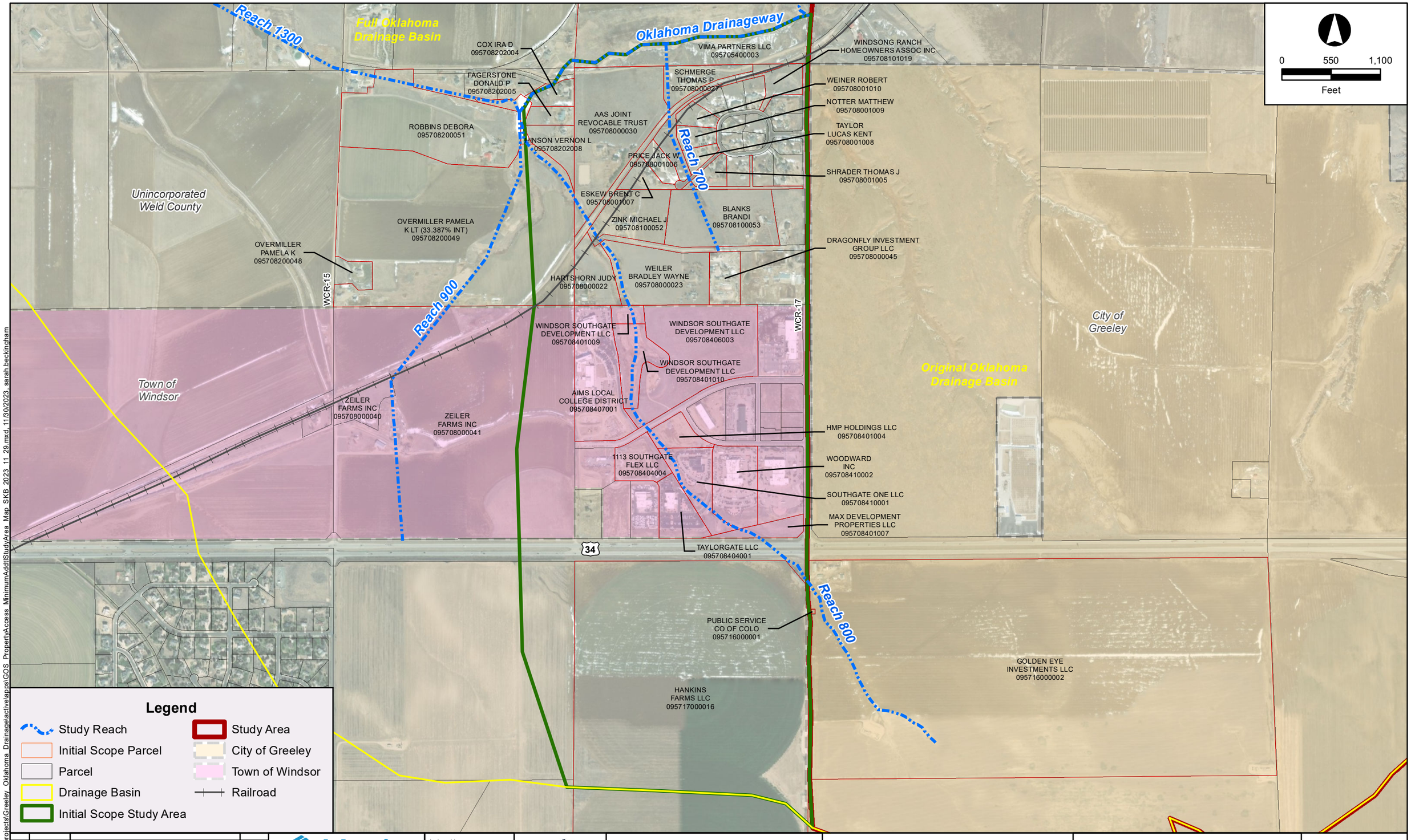


Subject: Contractor
Page Label: 55
Author: stinesa
Date: 9/29/2023 1:12:15 PM
Status:
Color:
Layer:
Space:

"ratio less than" (spell out to avoid confusion)

Subject: Sticky Note
Page Label: 55
Author: ben_liu
Date: 10/6/2023 4:10:29 PM
Status:
Color:
Layer:
Space:

Will revise.



Legend

- Study Reach
- Initial Scope Parcel
- Parcel
- Drainage Basin
- Initial Scope Study Area
- Study Area
- City of Greeley
- Town of Windsor
- Railroad

No.	DATE	DESCRIPTION	APPR.

Matrix Excellence by Design

designed by:
drawn by: SL
checked by:
project no.: 22.906.007
date: 10/25/2023

City of Greeley

CITY OF GREELEY

COMPREHENSIVE DRAINAGE PLAN
OKLAHOMA & SOUTH BASINS

REACHES 700-900
PARCEL ACCESS MAP

FILE: G:\gis_projects\Greeley_Oklahoma_Drainage\activeapps\GOS_PropertyAccess_MinimumAddt\StudyArea_Map_SKB_2023_11_29.mxd, 11/30/2023, sarah.beckingham

July 8, 2024

VIA ELECTRONIC MAIL

Matrix Design Group
Ben Liu
707 17th Street, Suite 3150
Denver, Colorado 80202

RE: Alternative Selection – Oklahoma Master Plan Basins 700 & 800

Dear Mr. Ben Liu,

The City of Greeley Stormwater Division has concluded its review of the Alternatives Analysis Report for the Oklahoma Master Plan Basins 700 & 800. The City elects to adopt the recommended plan and selects Option 4: LID, Detention and Channel Improvements for each basin.

Sincerely,

Aaron Stines
Stormwater Engineer
Public Works Department, Stormwater Division
2835 W. 10th Street, Greeley, CO 80631
Aaron.Stines@Greeleygov.com

Comments from BF

Final Concept Design, July 29, 2024
Greeley Comments: Black text
Matrix Responses: Blue text

- Figure 2-14 is missing an image for design point 701

  The inclusion of Structure 701 in the imagery was not possible for several reasons. Firstly, the property owner did not permit the use of images of their land for Matrix. Second, the pipe is submerged in a private pond- although no size could be verified, we believe it is a small diameter pipe.

- Figure 2-15 and 2-16 seem unnecessary

  The Greeley Project, comprising three main reports, includes a comprehensive analysis of land use. The first report does have areas with public lands along with parks and open spaces. Although the second report covers an area lacking public lands and parks, it still includes maps depicting these features to offer a comprehensive overview of Greeley's land allocation. This approach ensures a complete picture of the city's landscape, highlighting both the presence and absence of public recreational spaces across different sectors

- Pg 18 (25/254) Table 3-10 and 3-11: Are there only 2 key locations (at the outfall)? Would any other points within the model be helpful to have in a table?

  To maintain consistency across drainageways, we initially designated a single key point for both Drainageway 700 and Drainageway 800, with the latter's key point being its outfall. However, upon further consideration, we have decided to add a second key location for Drainageway 800 at structure 809, us-34 upstream of the highway.

- Pg 19 (26/254) I am unclear why culvert 703 is not in the report. Sentence states it is at the end of a small embankment, but why is that reason to remove it from the report? Also what is meant by these two culverts are not in the report? Does that mean they were not modeled? Not accounted for?

  We will change confusing terminology -- 806 is a detention pond outlet pipe and should not be calculated as a culvert. 703 is a small-diameter pipe through a small, informal embankment. Based on our field observations, we believe 703 is intended to provide some positive drainage but it not a major crossing structure. It is possible that this embankment could be removed in the future if the drainageway is improved so we do not wish to include in the major crossing analysis.

- Table 3-13 seems unnecessary

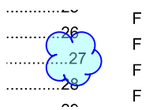
  While Table 3-13 seem unnecessary since both drainageways covers all alternative options, we chose to keep it in the report to facilitate merging this 700 & 800 study into the larger Oklahoma report (that includes more variety).

- Pg 44 (51/254) Stormwater Detention Facility Guidelines references the old City criteria. All references within the master plan should be updated to reference the new criteria. Beyond the references the document should align with the latest criteria.

  Thank you for catching that, the wrong date was written, and all data in the report should be referencing the March 2024 updated report.

2024_06_18_GO_Alternatives Analysis_Report-ALS COMMENTS.pdf Markup Summary

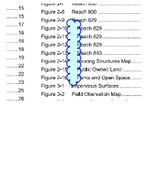
Engineer (17)



Subject: Engineer
Page Label: 5
Author: stinesa
Date: 7/2/2024 10:12:18 AM
Status:
Color:
Layer:
Space:

Subject: Sticky Note
Page Label: 5
Author: sabastian.ortega
Date: 7/9/2024 1:46:49 PM
Status:
Color:
Layer:
Space:

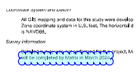
Revised



Subject: Engineer
Page Label: 5
Author: stinesa
Date: 7/2/2024 10:12:29 AM
Status:
Color:
Layer:
Space:

Subject: Sticky Note
Page Label: 5
Author: sabastian.ortega
Date: 7/9/2024 1:46:45 PM
Status:
Color:
Layer:
Space:

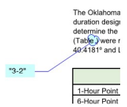
Revised



Subject: Engineer
Page Label: 8
Author: stinesa
Date: 7/2/2024 10:19:03 AM
Status:
Color:
Layer:
Space:

Subject: Sticky Note
Page Label: 8
Author: sabastian.ortega
Date: 7/9/2024 1:47:38 PM
Status:
Color:
Layer:
Space:

Changed to "Measurements of existing roadway crossings were completed by Matrix in March 2024."

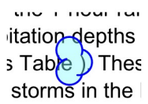


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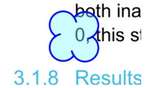
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Revised



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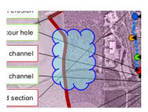


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crossing leaders

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Revised



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Revised

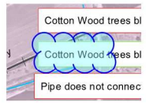


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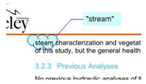
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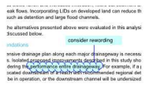


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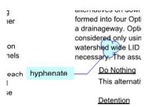


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consider rewording

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Revised



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hyphenate

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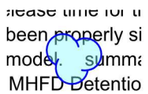


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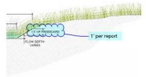
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Revised



Subject: Engineer
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1' per report

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Changed to 1'



Subject: Engineer
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Date: 7/5/2024 11:45:39 AM
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Space:

Provide title for each option selected

Subject: Sticky Note
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Author: sabastian.ortega
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Status:
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Revised

Comments from Mary Mateo

Alts Analysis, July 12, 2024
Greeley Comments: Black text
Matrix Responses: Blue text

Referencing Tables 3-14 and 3-15 below, MHFD Detention Workbooks are not included in Appendix E-2 for: D841 EURV 840 EURV 842. Also, there is a workbook for EURV 823, but this is not shown in the tables below.

Table 3-14 Option 2 Detention Basin Summary

Detention Facility No.	Reach Location	Contributing Subbasins	Storage Volume (acre-feet)	Drainage Area (acre)	Proposed Detention Facility (Q100 Future Sizing)		
					Size (acre)	Peak Inflow (cfs)	Peak Outflow (cfs)
D711	700	712	6.5	90.0	1.6	172	129
D823	829	820/830/824/844	43	327.0	6.3	793	356
D841	843	842/850	25	210.6	12.2	647	41
D844	844	844	17	126.7	4.4	523	204

Table 3-15 Option 4 LID Detention Basin Summary

Detention Facility No.	Reach Location	Contributing Subbasins	Drainage Area (acre)	% Future Imperv.	EURV Ponds				Flood Control Ponds			
					Storage Volume (acre-feet)	Size (acre)	Peak Inflow (cfs)	Peak Outflow (cfs)	Storage Volume (acre-feet)	Size (acre)	Peak Inflow (cfs)	Peak Outflow (cfs)
D_EURV_711	700	712	90.0	30.2%	2.40	0.60	170	155	6.5	1.3	155.2	110.8
D_EURV_820	829	820	81.0	69.80%	5.50	1.30	332	240	-	-	-	-
D_EURV_830	829	830	829.0	67.80%	5.60	1.50	293	193	-	-	-	-
D_EURV_840	843	840	63.0	76.5%	5.40	3.10	200	165	-	-	-	-
D_EURV_842	843	842/850	210.5	68.6%	14.30	9.50	646	328	2.4	0.6	328.3	284.0
D_EURV_844	N/A (Upstream of 843)	844	126.5	76.2%	9.40	2.30	523.28	382.80	-	-	-	-
D_FC_823	829	820/830/844/842/840	327.0	73.0%	-	-	-	-	20.0	5.0	474.7	261.0
D_FC_838	829	844	126.5	76.2%	-	-	-	-	17.3	3.3	524.4	292.0

Response:
EURV 823 was removed, and D841, EURV 840, and EURV 842 are now added to the Appendix.

How were the stage storage tables created for the proposed detention basins?

MHFD detention workbooks created stage storage tables by incorporating a sub-basin characteristic along with variables determined by Matrix. These variables were the same across every workbook, with the sub-basin characteristic being the only difference between them. With the exception of (Pre-existing) Detention Basin 823, conceptual detention basins assumed the minimum rectangular footprint with 4:1 Side slopes that would results in the required volume. This can be found in section 3.3.4 Alternatives Modeling, under option 2.

Discuss the placement of EURV Ponds with Flood Control Ponds and LID for Option 4?

EURV and flood control were placed upstream of any channels that had a velocity greater than 5 ft/s. This can be found in section 3.3.4 Alternatives Modeling, under option 4.

Why is the watershed length for Detention 711 different than that for EURV/Flood Control 711.

Thank you for catching this. This was fixed and replaced back into the report. This can be seen in Appendix E-2.

Per Section 3.3.4 Option 2 – Detention, “The design 100-year depth for the detention basins was six feet to avoid additional requirements associated with jurisdictional dams.” However, the MHFD Detention Workbooks for Option 2, Detention 823 and Option 4, Flood Control 823 show the 100-year volume at 10’ of depth. The areas indicated at stages 8.49’, 9.00’ and 10.00’ of the workbook for Option 2, Detention 823 are all identical, as are the areas indicated at stages 4.00’ through 10.00’ of the workbook for Option 4, Flood Control 823.

823 is an existing detention basin with a previously designed depth of 10 ft. We attempted to keep the concept geometry similar to the original design when possible. This has been written in the report, In section 3.3.4 Alternatives Modeling Option 2.

These measurements were taken from an older report of the area, with the measurements of the existing detention pond. In section 3.3.4 Alternatives Modeling Option 2.

Thank you for noticing Option 4 Flood Control 823 error. We have corrected the rating table to now match the other 823 geometries.

Tables 3-8 and 3-12 use different Manning’s n values for Reinforced Concrete Pipe. Should this be consistent in all applications?

It will be noted in the sections that the Mannings between the HY and SWMM are different. This can be found in section 3.2.1 Evaluation of Existing Facilities.

Section 3.1.7 Last bullet point references Section “0”

Done

Section 3.2.1

Last paragraph references culvert 807 then culvert 803. One of these appears to be a typo.

Next to last paragraph – typo – “possibility” should be possibly.

Done

Section 3.2.2 First paragraph – typo – “steam” characterization should be streaming characterization.

Done

Section 3.3.2 First paragraph – “the performance entire drainageway” should read “the performance of the entire drainageway.”

Done

Section 3.3.4

Option 2 – second paragraph – text missing from next to last sentence.

Option 3 – second paragraph – text missing from last sentence.

Done

On Page 38 of 188 – Heading is 3.3.1 Alternative Plans – should be 3.3.6? Also, reference to Figure 3-3 in this section appears to be incorrect.

Done

Figure 3-3 indicates 1.5’ of freeboard – report indicates 1’ (Sections 3.3.3 and 3.3.4 regarding Channel Improvements).

Done

2024-07-15 GO_Concept Design_Report_Draft-ALS Comments.pdf Markup Summary

Engineer (17)



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"improve on" or "improving"?

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Will remove "Improve of" and replace with improving.



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"Basin."

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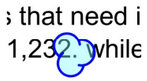


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Should this be "surface area of these ponds?" or "water surface area of these facilities?" Just trying to eliminate any confusion.

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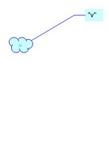
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Revised

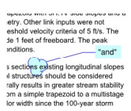


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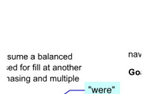


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Consider revising this sentence

Subject: Sticky Note
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fix

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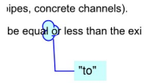
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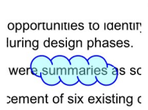


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"summarized"?

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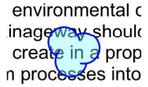
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Repeat of previous page

Subject: Sticky Note
Page Label: 62
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Removed

Comments from MM

Final Concept Design, July 29, 2024
Greeley Comments: Black text
Matrix Responses: Blue text

Section 4.2 – 2nd paragraph – City “of” Greeley
This will be fixed in the final concept design.

End of page 39 and beginning of page 40 – text doesn’t flow.
This will be changed to “The following sections describe overall guidelines, current elements and practices to employ, definitions of elements, as well as individual guidelines for elements to achieve the concept design.”

Page 41 – Permeable pavement – typo “though” should be “through”
Retention ponds/constructed wetland ponds - typo “though” should be “through”
Thank you for catching those spelling mistakes, that will be fixed in the final version.

End of page 43 and beginning of page 44 – text doesn’t flow.
This was rewritten as “ Figure 4 5 shows natural elements that can be incorporated into online detention basins (situated within the primary flow channel) to fulfill multiple purposes.” Can be found on page 43-44.

Page 44 – Stormwater Detention Facility Guidelines – 1st paragraph – reference current (2024) City of Greeley stormwater criteria.
we will get that fixed.

Page 45 – Channel Guidelines – 1st paragraph - reference current (2024) City of Greeley stormwater criteria.
we will get that fixed.

Page 46 – add period at end of sentence.
Thank you for catching that, we will get that fixed.

Section 4.2.4 3rd paragraph needs reworded.
This was reworded to “ Riprap is recommended near the outfall of 700 due to significant erosion and steep slopes that result in high water velocities. For the cost estimate, the riprap has been categorized as Type M soil riprap.” And can be found in Section 4.2.4 3rd paragraph

Section 4.2.5 3rd paragraph needs reworded.
This was reworded to “ Riprap is recommended near the entrance of the existing detention pond, due to significant erosion and steep slopes that result in high water velocities. For the cost estimate, the riprap has been categorized as Type M soil riprap..” And can be found in Section 4.2.5 3rd paragraph

Tables 4-6 and 4-7 Descriptions under Master Plan O&M Cost Summary are cut off.
The full description can be seen in Appendix F-7. The summaries on Section 4 had to be truncated to fit on a single page with the description.

2025-01 GOM_Baseline Hydrology_Report DRAFT-Comment Responses.pdf Markup Summary

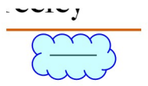
Engineer (9)



Subject: Engineer
Page Label: 8
Author: stinesa
Date: 1/17/2025 7:36:48 AM
Status: Completed set by sabastian.ortega on 4/24/2025 at 1:21:09 PM
Color:
Layer:
Space:

Subject: Re: Engineer
Page Label: 8
Author: ben_liu
Date: 1/29/2025 8:09:28 AM
Status:
Color:
Layer:
Space:

Will revise.



Subject: Engineer
Page Label: 24
Author: stinesa
Date: 1/17/2025 8:44:15 AM
Status: Completed set by sabastian.ortega on 4/24/2025 at 1:21:52 PM
Color:
Layer:
Space:

Subject: Re: Engineer
Page Label: 24
Author: ben_liu
Date: 1/29/2025 8:11:30 AM
Status:
Color:
Layer:
Space:

Will revise.



Subject: Engineer
Page Label: 40
Author: stinesa
Date: 1/17/2025 9:51:36 AM
Status:
Color:
Layer:
Space:

There is no guarantee of it happening, but mention ongoing talks to build Cascadia development (Lind owned properties, Colorado Eagles, water park)

Subject: Re: Engineer
Page Label: 40
Author: ben_liu
Date: 1/29/2025 8:11:54 AM
Status:
Color:
Layer:
Space:

Will revise to best of our (limited) knowledge.



Subject: Engineer
Page Label: 51
Author: stinesa
Date: 1/17/2025 12:42:35 PM
Status:
Color:
Layer:
Space:

move labels so leaders do not cross.

Subject: Re: Engineer
Page Label: 51
Author: ben_liu
Date: 1/29/2025 8:12:14 AM
Status:
Color:
Layer:
Space:

Will revise.



Subject: Engineer
Page Label: 52
Author: stinesa
Date: 1/17/2025 1:28:22 PM
Status:
Color:
Layer:
Space:

label frame color to match dot color?

Subject: Re: Engineer
Page Label: 52
Author: ben_liu
Date: 1/29/2025 8:12:35 AM
Status:
Color:
Layer:
Space:

Will revise.



Subject: Engineer
Page Label: 195
Author: stinesa
Date: 1/28/2025 12:21:59 PM
Status:
Color:
Layer:
Space:

LREGA linetype is difficult to see on the maps, especially this one being a color close to a wetland type. Can we change the color to stand out better?

Subject: Re: Engineer
Page Label: 195
Author: ben_liu
Date: 1/29/2025 8:13:20 AM
Status:
Color:
Layer:
Space:

Will revise.

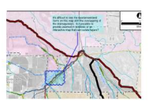


Subject: Engineer
Page Label: 12
Author: stinesa
Date: 1/28/2025 12:09:19 PM
Status:
Color:
Layer:
Space:

Doesn't the major basin outline extend beyond the study area? Update as necessary.

Subject: Re: Engineer
Page Label: 12
Author: ben_liu
Date: 2/5/2025 3:48:08 PM
Status:
Color:
Layer:
Space:

We will extend major basin line (but not study area) to the River.

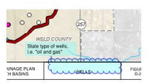


Subject: Engineer
Page Label: 195
Author: stinesa
Date: 1/28/2025 12:21:50 PM
Status:
Color:
Layer:
Space:

It's difficult to see the riparian/wetland items on this map with the overlapping of the drainageways. Is it possible to provide zoomed-in windows or an interactive map that can isolate layers?

Subject: Re: Engineer
Page Label: 195
Author: ben_liu
Date: 1/29/2025 8:14:56 AM
Status:
Color:
Layer:
Space:

Zoom windows wouldn't work well since the riparian layers follow much of the drainageways, we will revise color schema to show wetland/riparian colors with greater contrast.



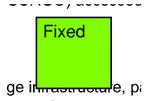
Subject: Engineer
Page Label: 196
Author: stinesa
Date: 1/28/2025 12:22:35 PM
Status:
Color:
Layer:
Space:

State type of wells, i.e. "oil and gas"

Subject: Re: Engineer
Page Label: 196
Author: ben_liu
Date: 1/29/2025 8:15:15 AM
Status:
Color:
Layer:
Space:

Will revise.

Text Box (2)



Subject: Text Box
Page Label: 8
Author: sabastian.ortega
Date: 4/24/2025 1:21:01 PM
Status:
Color:
Layer:
Space:

Fixed



Subject: Text Box
Page Label: 24
Author: sabastian.ortega
Date: 4/24/2025 1:21:47 PM
Status:
Color:
Layer:
Space:

Removed

2025-05-19 GOM_Alternative Analysis_DRAFT_CommentsResponse.pdf Markup Summary

Engineer (13)



Subject: Engineer
Page Label: 17
Author: stinesa
Date: 5/23/2025 8:19:35 AM
Status: Completed set by Sabastian Ortega on 7/9/2025 at 10:22:50 AM
Color:
Layer:
Space:

downstream of US-34 Culvert? downslope of US-34?

Subject: Re: Engineer
Page Label: 17
Author: ben_liu
Date: 6/3/2025 8:34:58 AM
Status:
Color:
Layer:
Space:

Will revise to downstream of the US-34 culverts

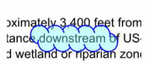


Subject: Engineer
Page Label: 17
Author: stinesa
Date: 5/23/2025 8:17:22 AM
Status: Completed set by Sabastian Ortega on 7/9/2025 at 10:22:32 AM
Color:
Layer:
Space:

"field"

Subject: Re: Engineer
Page Label: 17
Author: ben_liu
Date: 6/3/2025 8:35:17 AM
Status:
Color:
Layer:
Space:

Will revise

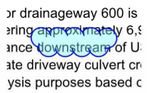


Subject: Engineer
Page Label: 17
Author: stinesa
Date: 5/23/2025 8:19:23 AM
Status: Completed set by Sabastian Ortega on 7/9/2025 at 10:29:42 AM
Color:
Layer:
Space:



Subject: Re: Engineer
Page Label: 17
Author: ben_liu
Date: 6/3/2025 8:45:26 AM
Status:
Color:
Layer:
Space:

Will revise to the downstream end of the US-34 culvert



Subject: Engineer
Page Label: 19
Author: stinesa
Date: 5/23/2025 8:23:25 AM
Status: Completed set by Sabastian Ortega on 7/9/2025 at 10:30:21 AM
Color:
Layer:
Space:

Subject: Re: Engineer
Page Label: 19
Author: ben_liu
Date: 6/3/2025 8:45:04 AM
Status:
Color:
Layer:
Space:

Will revise



Subject: Engineer
Page Label: 29
Author: stinesa
Date: 5/23/2025 1:43:54 PM
Status: Completed set by Sabastian Ortega on 7/9/2025 at 10:32:19 AM
Color:
Layer:
Space:

"WCR"

Subject: Re: Engineer
Page Label: 29
Author: ben_liu
Date: 6/3/2025 8:40:59 AM
Status:
Color:
Layer:
Space:

Will revise



Subject: Engineer
Page Label: 29
Author: stinesa
Date: 7/9/2025 10:32:45 AM
Status: Completed set by Sabastian Ortega on 7/9/2025 at 10:34:42 AM
Color:
Layer:
Space:

"probable"?

Subject: Re: Engineer
Page Label: 29
Author: ben_liu
Date: 6/3/2025 8:41:13 AM
Status:
Color:
Layer:
Space:

Will revise

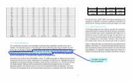


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Page Label: 40
Author: stinesa
Date: 7/9/2025 11:15:09 AM
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Completed set by Sabastian Ortega on 7/9/2025 at 12:22:33 PM
Color:
Layer:
Space:

Add Cascadia development blurb. It has now been approved.

Subject: Re: Engineer
Page Label: 40
Author: ben_liu
Date: 6/3/2025 8:41:47 AM
Status:
Color:
Layer:
Space:

Will revise

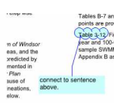


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Page Label: 42
Author: stinesa
Date: 5/23/2025 2:18:53 PM
Status: Completed set by Sabastian Ortega on 7/9/2025 at 2:02:48 PM
Color:
Layer:
Space:

Consider revising this part of sentence.

Subject: Re: Engineer
Page Label: 42
Author: ben_liu
Date: 6/3/2025 8:42:14 AM
Status:
Color:
Layer:
Space:

Will revise

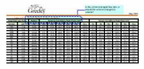


Subject: Engineer
Page Label: 46
Author: stinesa
Date: 5/23/2025 2:38:35 PM
Status: Completed set by Sabastian Ortega on 7/9/2025 at 2:12:51 PM
Color:
Layer:
Space:

connect to sentence above.

Subject: Re: Engineer
Page Label: 46
Author: ben_liu
Date: 6/3/2025 8:42:35 AM
Status:
Color:
Layer:
Space:

Will revise



Subject: Engineer
Page Label: 49
Author: stinesa
Date: 7/9/2025 3:14:21 PM
Status: Completed set by Sabastian Ortega on 7/9/2025 at 3:14:27 PM
Color:
Layer:
Space:

is this a time-averaged flow rate, or should the units be changed to volume?

Subject: Re: Engineer
Page Label: 49
Author: ben_liu
Date: 6/3/2025 8:43:41 AM
Status:
Color:
Layer:
Space:

Will revise, units and titles should be volumes

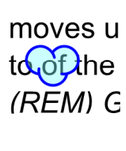


Subject: Engineer
Page Label: 50
Author: stinesa
Date: 5/23/2025 2:49:58 PM
Status: Completed set by Sabastian Ortega on 7/9/2025 at 3:17:52 PM
Color:
Layer:
Space:

incomplete

Subject: Re: Engineer
Page Label: 50
Author: ben_liu
Date: 6/3/2025 8:44:19 AM
Status:
Color:
Layer:
Space:

Will revise, sentence continues on next page



Subject: Engineer
Page Label: 51
Author: stinesa
Date: 5/23/2025 3:37:41 PM
Status: Completed set by Sabastian Ortega on 7/9/2025 at 3:18:16 PM
Color:
Layer:
Space:

Subject: Re: Engineer
Page Label: 51
Author: ben_liu
Date: 6/3/2025 8:44:34 AM
Status:
Color:
Layer:
Space:

Will revise

---

he east side of the development.

nt: *Construction Plans for Raindance Majo*
, prepared by TST, Inc. Consulting Engine
t Information:
ans and for the provide the design for the 2-
ds Blvd about 1100 feet east of Colorado I

nt: *Raindance Reservoir 92 Pump Station*
by TST, Inc. Consulting Engineers.
t Information:

Subject: Engineer
Page Label: 52
Author: stinesa
Date: 5/27/2025 8:32:56 AM
Status: Completed set by Sabastian Ortega on 7/9/2025 at 3:19:57 PM
Color:
Layer:
Space:

Subject: Re: Engineer
Page Label: 52
Author: ben_liu
Date: 6/3/2025 8:44:47 AM
Status:
Color:
Layer:
Space:

Will revise

Comments From Brain Fischer

Brain Response: Black Text
Matrix Response: Blue Text

- *On table 3-20 Proposed Crossing Structures – How were the options determined? Is there a recommended option?*

RESPONSE: Recommended options are summarized in Section 3.3.7, Table 3-20 presents the required sizes for reference.

- *On Page 69 the recommended plan section states that "the restoration objective for these major drainageways is to promote low maintenance stream geomorphology,…" and when I look at the weights in table 3-27 Alternatives Evaluation Matrix I notice items such as 'water quality' and 'habitat and environment' have a low weight compared to others. It seems to me that if the recommended plan revolves around restoration objectives that these weight ratings would be higher.*

RESPONSE: Greeley chose these weightings. We are open to discussing reweighting the categories for GOR if you think that the highest scoring options are incorrect.

Comments From Jordan White

Jordan White: Black Text
Matrix Response: Blue Text

---

1. *P. 32 under section "Reach 1300: Oklahoma Basin Primary Tributary," sentence #4 appears to incorrectly speak about Reach 1200 instead of Reach 1300 when referencing Figure 2-58.*

RESPONSE: Will revise.

2. *P. 36, figure 2-64: Map includes several green existing structures which are not listed in Table 2-1 (p. 34). Clarify why these mapped structures were not included on the Table. Are the mapped existing structures not major crossing structures?*

RESPONSE: Correct, minor structures and detention basin outlet structures were identified in the field and figures, but are not included for analysis and Table 2-1. Will add clarification to Section 2.3.2.

3. *Advisory: P. 37, figure 2-65: Advised to break up this map into 2 maps to provide space and easier reading since it's quite difficult to read the map with so many photo labels included.*

RESPONSE: Prefer to keep existing format for consistency with other figures, we considered other formats but the extent of the reaches and shape of GOR does not split easily.

4. *Advisory: Greeley is annexing a sizable amount of territory in West Greely, may just want to double-check this does not impact maps' Greeley boundaries.*

5. *Advisory: Greeley annexations may impact Figure 2-66 (Public Owned Land Map) since some of the annexations are to increase City of Greeley Public Land*

6. *Advisory: Consider updating the imperviousness values in Table 3-6 to the MHFD imperviousness values released in March 2024.*

RESPONSE: Prefer to keep existing values since hydrology has previously been reviewed and approved.

7. *On page. 80 in the references section, it lists "CWC Consulting Group, Conceptual Drainage Report for Delantero, March, 2022." Be aware that the Delantero Preliminary Subdivision (SUB2023-0003) and Preliminary Drainage Report were approved in 1/32/2024. It may be prudent to look through the preliminary report and see how much flow is expected from this development*

2025-07-31 GOM_Concept Design Report_DRAFT-CommentResponse.pdf Markup Summary

Engineer (9)



Subject: Engineer
Page Label: 46
Author: Aaron Stines
Date: 8/4/2025 11:31:11 AM
Status: Confirmed set by sabastian.ortega on 10/7/2025 at 10:12:54 AM
Color:
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Space:

extend this leader past the basin boundary.

Subject: Re: Engineer
Page Label: 46
Author: ben_liu
Date: 8/27/2025 8:53:46 AM
Status:
Color:
Layer:
Space:

Will revise

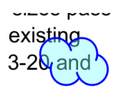


Subject: Engineer
Page Label: 49
Author: Aaron Stines
Date: 8/4/2025 12:01:30 PM
Status: Completed set by sabastian.ortega on 10/7/2025 at 9:29:43 AM
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Space:

"parallel to"

Subject: Re: Engineer
Page Label: 49
Author: ben_liu
Date: 8/27/2025 8:54:00 AM
Status:
Color:
Layer:
Space:

Will revise



Subject: Engineer
Page Label: 57
Author: Aaron Stines
Date: 8/4/2025 3:47:25 PM
Status: Completed set by sabastian.ortega on 10/7/2025 at 9:47:25 AM
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Subject: Re: Engineer
Page Label: 57
Author: ben_liu
Date: 8/27/2025 8:54:17 AM
Status:
Color:
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Space:

Will remove



Subject: Engineer
Page Label: 107
Author: brianfischer
Date: 8/5/2025 9:40:22 AM
Status: Completed set by sabastian.ortega on 10/7/2025 at 10:12:29 AM
Color:
Layer:
Space:

I do not see these numbers reflected in table 4-14. Is this an error to change or can further narrative be added to clarify?

Subject: Re: Engineer
Page Label: 107
Author: ben_liu
Date: 8/27/2025 8:58:10 AM
Status:
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Error, will revise

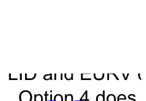


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Author: Aaron Stines
Date: 10/7/2025 11:28:52 AM
Status: Completed set by sabastian.ortega on 10/7/2025 at 11:28:59 AM
Color:
Layer:
Space:

Please reference this table in the report and add discussion of results presented.

Subject: Re: Engineer
Page Label: 65
Author: ben_liu
Date: 8/27/2025 8:55:30 AM
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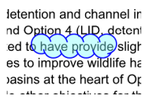
Will revise



Subject: Engineer
Page Label: 73
Author: Aaron Stines
Date: 8/5/2025 3:19:10 PM
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Subject: Re: Engineer
Page Label: 73
Author: ben_liu
Date: 8/27/2025 8:57:01 AM
Status:
Color:
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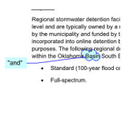
Will revise



Subject: Engineer
Page Label: 80
Author: Aaron Stines
Date: 8/6/2025 8:48:47 AM
Status: Completed set by sabastian.ortega on 10/7/2025 at 9:38:38 AM
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Subject: Re: Engineer
Page Label: 80
Author: ben_liu
Date: 8/27/2025 8:57:16 AM
Status:
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Will revise

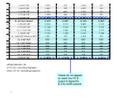


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Page Label: 94
Author: Aaron Stines
Date: 8/7/2025 1:36:29 PM
Status: Completed set by sabastian.ortega on 10/7/2025 at 9:01:35 AM
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Space:

"and"

Subject: Re: Engineer
Page Label: 94
Author: ben_liu
Date: 8/27/2025 8:57:25 AM
Status:
Color:
Layer:
Space:

Will revise



Subject: Engineer
Page Label: 70
Author: Aaron Stines
Date: 10/16/2025 9:29:16 AM
Status: Completed set by sabastian.ortega on 10/7/2025 at 10:56:52 AM
Color:
Layer:
Space:

Values do not appear to match the HY-8 output in Appendix E-3 for GOR culverts

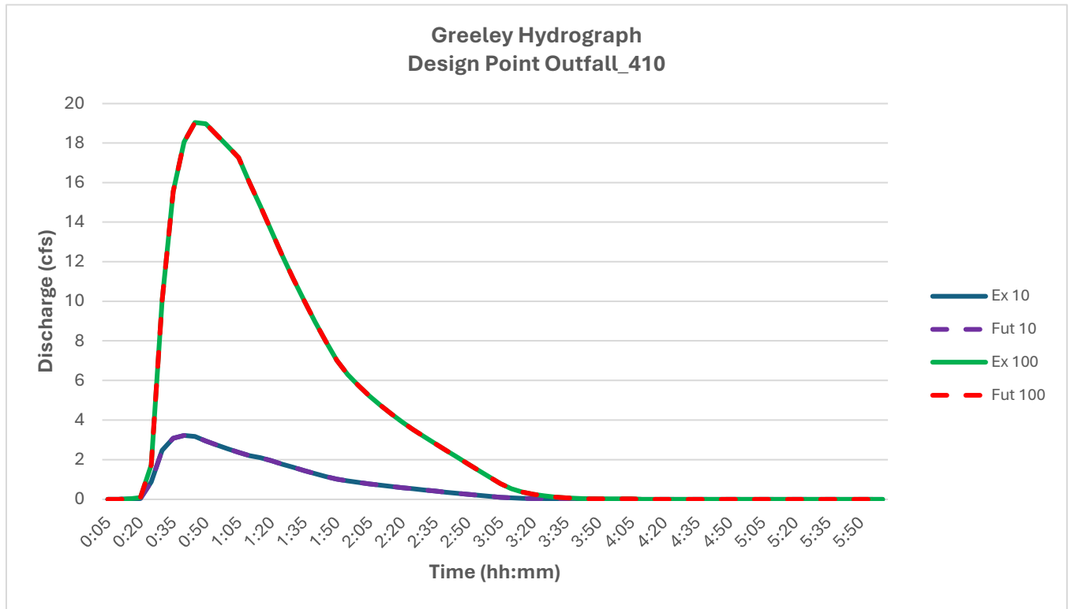
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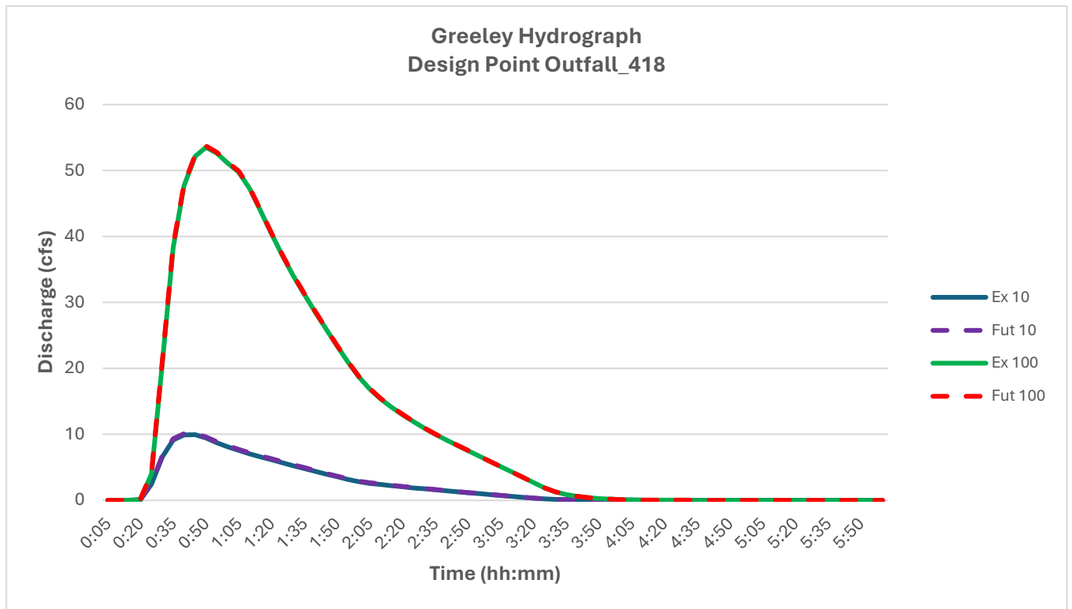
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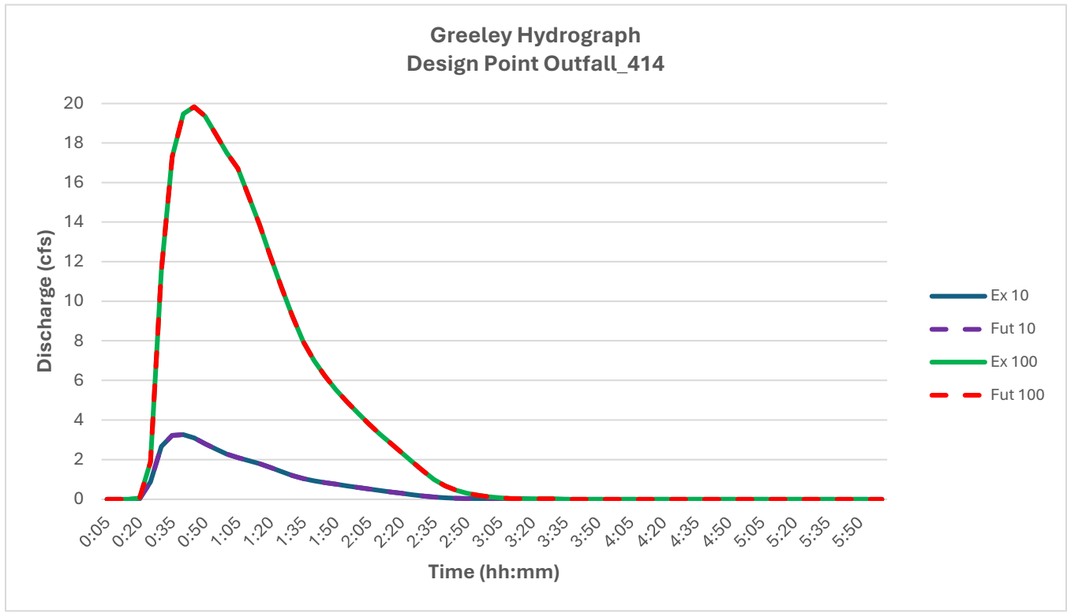
Fixed, now Design Q values can be seen in Appendix E, Hy-8 Results in the summary tables.

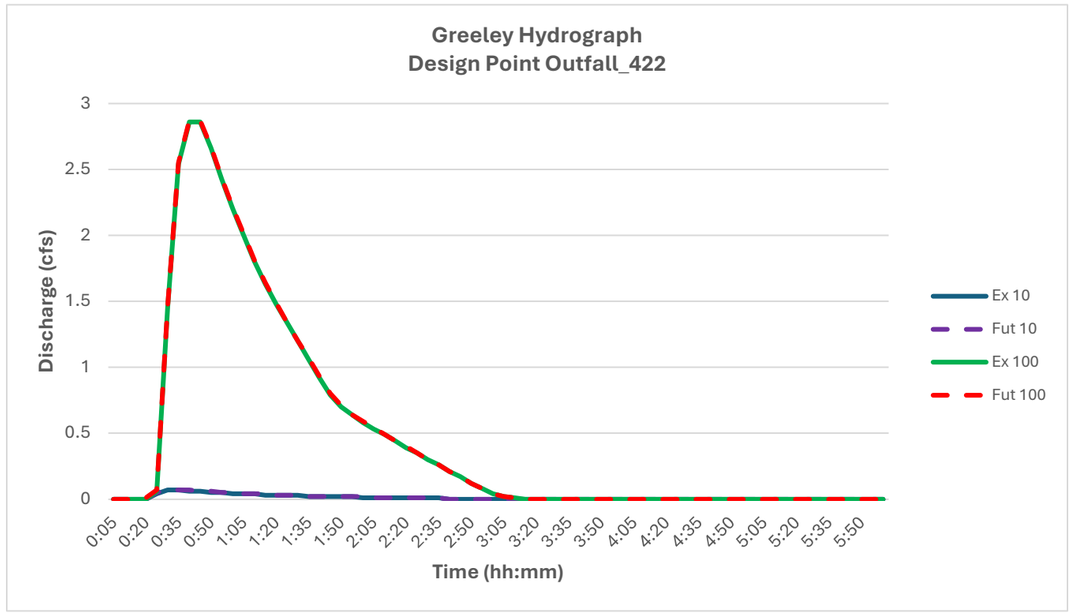
APPENDIX B – HYDROLOGIC ANALYSIS

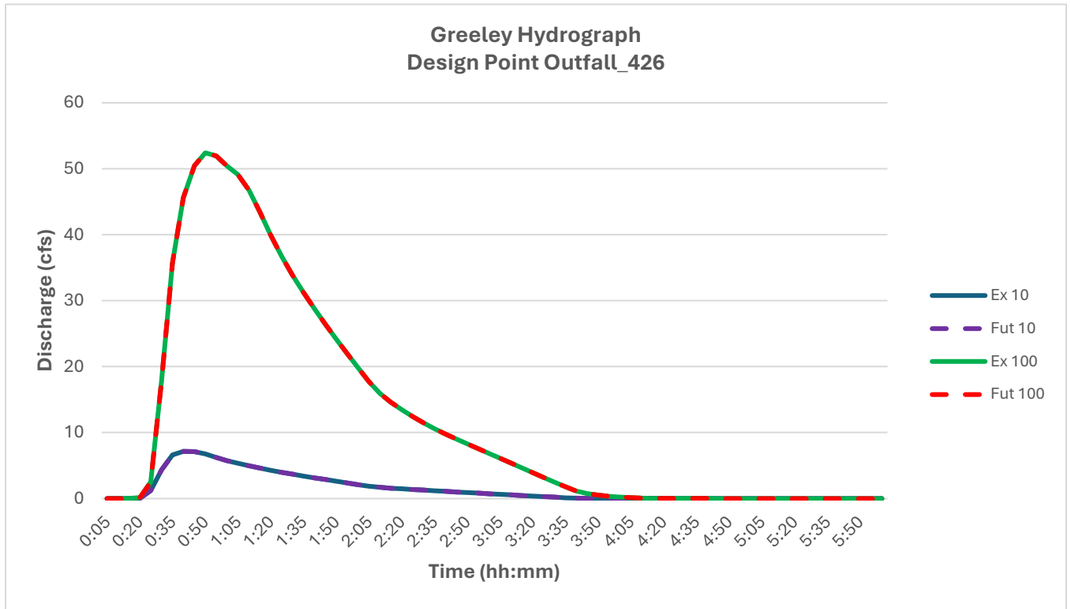
Click here for Figure B-1: Interactive Hydrology Map

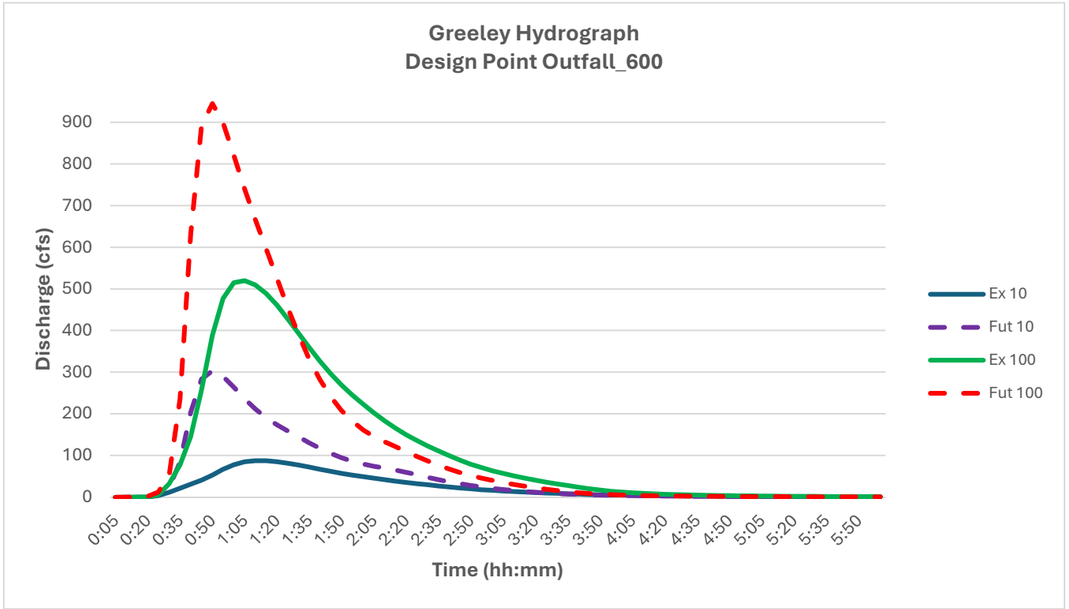

Greeley Hydrograph
Design Point Outfall_410
Discharge (cfs)
0
2
4
6
8
10
12
14
16
18
20
0:05
0:20
0:35
0:50
1:05
1:20
1:35
1:50
2:05
2:20
2:35
2:50
3:05
3:20
3:35
3:50
4:05
4:20
4:35
4:50
5:05
5:20
5:35
5:50
Time (hh:mm)
Ex 10
Fut 10
Ex 100
Fut 100

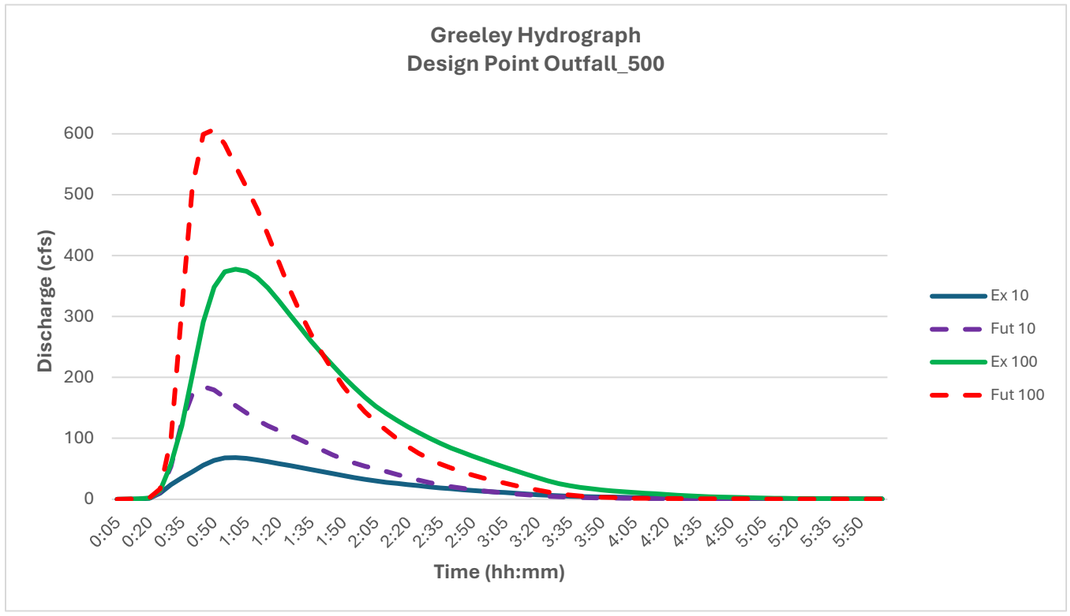

Greeley Hydrograph
Design Point Outfall_418
Discharge (cfs)
0
10
20
30
40
50
60
0:05
0:20
0:35
0:50
1:05
1:20
1:35
1:50
2:05
2:20
2:35
2:50
3:05
3:20
3:35
3:50
4:05
4:20
4:35
4:50
5:05
5:20
5:35
5:50
Time (hh:mm)
Ex 10
Fut 10
Ex 100
Fut 100

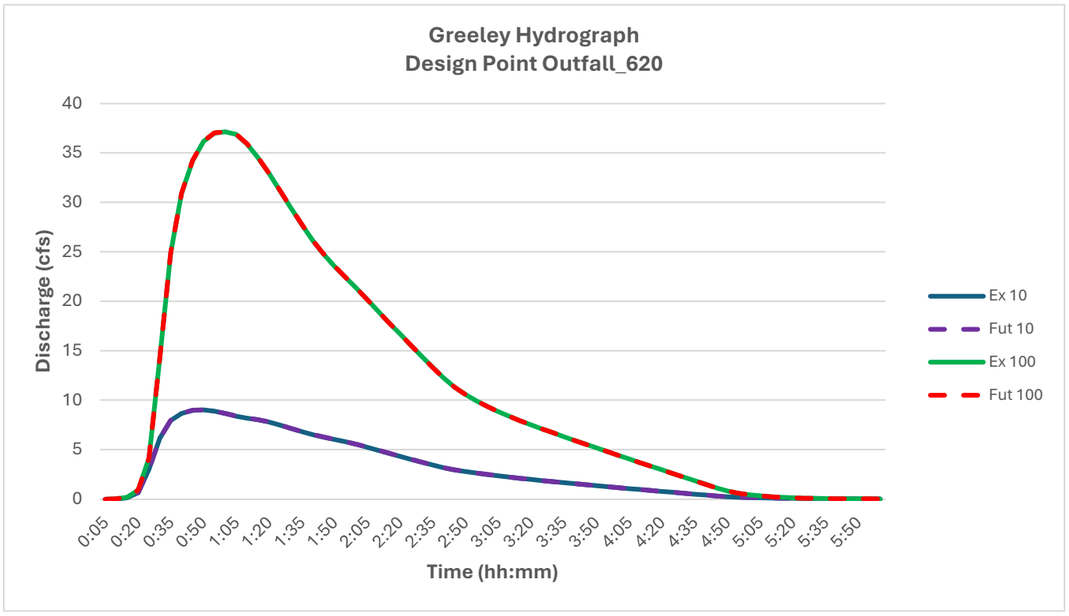

Greeley Hydrograph
Design Point Outfall_414
Discharge (cfs)
0
2
4
6
8
10
12
14
16
18
20
0:05
0:20
0:35
0:50
1:05
1:20
1:35
1:50
2:05
2:20
2:35
2:50
3:05
3:20
3:35
3:50
4:05
4:20
4:35
4:50
5:05
5:20
5:35
5:50
Time (hh:mm)
Ex 10
Fut 10
Ex 100
Fut 100

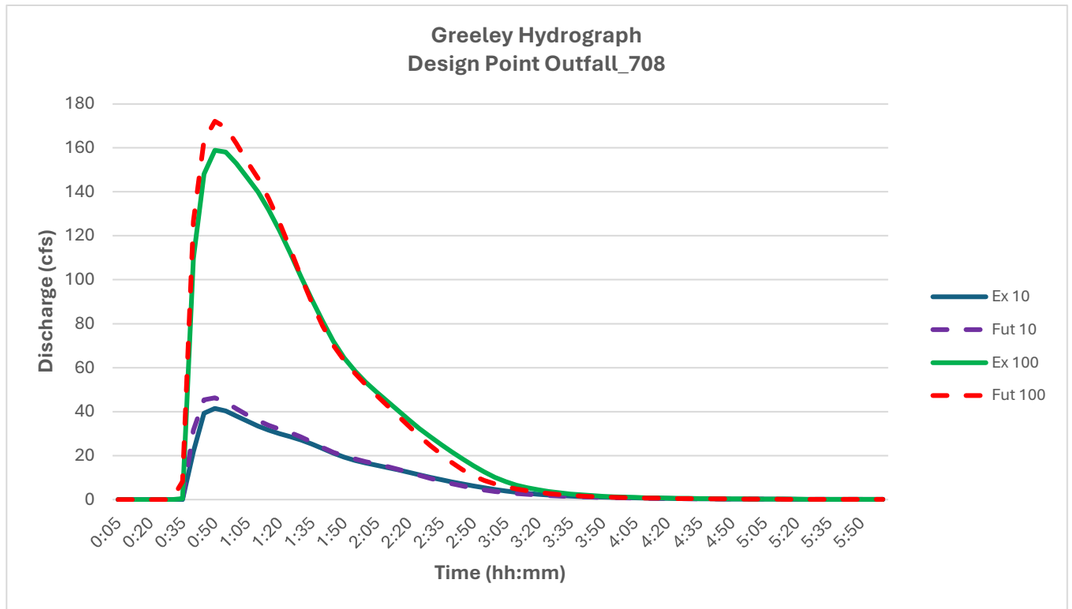

Greeley Hydrograph
Design Point Outfall_422
Discharge (cfs)
0
0.5
1
1.5
2
2.5
3
0:05
0:20
0:35
0:50
1:05
1:20
1:35
1:50
2:05
2:20
2:35
2:50
3:05
3:20
3:35
3:50
4:05
4:20
4:35
4:50
5:05
5:20
5:35
5:50
Time (hh:mm)
Ex 10
Fut 10
Ex 100
Fut 100

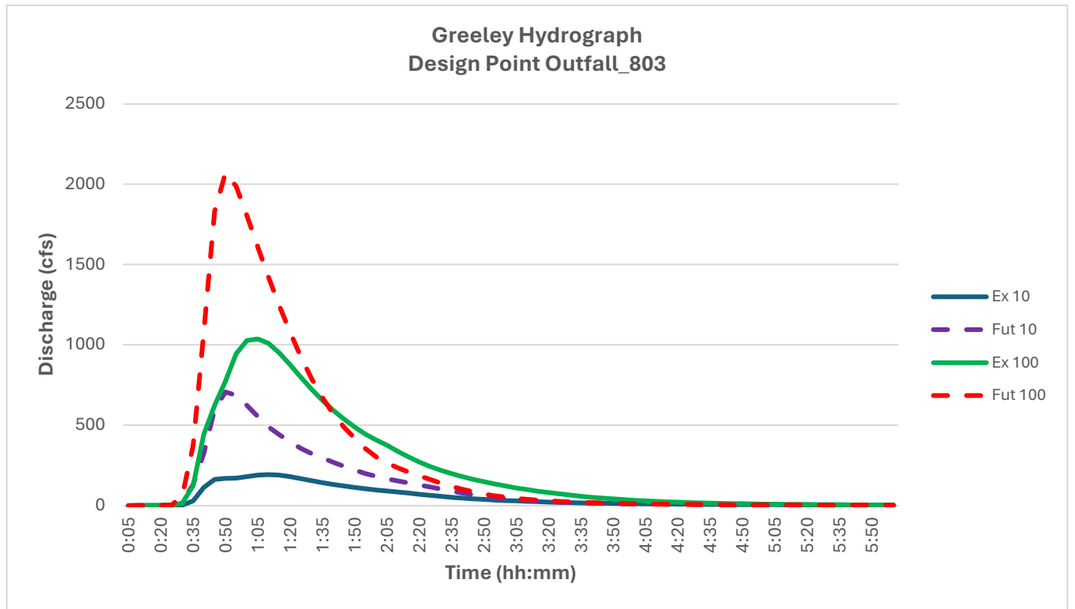

Greeley Hydrograph
Design Point Outfall_426
Discharge (cfs)
60
50
40
30
20
10
0
0:05 0:20 0:35 0:50 1:05 1:20 1:35 1:50 2:05 2:20 2:35 2:50 3:05 3:20 3:35 3:50 4:05 4:20 4:35 4:50 5:05 5:20 5:35 5:50
Time (hh:mm)
Ex 10
Fut 10
Ex 100
Fut 100

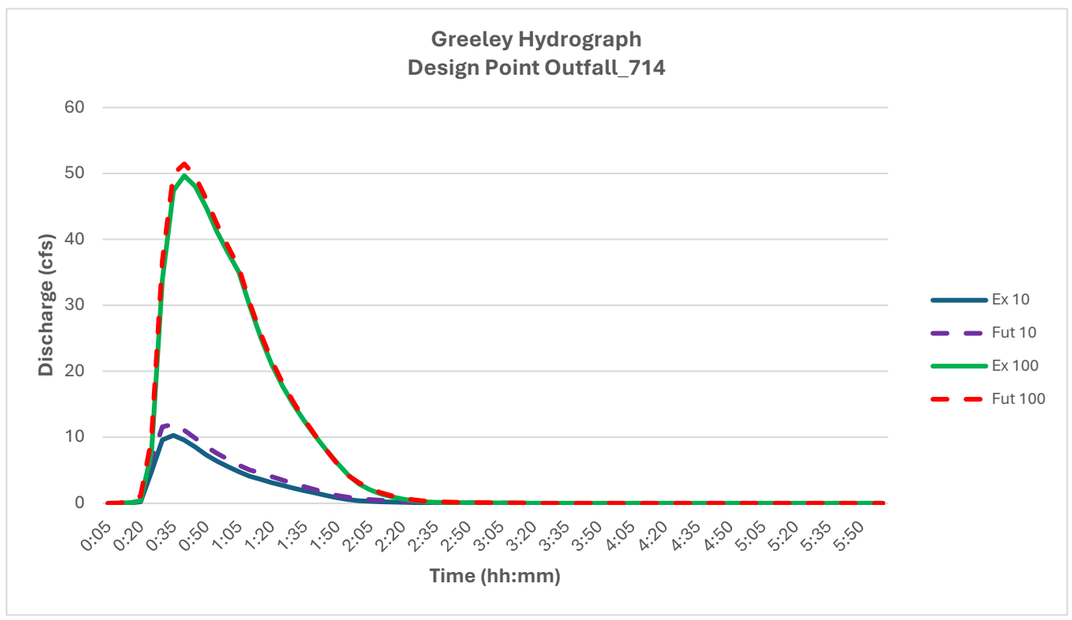

Greeley Hydrograph
Design Point Outfall_600
Discharge (cfs)
900
800
700
600
500
400
300
200
100
0
0:05 0:20 0:35 0:50 1:05 1:20 1:35 1:50 2:05 2:20 2:35 2:50 3:05 3:20 3:35 3:50 4:05 4:20 4:35 4:50 5:05 5:20 5:35 5:50
Time (hh:mm)
Ex 10
Fut 10
Ex 100
Fut 100

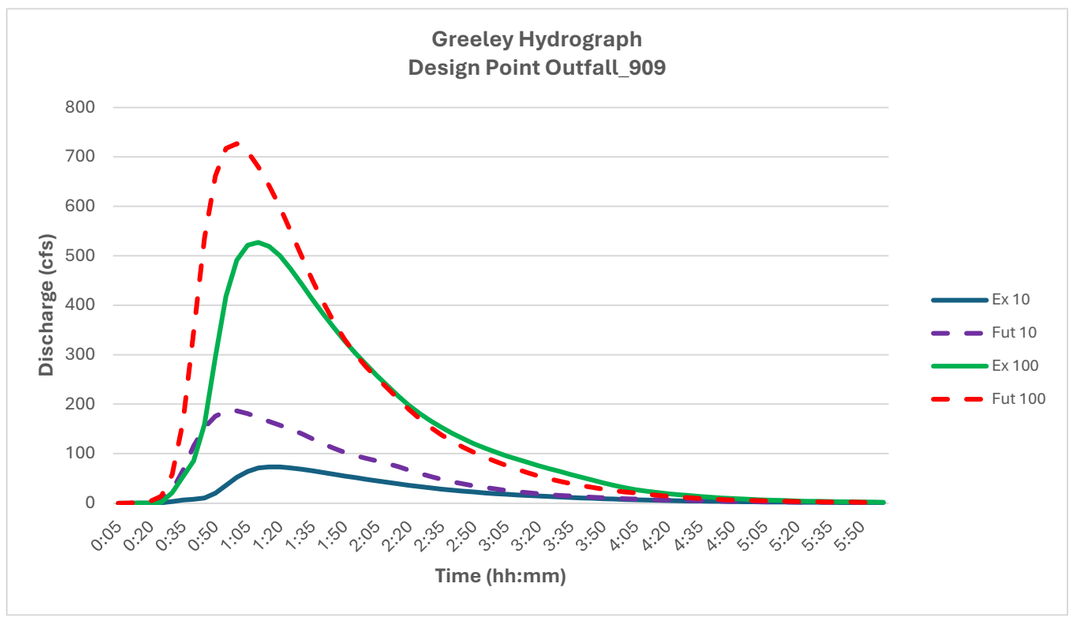

Greeley Hydrograph
Design Point Outfall_500
Discharge (cfs)
600
500
400
300
200
100
0
0:05 0:20 0:35 0:50 1:05 1:20 1:35 1:50 2:05 2:20 2:35 2:50 3:05 3:20 3:35 3:50 4:05 4:20 4:35 4:50 5:05 5:20 5:35 5:50
Time (hh:mm)
Ex 10
Fut 10
Ex 100
Fut 100

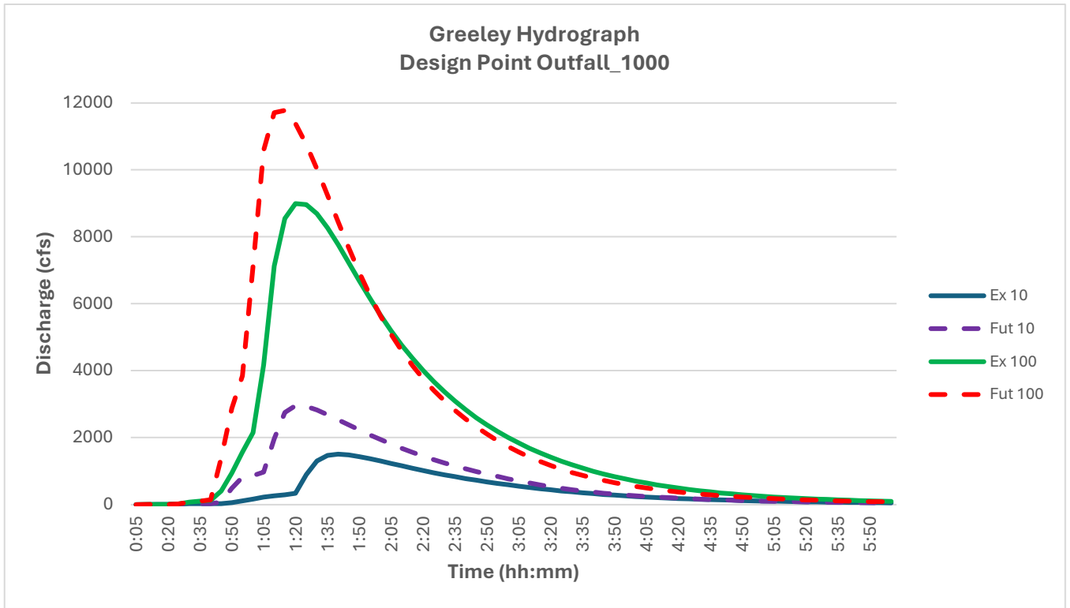

Greeley Hydrograph
Design Point Outfall_620
Discharge (cfs)
40
35
30
25
20
15
10
5
0
0:05 0:20 0:35 0:50 1:05 1:20 1:35 1:50 2:05 2:20 2:35 2:50 3:05 3:20 3:35 3:50 4:05 4:20 4:35 4:50 5:05 5:20 5:35 5:50
Time (hh:mm)
Ex 10
Fut 10
Ex 100
Fut 100

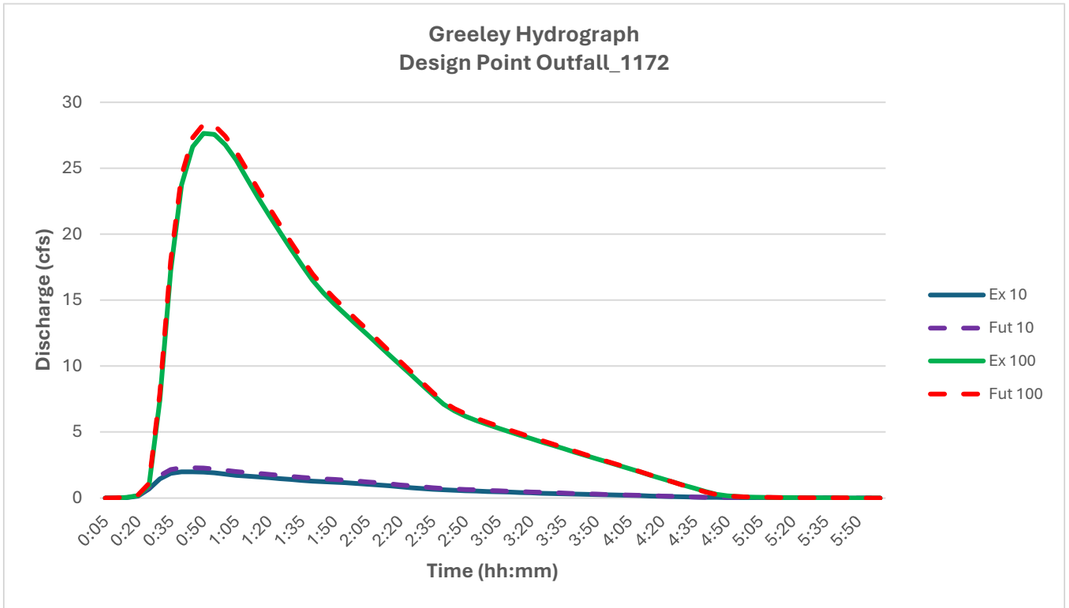

Greeley Hydrograph
Design Point Outfall_708
Discharge (cfs)
Time (hh:mm)
Ex 10
Fut 10
Ex 100
Fut 100

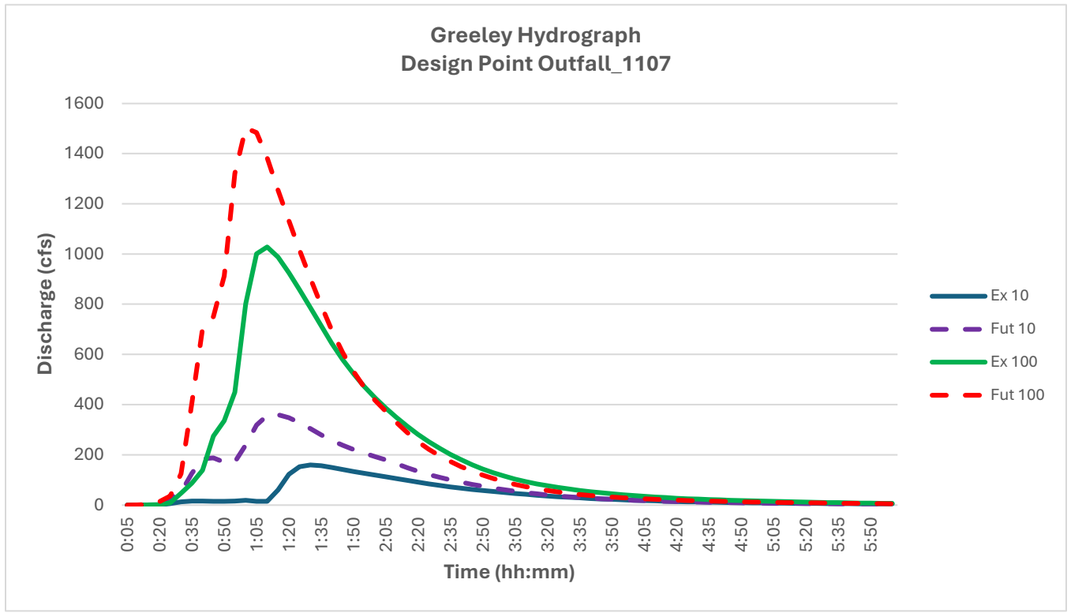

Greeley Hydrograph
Design Point Outfall_803
Discharge (cfs)
Time (hh:mm)
Ex 10
Fut 10
Ex 100
Fut 100

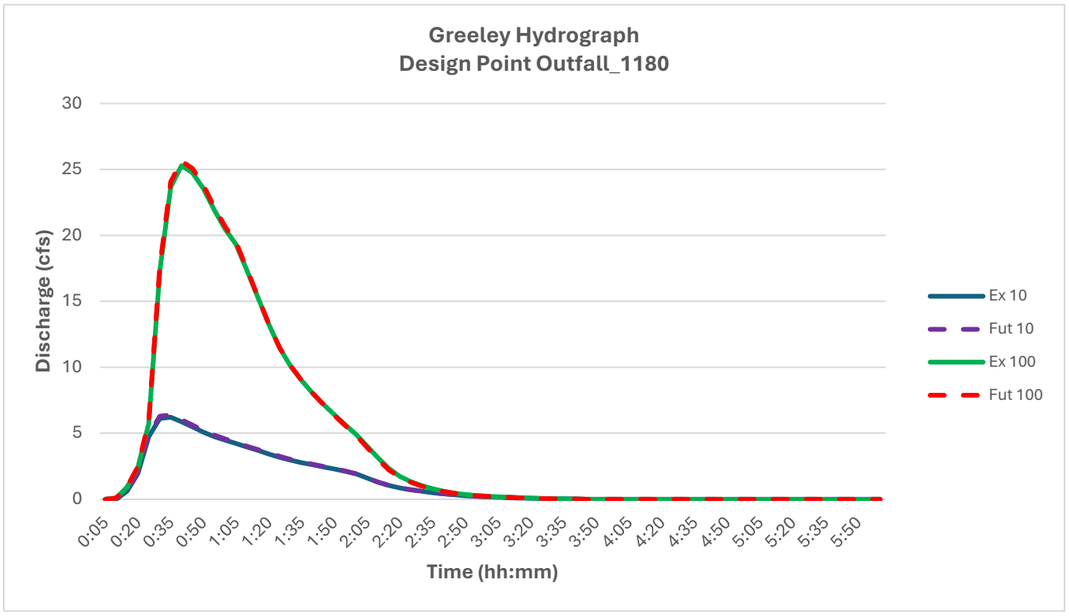

Greeley Hydrograph
Design Point Outfall_714
Discharge (cfs)
Time (hh:mm)
Ex 10
Fut 10
Ex 100
Fut 100

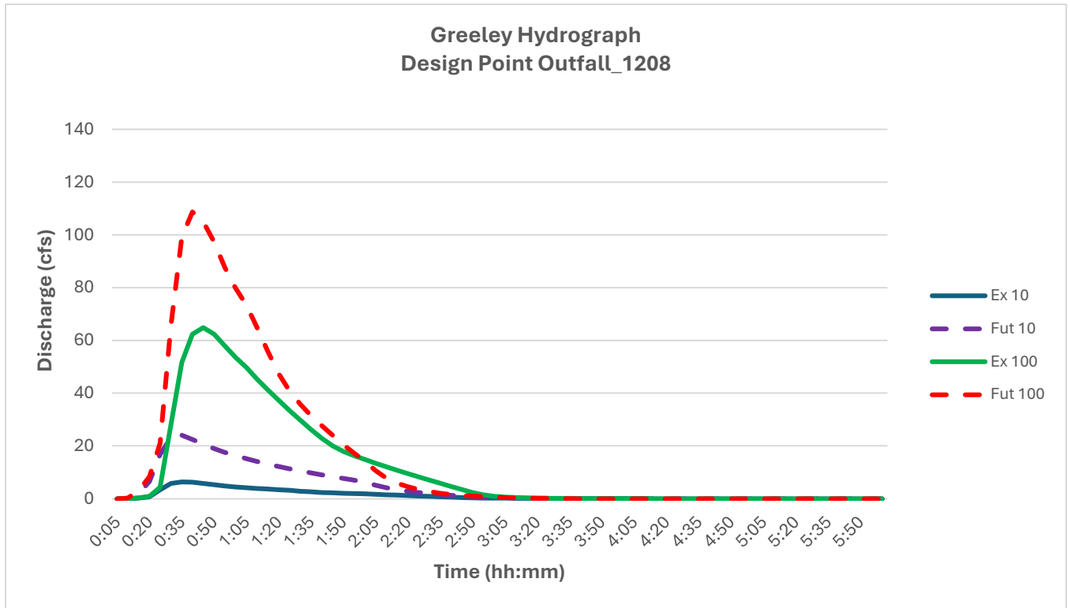

Greeley Hydrograph
Design Point Outfall_909
Discharge (cfs)
Time (hh:mm)
Ex 10
Fut 10
Ex 100
Fut 100

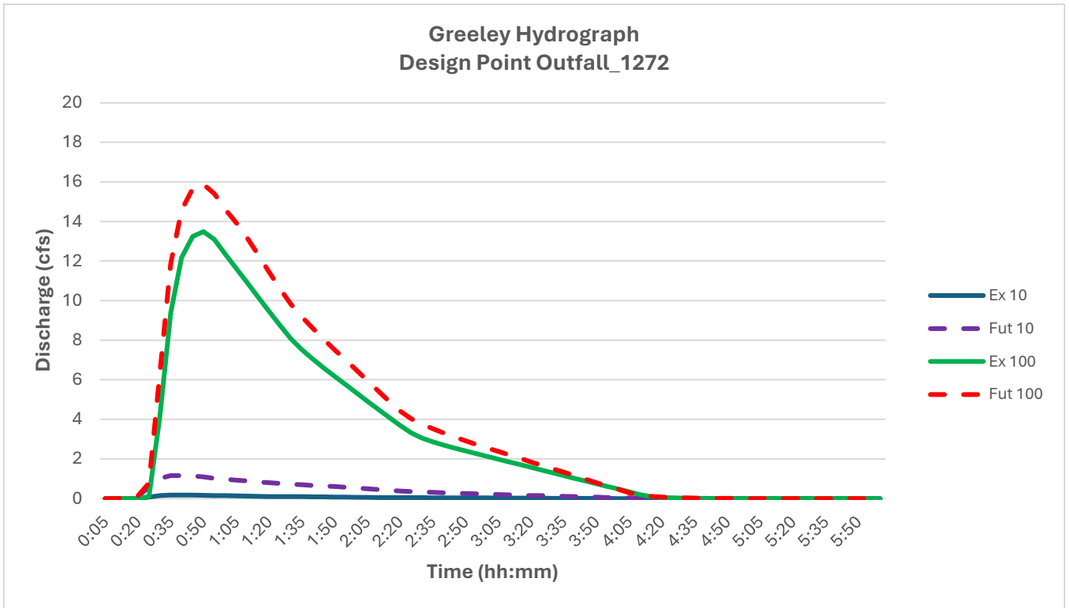

Greeley Hydrograph
Design Point Outfall_1000
Discharge (cfs)
12000
10000
8000
6000
4000
2000
0
0:05 0:20 0:35 0:50 1:05 1:20 1:35 1:50 2:05 2:20 2:35 2:50 3:05 3:20 3:35 3:50 4:05 4:20 4:35 4:50 5:05 5:20 5:35 5:50
Time (hh:mm)
Ex 10
Fut 10
Ex 100
Fut 100

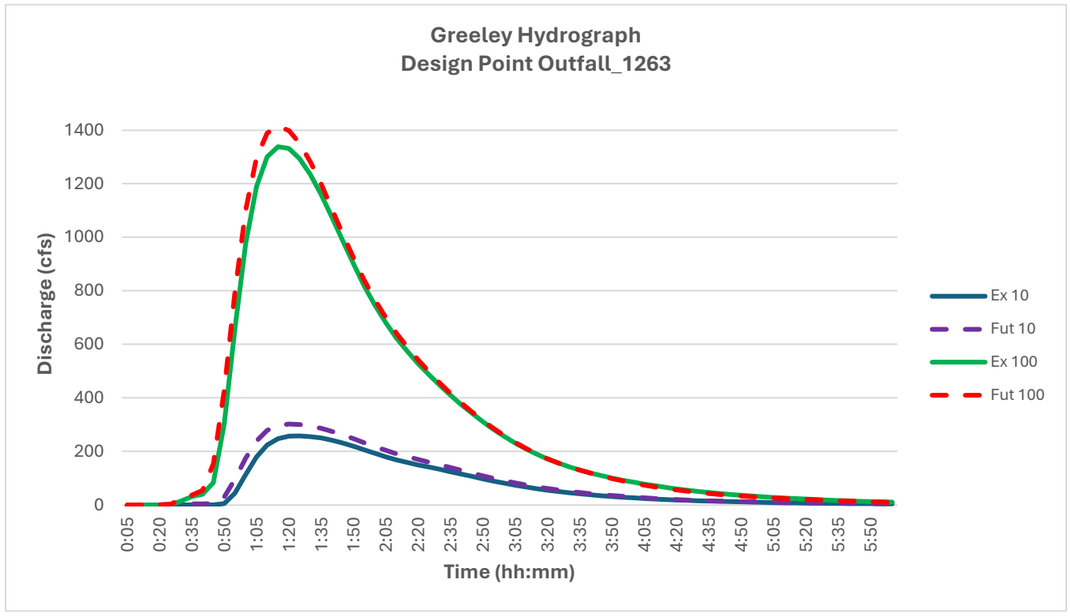

Greeley Hydrograph
Design Point Outfall_1172
Discharge (cfs)
30
25
20
15
10
5
0
0:05 0:20 0:35 0:50 1:05 1:20 1:35 1:50 2:05 2:20 2:35 2:50 3:05 3:20 3:35 3:50 4:05 4:20 4:35 4:50 5:05 5:20 5:35 5:50
Time (hh:mm)
Ex 10
Fut 10
Ex 100
Fut 100

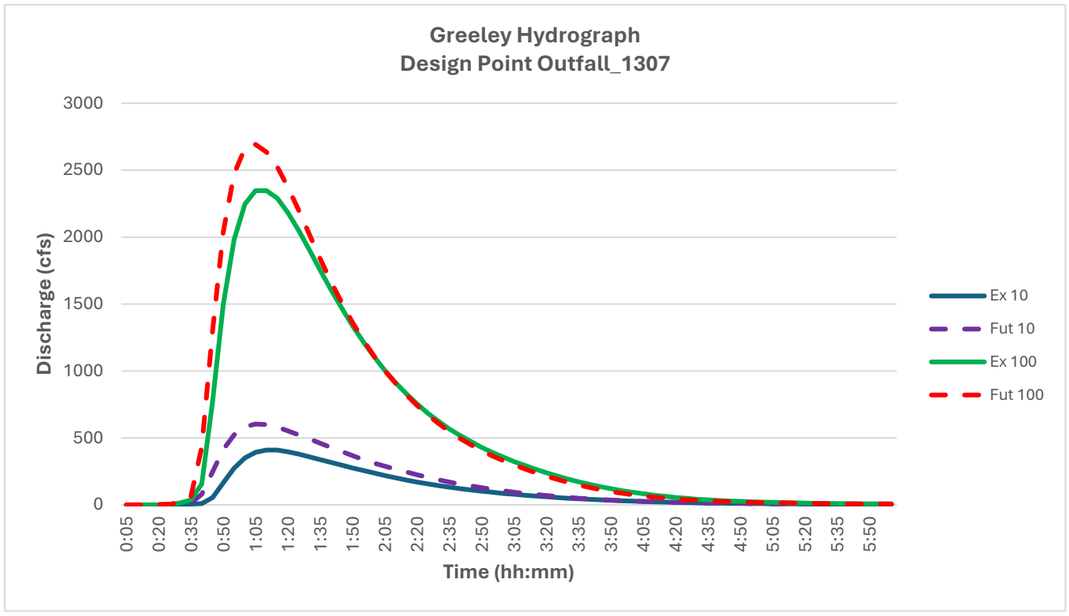

Greeley Hydrograph
Design Point Outfall_1107
Discharge (cfs)
1600
1400
1200
1000
800
600
400
200
0
0:05 0:20 0:35 0:50 1:05 1:20 1:35 1:50 2:05 2:20 2:35 2:50 3:05 3:20 3:35 3:50 4:05 4:20 4:35 4:50 5:05 5:20 5:35 5:50
Time (hh:mm)
Ex 10
Fut 10
Ex 100
Fut 100

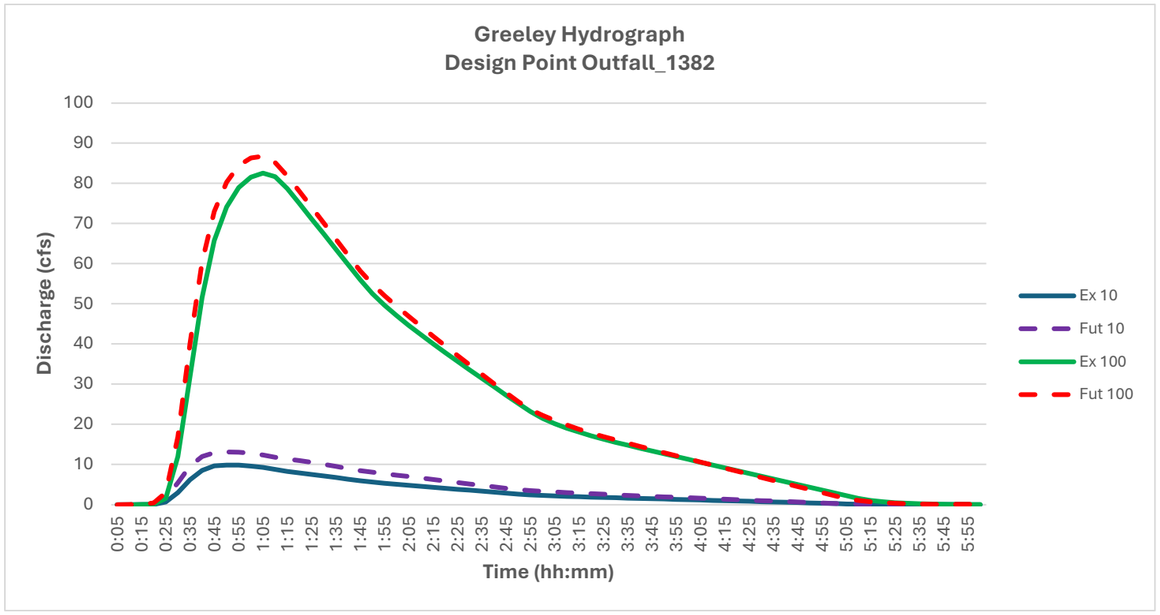

Greeley Hydrograph
Design Point Outfall_1180
Discharge (cfs)
30
25
20
15
10
5
0
0:05 0:20 0:35 0:50 1:05 1:20 1:35 1:50 2:05 2:20 2:35 2:50 3:05 3:20 3:35 3:50 4:05 4:20 4:35 4:50 5:05 5:20 5:35 5:50
Time (hh:mm)
Ex 10
Fut 10
Ex 100
Fut 100


Greeley Hydrograph
Design Point Outfall_1208
Discharge (cfs)
0
20
40
60
80
100
120
140
0:05
0:20
0:35
0:50
1:05
1:20
1:35
1:50
2:05
2:20
2:35
2:50
3:05
3:20
3:35
3:50
4:05
4:20
4:35
4:50
5:05
5:20
5:35
5:50
Time (hh:mm)
Ex 10
Fut 10
Ex 100
Fut 100


Greeley Hydrograph
Design Point Outfall_1272
Discharge (cfs)
0
2
4
6
8
10
12
14
16
18
20
0:05
0:20
0:35
0:50
1:05
1:20
1:35
1:50
2:05
2:20
2:35
2:50
3:05
3:20
3:35
3:50
4:05
4:20
4:35
4:50
5:05
5:20
5:35
5:50
Time (hh:mm)
Ex 10
Fut 10
Ex 100
Fut 100


Greeley Hydrograph
Design Point Outfall_1263
Discharge (cfs)
0
200
400
600
800
1000
1200
1400
0:05
0:20
0:35
0:50
1:05
1:20
1:35
1:50
2:05
2:20
2:35
2:50
3:05
3:20
3:35
3:50
4:05
4:20
4:35
4:50
5:05
5:20
5:35
5:50
Time (hh:mm)
Ex 10
Fut 10
Ex 100
Fut 100


Greeley Hydrograph
Design Point Outfall_1307
Discharge (cfs)
0
500
1000
1500
2000
2500
3000
0:05
0:20
0:35
0:50
1:05
1:20
1:35
1:50
2:05
2:20
2:35
2:50
3:05
3:20
3:35
3:50
4:05
4:20
4:35
4:50
5:05
5:20
5:35
5:50
Time (hh:mm)
Ex 10
Fut 10
Ex 100
Fut 100


Greeley Hydrograph
Design Point Outfall_1382
Discharge (cfs)
100
90
80
70
60
50
40
30
20
10
0
0:05
0:15
0:25
0:35
0:45
0:55
1:05
1:15
1:25
1:35
1:45
1:55
2:05
2:15
2:25
2:35
2:45
2:55
3:05
3:15
3:25
3:35
3:45
3:55
4:05
4:15
4:25
4:35
4:45
4:55
5:05
5:15
5:25
5:35
5:45
5:55
Time (hh:mm)
Ex 10
Fut 10
Ex 100
Fut 100

Return Period	2-Year
1Hr Depth	0.85
6Hr Depth	1.28
Area Adjust	0 Sq. Mi.
Time	Depth
0:05	0.02
0:10	0.03
0:15	0.07
0:20	0.14
0:25	0.21
0:25	0.12
0:35	0.05
0:40	0.04
0:45	0.03
0:50	0.03
0:55	0.03
1:00	0.03
1:05	0.03
1:10	0.02
1:15	0.02
1:20	0.02
1:25	0.02
1:30	0.02
1:35	0.02
1:40	0.02
1:45	0.02
1:50	0.02
1:55	0.01
2:00	0.01
2:05	0.00
Total Depth (in)	0.98

Return Period	5-Year
1Hr Depth	1.12
6Hr Depth	1.67
Area Adjust	0 Sq. Mi.
Time	Depth
0:05	0.02
0:10	0.04
0:15	0.10
0:20	0.17
0:25	0.28
0:25	0.15
0:35	0.06
0:40	0.05
0:45	0.04
0:50	0.04
0:55	0.03
1:00	0.03
1:05	0.03
1:10	0.03
1:15	0.03
1:20	0.02
1:25	0.02
1:30	0.02
1:35	0.02
1:40	0.02
1:45	0.02
1:50	0.02
1:55	0.02
2:00	0.01
2:05	0.00
Total Depth (in)	1.30

Return Period	10-Year
1Hr Depth	1.40
6Hr Depth	2.08
Area Adjust	0 Sq. Mi.
Time	Depth
0:05	0.03
0:10	0.05
0:15	0.11
0:20	0.21
0:25	0.35
0:30	0.17
0:35	0.08
0:40	0.06
0:45	0.05
0:50	0.04
0:55	0.04
1:00	0.04
1:05	0.04
1:10	0.04
1:15	0.04
1:20	0.03
1:25	0.03
1:30	0.03
1:35	0.03
1:40	0.03
1:45	0.03
1:50	0.03
1:55	0.02
2:00	0.02
2:05	0.00
Total Depth (in)	1.62

Return Period	25-Year
1Hr Depth	1.87
6Hr Depth	2.77
Area Adjust	0 Sq. Mi.
Time	Depth
0:05	0.02
0:10	0.07
0:15	0.09
0:20	0.15
0:25	0.28
0:30	0.47
0:35	0.22
0:40	0.15
0:45	0.09
0:50	0.09
0:55	0.06
1:00	0.06
1:05	0.06
1:10	0.04
1:15	0.04
1:20	0.03
1:25	0.03
1:30	0.03
1:35	0.03
1:40	0.03
1:45	0.03
1:50	0.03
1:55	0.03
2:00	0.03
2:05	0.00
Total Depth (in)	2.16

Return Period	50-Year
1Hr Depth	2.30
6Hr Depth	3.39
Area Adjust	0 Sq. Mi.
Time	Depth
0:05	0.03
0:10	0.08
0:15	0.11
0:20	0.18
0:25	0.35
0:30	0.57
0:35	0.28
0:40	0.18
0:45	0.11
0:50	0.11
0:55	0.07
1:00	0.07
1:05	0.07
1:10	0.06
1:15	0.06
1:20	0.04
1:25	0.04
1:30	0.03
1:35	0.03
1:40	0.03
1:45	0.03
1:50	0.03
1:55	0.03
2:00	0.03
2:05	0.00
Total Depth (in)	2.66

Return Period	100-Year
1Hr Depth	2.79
6Hr Depth	4.11
Area Adjust	0 Sq. Mi.
Time	Depth
0:05	0.03
0:10	0.08
0:15	0.13
0:20	0.22
0:25	0.39
0:30	0.70
0:35	0.39
0:40	0.22
0:45	0.17
0:50	0.14
0:55	0.11
1:00	0.11
1:05	0.11
1:10	0.06
1:15	0.06
1:20	0.03
1:25	0.03
1:30	0.03
1:35	0.03
1:40	0.03
1:45	0.03
1:50	0.03
1:55	0.03
2:00	0.03
2:05	0.00
Total Depth (in)	3.23

Return Period	2-Year
1Hr Depth	0.84
6Hr Depth	1.28
Area Adjust	0 Sq. Mi.
Time	Depth
0:05	0.02
0:10	0.03
0:15	0.07
0:20	0.13
0:25	0.21
0:25	0.12
0:35	0.05
0:40	0.04
0:45	0.03
0:50	0.03
0:55	0.03
1:00	0.03
1:05	0.03
1:10	0.02
1:15	0.02
1:20	0.02
1:25	0.02
1:30	0.02
1:35	0.02
1:40	0.02
1:45	0.02
1:50	0.02
1:55	0.01
2:00	0.01
2:05	0.00
Total Depth (in)	0.97

Return Period	5-Year
1Hr Depth	1.12
6Hr Depth	1.67
Area Adjust	0 Sq. Mi.
Time	Depth
0:05	0.02
0:10	0.04
0:15	0.10
0:20	0.17
0:25	0.28
0:25	0.15
0:35	0.06
0:40	0.05
0:45	0.04
0:50	0.04
0:55	0.03
1:00	0.03
1:05	0.03
1:10	0.03
1:15	0.03
1:20	0.02
1:25	0.02
1:30	0.02
1:35	0.02
1:40	0.02
1:45	0.02
1:50	0.02
1:55	0.02
2:00	0.01
2:05	0.00
Total Depth (in)	1.30

Return Period	10-Year
1Hr Depth	1.40
6Hr Depth	2.08
Area Adjust	0 Sq. Mi.
Time	Depth
0:05	0.03
0:10	0.05
0:15	0.11
0:20	0.21
0:25	0.35
0:30	0.17
0:35	0.08
0:40	0.06
0:45	0.05
0:50	0.04
0:55	0.04
1:00	0.04
1:05	0.04
1:10	0.04
1:15	0.04
1:20	0.03
1:25	0.03
1:30	0.03
1:35	0.03
1:40	0.03
1:45	0.03
1:50	0.03
1:55	0.02
2:00	0.02
2:05	0.00
Total Depth (in)	1.62

Return Period	25-Year
1Hr Depth	1.87
6Hr Depth	2.78
Area Adjust	0 Sq. Mi.
Time	Depth
0:05	0.02
0:10	0.07
0:15	0.09
0:20	0.15
0:25	0.28
0:30	0.47
0:35	0.22
0:40	0.15
0:45	0.09
0:50	0.09
0:55	0.06
1:00	0.06
1:05	0.06
1:10	0.04
1:15	0.04
1:20	0.03
1:25	0.03
1:30	0.03
1:35	0.03
1:40	0.03
1:45	0.03
1:50	0.03
1:55	0.03
2:00	0.03
2:05	0.00
Total Depth (in)	2.16

Return Period	50-Year
1Hr Depth	2.31
6Hr Depth	3.41
Area Adjust	0 Sq. Mi.
Time	Depth
0:05	0.03
0:10	0.08
0:15	0.12
0:20	0.18
0:25	0.35
0:30	0.58
0:35	0.28
0:40	0.18
0:45	0.12
0:50	0.12
0:55	0.07
1:00	0.07
1:05	0.07
1:10	0.06
1:15	0.06
1:20	0.04
1:25	0.04
1:30	0.03
1:35	0.03
1:40	0.03
1:45	0.03
1:50	0.03
1:55	0.03
2:00	0.03
2:05	0.00
Total Depth (in)	2.67

Return Period	100-Year
1Hr Depth	2.8
6Hr Depth	4.13
Area Adjust	0 Sq. Mi.
Time	Depth
0:05	0.03
0:10	0.08
0:15	0.13
0:20	0.22
0:25	0.39
0:30	0.70
0:35	0.39
0:40	0.22
0:45	0.17
0:50	0.14
0:55	0.11
1:00	0.11
1:05	0.11
1:10	0.06
1:15	0.06
1:20	0.03
1:25	0.03
1:30	0.03
1:35	0.03
1:40	0.03
1:45	0.03
1:50	0.03
1:55	0.03
2:00	0.03
2:05	0.00
Total Depth (in)	3.24

Raingage	Return Period (Years)	1 Hr Depths (in)	6 Hr Depths (in)
Greeley	WQ	0.6	N/A
	2	0.844	1.28
	5	1.12	1.67
	10	1.4	2.08
	25	1.87	2.78
	50	2.31	3.41
	100	2.8	4.13
	500	4.18	6.19
GOS Greeley	WQ	0.6	N/A
	2	0.845	1.28
	5	1.12	1.67
	10	1.4	2.08
	25	1.87	2.77
	50	2.3	3.39
	100	2.79	4.11
	500	4.16	6.13

Enter "X" to Run Scenario	Scenario ID	Land Use (E or F)	Return Period (yr)	Correction Area (Sq.Mi.)
X	1	E	WQ	0
X	2	E	2	0
X	3	E	5	0
X	4	E	10	0
X	5	E	25	0
X	6	E	50	0
X	7	E	100	0
X	8	E	500	0
X	9	F	WQ	0
X	10	F	2	0
X	11	F	5	0
X	12	F	10	0
X	13	F	25	0
X	14	F	50	0
X	15	F	100	0
X	16	F	500	0

Subcatchment Name	Existing Landuse % Imperviousness	Future Landuse % Imperviousness
110	4.8	4.8
114	3.8	3.8
118	2.0	2.0
122	4.4	39.3
126	21.2	21.2
130	7.9	14.3
134	11.0	53.9
138	23.7	69.3
142	11.9	11.9
146	6.9	28.7
150	5.7	20.1
154	20.6	53.0
210	4.6	4.6
220	2.2	2.2
224	2.0	2.8
226	32.6	44.6
228	2.0	40.9
232	2.0	3.6
236	2.0	31.5
240	2.0	2.2
244	5.5	53.9
248	4.0	75.5
250	2.0	66.1
252	5.1	68.6
256	2.0	43.8
260	2.0	9.8
264	16.3	66.3
268	17.1	57.0
310	2.4	2.4
314	31.3	35.0
410	4.8	4.8
414	2.9	2.9
418	3.0	3.7
422	3.8	4.0
426	4.7	4.7
510	14.6	14.9
514	2.1	60.9

Subcatchment Name	Existing Landuse % Imperviousness	Future Landuse % Imperviousness
518	4.0	51.8
610	4.4	16.8
614	17.0	52.4
618	7.6	76.9
620	23.4	23.5
622	4.9	74.5
712	27.3	30.2
714	5.0	12.5
804	10.0	10.0
810	4.7	48.1
820	52.0	69.8
824	13.6	78.0
830	50.6	67.8
840	8.0	76.5
842	2.6	68.6
844	6.7	76.2
850	2.0	60.1
910	4.8	27.8
930	9.9	76.2
940	5.1	22.5
950	5.3	22.7
960	25.1	26.6
1032	45.0	47.3
1108	15.9	35.3
1180	18.5	41.0
1172	22.9	43.7
1110	10.2	46.2
1116	10.9	40.7
1124	7.9	56.9
1132	7.7	44.8
1126	47.8	67.1
1140	20.0	41.0
1142	21.7	44.8
1144	12.0	12.0
1148	7.8	68.2
1150	13.3	75.8
1152	45.1	47.5

Subcatchment Name	Existing Landuse % Imperviousness	Future Landuse % Imperviousness
1164	42.9	43.6
1208	14.7	36.0
1210	3.9	13.3
1216	2.8	12.7
1224	5.0	15.8
1226	4.4	29.8
1228	6.5	15.1
1230	2.1	12.0
1232	42.2	46.4
1234	45.2	45.3
1236	45.7	46.4
1238	45.0	45.0
1240	9.2	14.2
1248	45.2	48.1
1256	47.4	55.6
1258	16.3	16.3
1260	15.2	15.7
1264	2.3	12.2
1272	2.1	11.6
1274	11.5	20.3
1308	4.8	11.3
1310	6.8	13.0
1316	6.9	13.0
1318	6.7	12.5
1320	7.0	12.1
1322	8.1	12.0
1324	2.0	12.0
1328	20.8	20.8
1340	52.2	53.8
1348	9.2	13.7
1349	9.7	13.3
1352	4.4	12.0
1354	3.8	12.0
1356	9.7	14.3
1358	4.8	13.3
1164	42.9	43.6
1208	14.7	36.0

Subcatchment Name	Existing Landuse % Imperviousness	Future Landuse % Imperviousness
1164	42.9	43.6
1208	14.7	36.0
1210	3.9	13.3
1216	2.8	12.7
1224	5.0	15.8
1226	4.4	29.8
1228	6.5	15.1
1230	2.1	12.0
1232	42.2	46.4
1234	45.2	45.3
1236	45.7	46.4

								Depression Storage		Horton's Infiltration Parameters			DCIA Level and Fractions			
Catchment Name/ID	SWMM Node/ID	Raingage Name/ID	Area (sq.mi.)	Dist. to Centroid (miles)	Length (miles)	Slope (ft./ft.)	Percent Imperv.	Pervious (inches)	Imperv. (inches)	Initial Rate (in./hr.)	Final Rate (in.hr.)	Decay Coeff. (1/sec.)	DCIA Level	Dir. Con'ct Imperv. Fraction	Receiv. Perv. Fraction	Percent Eff. Imperv.
110	110	GOS GREELEY	0.111	0.506	0.975	0.027	4.8	0.35	0.10	3.00	0.50	0.0018	0.00	0.10	0.05	4.34
114	114	GOS GREELEY	0.175	0.346	0.914	0.031	3.8	0.40	0.10	3.00	0.50	0.0018	0.00	0.08	0.04	3.41
118	118	GOS GREELEY	0.059	0.278	0.474	0.048	2.0	0.40	0.10	3.00	0.50	0.0018	0.00	0.04	0.02	1.81
122	122	GOS GREELEY	0.192	0.486	1.184	0.027	4.4	0.35	0.10	3.00	0.50	0.0018	0.00	0.09	0.04	4.00
126	126	GOS GREELEY	0.032	0.133	0.286	0.013	21.2	0.40	0.10	4.50	0.60	0.0018	0.00	0.42	0.13	19.74
130	130	GOS GREELEY	0.073	0.318	0.607	0.038	7.9	0.35	0.10	3.00	0.50	0.0018	0.00	0.16	0.08	7.20
134	134	GOS GREELEY	0.084	0.217	0.593	0.028	11.0	0.35	0.10	3.00	0.50	0.0018	0.00	0.22	0.10	10.16
138	138	GOS GREELEY	0.130	0.176	0.483	0.017	23.7	0.35	0.10	3.00	0.50	0.0018	0.00	0.47	0.14	22.55
142	142	GOS GREELEY	0.031	0.233	0.500	0.034	11.9	0.40	0.10	3.00	0.50	0.0018	0.00	0.24	0.11	11.03
146	146	GOS GREELEY	0.062	0.463	0.831	0.033	6.9	0.35	0.10	3.00	0.50	0.0018	0.00	0.14	0.07	6.35
150	150	GOS GREELEY	0.093	0.272	0.641	0.040	5.7	0.35	0.10	3.00	0.50	0.0018	0.00	0.11	0.06	5.18
154	154	GOS GREELEY	0.139	0.231	0.515	0.027	20.6	0.35	0.10	3.00	0.50	0.0018	0.00	0.41	0.13	19.48
210	210	GOS GREELEY	0.076	0.155	0.506	0.042	4.6	0.35	0.10	3.00	0.50	0.0018	0.00	0.09	0.05	4.19
220	220	GOS GREELEY	0.156	0.410	0.800	0.034	2.2	0.40	0.10	3.00	0.50	0.0018	0.00	0.04	0.02	1.96
224	224	GOS GREELEY	0.100	0.239	0.642	0.041	2.0	0.35	0.10	3.00	0.50	0.0018	0.00	0.04	0.02	1.81
226	226	GOS GREELEY	0.095	0.307	0.593	0.034	32.6	0.35	0.10	3.00	0.50	0.0018	0.00	0.65	0.18	31.52
228	228	GOS GREELEY	0.103	0.359	0.664	0.026	2.0	0.35	0.10	3.00	0.50	0.0018	0.00	0.04	0.02	1.81
232	232	GOS GREELEY	0.166	0.432	0.945	0.034	2.0	0.35	0.10	3.00	0.50	0.0018	0.00	0.04	0.02	1.81
236	236	GOS GREELEY	0.094	0.355	0.753	0.036	2.0	0.35	0.10	3.00	0.50	0.0018	0.00	0.04	0.02	1.81
240	240	GOS GREELEY	0.034	0.160	0.395	0.051	2.0	0.40	0.10	3.00	0.50	0.0018	0.00	0.04	0.02	1.81
244	244	GOS GREELEY	0.141	0.480	0.830	0.038	5.5	0.35	0.10	3.00	0.50	0.0018	0.00	0.11	0.05	4.99
248	248	GOS GREELEY	0.151	0.284	0.543	0.016	4.0	0.35	0.10	3.00	0.50	0.0018	0.00	0.08	0.04	3.66
250	250	GOS GREELEY	0.068	0.120	0.339	0.022	2.0	0.35	0.10	3.00	0.50	0.0018	0.00	0.04	0.02	1.81
252	252	GOS GREELEY	0.098	0.393	0.739	0.021	5.1	0.35	0.10	3.00	0.50	0.0018	0.00	0.10	0.05	4.66
256	256	GOS GREELEY	0.146	0.554	0.954	0.032	2.0	0.35	0.10	4.50	0.60	0.0018	0.00	0.04	0.02	1.76
260	260	GOS GREELEY	0.101	0.321	0.670	0.050	2.0	0.35	0.10	3.00	0.50	0.0018	0.00	0.04	0.02	1.81
264	264	GOS GREELEY	0.107	0.331	0.854	0.024	16.3	0.35	0.10	3.00	0.50	0.0018	0.00	0.33	0.12	15.23
268	268	GOS GREELEY	0.092	0.287	0.637	0.018	17.1	0.35	0.10	3.00	0.50	0.0018	0.00	0.34	0.12	16.02
310	310	GOS GREELEY	0.138	0.389	0.760	0.038	2.4	0.40	0.10	4.50	0.60	0.0018	0.00	0.05	0.02	2.14
314	314	GOS GREELEY	0.108	0.245	0.526	0.038	31.3	0.35	0.10	4.50	0.60	0.0018	0.00	0.63	0.17	29.79
410	410	GOS GREELEY	0.021	0.189	0.311	0.073	4.8	0.40	0.10	3.00	0.50	0.0018	0.00	0.10	0.05	4.41
414	414	GOS GREELEY	0.019	0.143	0.263	0.087	2.9	0.40	0.10	3.00	0.50	0.0018	0.00	0.06	0.03	2.67
418	418	GOS GREELEY	0.062	0.276	0.605	0.047	3.0	0.35	0.10	3.00	0.50	0.0018	0.00	0.06	0.03	2.69

								Depression Storage		Horton's Infiltration Parameters			DCIA Level and Fractions			
Catchment Name/ID	SWMM Node/ID	Raingage Name/ID	Area (sq.mi.)	Dist. to Centroid (miles)	Length (miles)	Slope (ft./ft.)	Percent Imperv.	Pervious (inches)	Imperv. (inches)	Initial Rate (in./hr.)	Final Rate (in.hr.)	Decay Coeff. (1/sec.)	DCIA Level	Dir. Con'ct Imperv. Fraction	Receiv. Perv. Fraction	Percent Eff. Imperv.
422	422	GOS GREELEY	0.006	0.102	0.196	0.097	3.8	0.40	0.10	5.00	1.00	0.0007	0.00	0.08	0.04	3.01
426	426	GOS GREELEY	0.068	0.320	0.635	0.046	4.7	0.35	0.10	4.50	0.60	0.0018	0.00	0.09	0.05	4.13
510	510	GOS GREELEY	0.193	0.483	0.920	0.033	14.6	0.35	0.10	3.00	0.50	0.0018	0.00	0.29	0.11	13.60
514	514	GOS GREELEY	0.138	0.457	0.927	0.025	2.1	0.35	0.10	3.00	0.50	0.0018	0.00	0.04	0.02	1.92
518	518	GOS GREELEY	0.125	0.298	0.642	0.024	4.0	0.35	0.10	3.00	0.50	0.0018	0.00	0.08	0.04	3.60
610	610	GOS GREELEY	0.166	0.452	0.971	0.032	4.4	0.35	0.10	3.00	0.50	0.0018	0.00	0.09	0.04	3.98
614	614	GOS GREELEY	0.157	0.330	0.607	0.036	17.0	0.35	0.10	3.00	0.50	0.0018	0.00	0.34	0.12	15.94
618	618	GOS GREELEY	0.084	0.185	0.446	0.026	7.6	0.35	0.10	3.00	0.50	0.0018	0.00	0.15	0.08	6.99
620	620	GREELEY	0.053	0.272	0.598	0.008	23.4	0.35	0.10	3.00	0.50	0.0018	0.00	0.47	0.14	22.29
622	622	GOS GREELEY	0.161	0.336	0.673	0.019	4.9	0.35	0.10	3.00	0.50	0.0018	0.00	0.10	0.05	4.43
712	712	GREELEY	0.140	0.346	0.764	0.033	27.3	0.35	0.10	3.00	0.50	0.0018	0.00	0.55	0.16	26.15
714	714	GREELEY	0.035	0.091	0.212	0.030	5.0	0.35	0.10	3.00	0.50	0.0018	0.00	0.10	0.05	4.57
804	804	GREELEY	0.040	0.085	0.381	0.018	10.0	0.35	0.10	5.00	1.00	0.0007	0.00	0.20	0.10	8.06
810	810	GREELEY	0.115	0.242	0.599	0.011	4.7	0.35	0.10	3.00	0.50	0.0018	0.00	0.09	0.05	4.26
820	820	GREELEY	0.127	0.170	0.537	0.021	52.0	0.35	0.10	3.00	0.50	0.0018	0.00	0.86	0.24	51.19
824	824	GREELEY	0.068	0.192	0.421	0.017	13.6	0.35	0.10	3.00	0.50	0.0018	0.00	0.27	0.11	12.63
830	830	GREELEY	0.111	0.121	0.541	0.019	50.6	0.35	0.10	3.00	0.50	0.0018	0.00	0.85	0.23	49.78
840	840	GREELEY	0.100	0.339	0.674	0.023	8.0	0.35	0.10	3.00	0.50	0.0018	0.00	0.16	0.08	7.34
842	842	GREELEY	0.173	0.312	0.834	0.016	2.6	0.35	0.10	3.00	0.50	0.0018	0.00	0.05	0.03	2.37
844	844	GREELEY	0.198	0.278	0.542	0.016	6.7	0.35	0.10	3.00	0.50	0.0018	0.00	0.13	0.07	6.11
850	850	GREELEY	0.156	0.361	0.569	0.023	2.0	0.35	0.10	4.50	0.60	0.0018	0.00	0.04	0.02	1.76
910	910	GREELEY	0.159	0.415	0.843	0.019	4.8	0.35	0.10	4.30	0.70	0.0014	0.00	0.10	0.05	4.17
930	930	GREELEY	0.164	0.350	0.704	0.011	9.9	0.35	0.10	3.50	0.60	0.0016	0.00	0.20	0.10	8.94
940	940	GREELEY	0.142	0.346	0.667	0.015	5.1	0.35	0.10	3.70	0.50	0.0018	0.00	0.10	0.05	4.57
950	950	GREELEY	0.173	0.439	0.819	0.011	5.3	0.35	0.10	3.70	0.50	0.0018	0.00	0.11	0.05	4.78
960	960	GREELEY	0.059	0.083	0.394	0.014	25.1	0.35	0.10	3.40	0.50	0.0018	0.00	0.50	0.15	23.94
1032	1032	GREELEY	0.015	0.070	0.215	0.022	45.0	0.35	0.10	5.00	1.00	0.0007	0.00	0.82	0.21	42.94
1108	1108	GREELEY	0.006	0.064	0.152	0.080	15.9	0.35	0.10	5.00	1.00	0.0007	0.00	0.32	0.12	13.52
1110	1110	GREELEY	0.027	0.183	0.364	0.036	18.5	0.35	0.10	5.00	1.00	0.0007	0.00	0.37	0.13	15.89
1116	1116	GREELEY	0.094	0.202	0.577	0.025	22.9	0.35	0.10	4.20	0.80	0.0011	0.00	0.46	0.14	20.95
1124	1124	GREELEY	0.046	0.115	0.500	0.017	10.2	0.35	0.10	4.40	0.90	0.0010	0.00	0.20	0.10	8.64
1132	1132	GREELEY	0.040	0.129	0.294	0.028	10.9	0.35	0.10	5.00	1.00	0.0007	0.00	0.22	0.10	8.92
1126	1126	GREELEY	0.094	0.053	0.406	0.019	7.9	0.35	0.10	5.00	1.00	0.0007	0.00	0.16	0.08	6.36
1140	1140	GREELEY	0.188	0.216	0.637	0.016	7.7	0.35	0.10	4.90	1.00	0.0008	0.00	0.15	0.08	6.28
1142	1142	GREELEY	0.029	0.158	0.370	0.018	47.8	0.35	0.10	4.90	1.00	0.0007	0.00	0.84	0.22	45.85
1144	1144	GREELEY	0.127	0.074	0.702	0.009	20.0	0.35	0.10	4.70	0.90	0.0008	0.00	0.40	0.13	17.63
1148	1148	GREELEY	0.170	0.376	0.793	0.016	21.7	0.35	0.10	4.90	1.00	0.0008	0.00	0.43	0.14	19.11

								Depression Storage		Horton's Infiltration Parameters			DCIA Level and Fractions			
Catchment Name/ID	SWMM Node/ID	Raingage Name/ID	Area (sq.mi.)	Dist. to Centroid (miles)	Length (miles)	Slope (ft./ft.)	Percent Imperv.	Pervious (inches)	Imperv. (inches)	Initial Rate (in./hr.)	Final Rate (in.hr.)	Decay Coeff. (1/sec.)	DCIA Level	Dir. Con'ct Imperv. Fraction	Receiv. Perv. Fraction	Percent Eff. Imperv.
1150	1150	GREELEY	0.088	0.262	0.862	0.010	12.0	0.35	0.10	4.70	0.90	0.0011	0.00	0.24	0.11	10.31
1152	1152	GREELEY	0.033	0.142	0.303	0.028	7.8	0.35	0.10	3.00	0.50	0.0018	0.00	0.16	0.08	7.10
1154	1154	GREELEY	0.085	0.390	0.513	0.019	13.3	0.35	0.10	3.50	0.60	0.0016	0.00	0.27	0.11	12.14
1156	1156	GREELEY	0.121	0.378	0.684	0.018	45.1	0.35	0.10	4.80	0.90	0.0009	0.00	0.83	0.22	43.37
1164	1164	GREELEY	0.184	0.339	0.558	0.017	44.6	0.35	0.10	3.60	0.50	0.0018	0.00	0.82	0.21	43.64
1172	1172	GREELEY	0.077	0.464	0.708	0.026	11.4	0.35	0.10	4.90	1.00	0.0007	0.00	0.23	0.10	9.33
1180	1180	GREELEY	0.021	0.153	0.401	0.035	42.9	0.35	0.10	4.30	0.80	0.0011	0.00	0.81	0.21	41.39
1208	1208	GREELEY	0.099	0.242	0.585	0.029	14.7	0.35	0.10	4.80	1.00	0.0008	0.00	0.29	0.11	12.53
1210	1210	GREELEY	0.152	0.280	0.852	0.009	3.9	0.35	0.10	5.00	1.00	0.0008	0.00	0.08	0.04	3.09
1216	1216	GREELEY	0.201	0.643	0.873	0.005	2.8	0.35	0.10	4.10	0.70	0.0013	0.00	0.06	0.03	2.42
1224	1224	GREELEY	0.126	0.300	0.851	0.013	5.0	0.35	0.10	4.20	0.60	0.0018	0.00	0.10	0.05	4.46
1226	1226	GREELEY	0.071	0.345	0.619	0.013	4.4	0.35	0.10	4.30	0.60	0.0018	0.00	0.09	0.04	3.86
1228	1228	GREELEY	0.057	0.233	0.623	0.012	6.5	0.35	0.10	4.60	0.70	0.0016	0.00	0.13	0.06	5.64
1230	1230	GREELEY	0.049	0.143	0.443	0.022	2.1	0.35	0.10	4.50	0.60	0.0017	0.00	0.04	0.02	1.88
1232	1232	GREELEY	0.195	0.209	0.603	0.019	42.2	0.35	0.10	4.10	0.60	0.0018	0.00	0.81	0.21	41.14
1234	1234	GREELEY	0.076	0.147	0.501	0.016	45.2	0.35	0.10	3.90	0.60	0.0018	0.00	0.83	0.22	44.11
1236	1236	GREELEY	0.119	0.414	0.752	0.014	45.7	0.35	0.10	3.50	0.60	0.0017	0.00	0.83	0.22	44.66
1238	1238	GREELEY	0.124	0.207	0.519	0.002	45.0	0.35	0.10	3.20	0.50	0.0018	0.00	0.83	0.22	44.10
1240	1240	GREELEY	0.039	0.139	0.244	0.015	9.2	0.35	0.10	4.20	0.60	0.0018	0.00	0.18	0.09	8.24
1248	1248	GREELEY	0.047	0.284	0.466	0.015	45.2	0.35	0.10	3.20	0.50	0.0018	0.00	0.83	0.22	44.29
1256	1256	GREELEY	0.092	0.319	0.557	0.011	47.4	0.35	0.10	4.30	0.60	0.0018	0.00	0.84	0.22	46.27
1258	1258	GREELEY	0.088	0.171	0.420	0.007	16.3	0.35	0.10	3.30	0.50	0.0018	0.00	0.33	0.12	15.24
1260	1260	GREELEY	0.099	0.286	0.709	0.011	15.2	0.35	0.10	3.30	0.50	0.0018	0.00	0.30	0.12	14.17
1264	1264	GREELEY	0.062	0.215	0.527	0.028	2.3	0.35	0.10	4.70	0.80	0.0013	0.00	0.05	0.02	1.97
1272	1272	GREELEY	0.036	0.253	0.484	0.029	2.1	0.35	0.10	5.00	1.00	0.0008	0.00	0.04	0.02	1.62
1274	1274	GREELEY	0.031	0.165	0.408	0.012	11.5	0.35	0.10	3.80	0.60	0.0018	0.00	0.23	0.10	10.41
1308	1308	GREELEY	0.098	0.378	0.680	0.019	4.8	0.35	0.10	4.50	0.70	0.0016	0.00	0.10	0.05	4.17
1310	1310	GREELEY	0.057	0.241	0.486	0.017	6.8	0.35	0.10	4.10	0.60	0.0018	0.00	0.14	0.07	6.10
1316	1316	GREELEY	0.159	0.339	0.650	0.014	6.9	0.35	0.10	4.20	0.60	0.0018	0.00	0.14	0.07	6.15
1318	1318	GREELEY	0.051	0.228	0.406	0.012	6.7	0.35	0.10	4.40	0.60	0.0018	0.00	0.13	0.07	5.92
1320	1320	GREELEY	0.087	0.094	0.369	0.023	7.0	0.35	0.10	4.50	0.60	0.0018	0.00	0.14	0.07	6.25
1322	1322	GREELEY	0.111	0.234	0.582	0.016	8.1	0.35	0.10	3.50	0.50	0.0018	0.00	0.16	0.08	7.39
1324	1324	GREELEY	0.082	0.182	0.397	0.011	2.0	0.35	0.10	3.80	0.60	0.0018	0.00	0.04	0.02	1.77
1328	1328	GREELEY	0.012	0.167	0.289	0.006	20.8	0.35	0.10	3.00	0.50	0.0018	0.00	0.42	0.13	19.69
1340	1340	GREELEY	0.178	0.227	1.029	0.008	52.2	0.35	0.10	4.20	0.60	0.0018	0.00	0.86	0.24	51.15

								Depression Storage		Horton's Infiltration Parameters			DCIA Level and Fractions			
Catchment Name/ID	SWMM Node/ID	Raingage Name/ID	Area (sq.mi.)	Dist. to Centroid (miles)	Length (miles)	Slope (ft./ft.)	Percent Imperv.	Pervious (inches)	Imperv. (inches)	Initial Rate (in./hr.)	Final Rate (in.hr.)	Decay Coeff. (1/sec.)	DCIA Level	Dir. Con'ct Imperv. Fraction	Receiv. Perv. Fraction	Percent Eff. Imperv.
1348	1348	GREELEY	0.109	0.234	0.535	0.015	9.2	0.35	0.10	3.40	0.50	0.0018	0.00	0.18	0.09	8.39
1349	1349	GREELEY	0.054	0.159	0.399	0.013	9.7	0.35	0.10	3.40	0.50	0.0018	0.00	0.19	0.10	8.90
1352	1352	GREELEY	0.184	0.396	0.801	0.013	4.4	0.35	0.10	3.50	0.50	0.0018	0.00	0.09	0.04	3.95
1354	1354	GREELEY	0.102	0.237	0.660	0.018	3.8	0.35	0.10	3.50	0.50	0.0018	0.00	0.08	0.04	3.46
1356	1356	GREELEY	0.148	0.269	0.586	0.010	9.7	0.35	0.10	3.60	0.50	0.0018	0.00	0.19	0.10	8.89
1358	1358	GREELEY	0.173	0.440	0.675	0.012	4.8	0.35	0.10	3.60	0.50	0.0018	0.00	0.10	0.05	4.37
1368	1368	GREELEY	0.046	0.184	0.389	0.013	42.3	0.35	0.10	3.00	0.50	0.0018	0.00	0.81	0.21	41.45
1364	1364	GREELEY	0.070	0.113	0.457	0.007	61.9	0.35	0.10	3.40	0.50	0.0018	0.00	0.90	0.28	61.14
1372	1372	GREELEY	0.190	0.306	0.504	0.005	4.0	0.35	0.10	3.40	0.50	0.0018	0.00	0.08	0.04	3.61
1362	1362	GREELEY	0.030	0.265	0.400	0.009	9.4	0.35	0.10	3.50	0.50	0.0018	0.00	0.19	0.09	8.59
1382	1382	GREELEY	0.143	0.590	0.881	0.014	5.1	0.35	0.10	4.50	0.60	0.0017	0.00	0.10	0.05	4.47
1386	1386	GREELEY	0.058	0.181	0.708	0.006	12.0	0.35	0.10	3.40	0.50	0.0018	0.00	0.24	0.11	11.08
1388	1388	GREELEY	0.185	0.300	0.506	0.019	3.4	0.35	0.10	3.30	0.50	0.0018	0.00	0.07	0.03	3.09
1392	1392	GREELEY	0.129	0.204	0.668	0.014	5.7	0.35	0.10	4.00	0.60	0.0017	0.00	0.11	0.06	5.06
1394	1394	GREELEY	0.160	0.234	1.013	0.009	3.5	0.35	0.10	3.40	0.50	0.0018	0.00	0.07	0.03	3.15
1396	1396	GREELEY	0.121	0.336	0.678	0.012	3.3	0.35	0.10	3.00	0.50	0.0018	0.00	0.07	0.03	3.02
1398	1398	GREELEY	0.082	0.188	0.534	0.008	14.1	0.35	0.10	3.00	0.50	0.0018	0.00	0.28	0.11	13.10

		Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
Catchment Name/ID	User Comment for Catchment	CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
110		0.147	0.164	71.2	10.48	37.0	7.40	17.5	47	257,766	1.84	474,044	65.0	73	473,948	1.02
114		0.150	0.206	45.3	8.65	23.5	6.11	14.4	116	406,013	1.78	722,616	50.0	157	722,227	1.41
118		0.156	0.131	43.8	5.91	22.8	4.17	9.8	40	136,996	1.76	241,055	50.0	53	241,032	1.41
122		0.148	0.208	60.8	11.24	31.6	7.94	18.7	94	445,075	1.84	816,733	60.0	143	816,692	1.16
126		0.111	0.077	39.8	3.86	20.7	2.73	6.4	24	74,154	1.84	136,604	45.0	31	136,226	1.52
130		0.136	0.127	50.1	6.39	26.1	4.52	10.7	44	169,548	1.87	317,651	50.0	63	317,702	1.34
134		0.126	0.126	41.1	5.48	21.4	3.87	9.1	61	194,175	1.91	370,693	45.0	84	370,269	1.56
138		0.107	0.145	28.3	4.65	14.7	3.29	7.8	138	301,853	2.06	620,979	40.0	177	618,981	2.13
142		0.124	0.080	58.3	5.08	30.3	3.59	8.5	16	71,765	1.88	134,597	50.0	23	134,384	1.17
146		0.139	0.120	77.7	8.69	40.4	6.14	14.5	24	143,818	1.86	267,976	65.0	38	267,866	0.96
150		0.144	0.149	42.5	6.36	22.1	4.49	10.6	66	216,576	1.85	400,486	50.0	90	400,569	1.50
154		0.111	0.150	29.8	4.94	15.5	3.49	8.2	140	323,632	2.02	653,994	40.0	181	651,551	2.03
210		0.147	0.139	31.3	4.84	16.3	3.42	8.1	73	177,186	1.84	325,543	45.0	90	324,625	1.85
220		0.156	0.202	47.5	8.88	24.7	6.28	14.8	99	363,101	1.76	639,572	50.0	134	639,193	1.34
224		0.156	0.166	38.7	6.42	20.1	4.54	10.7	77	231,887	1.81	419,386	45.0	102	419,591	1.59
226		0.098	0.146	31.3	5.01	16.3	3.54	8.3	91	221,759	2.16	479,546	45.0	124	478,284	2.03
228		0.156	0.168	52.3	8.26	27.2	5.84	13.8	59	240,005	1.81	434,068	55.0	84	433,632	1.27
232		0.156	0.208	51.7	9.77	26.9	6.90	16.3	96	384,902	1.81	696,126	55.0	138	695,900	1.30
236		0.156	0.161	53.5	8.12	27.8	5.74	13.5	53	217,622	1.81	393,586	55.0	75	393,321	1.25
240		0.156	0.102	38.8	4.55	20.2	3.22	7.6	26	79,324	1.76	139,577	45.0	33	139,239	1.52
244		0.144	0.180	53.0	8.84	27.6	6.25	14.7	80	328,035	1.85	605,870	55.0	116	605,519	1.29
248		0.149	0.191	39.9	7.37	20.8	5.21	12.3	114	350,880	1.83	642,445	50.0	152	642,127	1.58
250		0.156	0.140	28.1	4.51	14.6	3.19	7.5	73	158,220	1.81	286,153	40.0	87	285,200	1.99
252		0.146	0.154	62.0	8.85	32.2	6.25	14.7	48	228,783	1.84	421,629	55.0	71	421,403	1.13
256		0.156	0.197	62.7	11.00	32.6	7.77	18.3	70	339,970	1.64	556,195	60.0	97	556,053	1.03
260		0.156	0.167	43.1	7.02	22.4	4.96	11.7	70	234,503	1.81	424,117	50.0	95	424,079	1.47
264		0.117	0.136	53.9	7.13	28.0	5.04	11.9	60	249,635	1.97	491,827	50.0	90	491,671	1.31
268		0.116	0.126	49.8	6.33	25.9	4.47	10.5	55	212,597	1.98	420,867	50.0	82	420,987	1.39
310		0.155	0.190	46.6	8.30	24.2	5.87	13.8	89	319,565	1.59	508,872	50.0	111	508,663	1.26
314		0.100	0.149	25.7	4.45	13.4	3.14	7.4	126	251,527	2.02	507,147	40.0	155	505,865	2.24
410		0.147	0.077	42.8	4.04	22.3	2.86	6.7	15	48,596	1.79	87,101	45.0	19	86,893	1.43
414		0.153	0.077	34.7	3.55	18.0	2.51	5.9	16	43,852	1.77	77,639	45.0	20	77,363	1.64
418		0.153	0.131	48.3	6.36	25.1	4.50	10.6	38	143,829	1.82	261,646	50.0	54	261,733	1.35

		Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
Catchment Name/ID	User Comment for Catchment	CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
422		0.152	0.047	40.3	2.96	21.0	2.09	4.9	5	15,040	0.70	10,471	40.0	3	10,387	0.69
426		0.148	0.132	51.1	6.69	26.6	4.73	11.2	40	157,878	1.67	263,342	50.0	53	263,415	1.21
510		0.120	0.176	48.9	8.12	25.4	5.74	13.5	118	448,125	1.95	874,094	50.0	174	873,574	1.41
514		0.156	0.192	61.0	10.48	31.7	7.40	17.5	68	321,518	1.81	581,890	60.0	101	581,784	1.14
518		0.150	0.176	44.1	7.45	22.9	5.27	12.4	85	289,290	1.83	529,451	50.0	117	528,990	1.47
610		0.148	0.198	54.0	9.72	28.1	6.87	16.2	92	384,646	1.83	705,726	55.0	135	705,522	1.27
614		0.116	0.161	34.8	5.80	18.1	4.10	9.7	135	364,132	1.98	720,484	45.0	182	719,833	1.82
618		0.137	0.136	34.4	5.09	17.9	3.60	8.5	73	195,193	1.87	365,211	45.0	95	364,539	1.76
620		0.108	0.097	70.0	6.69	36.4	4.73	11.2	23	122,352	2.06	252,584	60.0	37	252,646	1.10
622		0.147	0.193	45.2	8.21	23.5	5.80	13.7	107	373,312	1.84	686,948	50.0	149	686,419	1.45
712		0.103	0.155	37.4	5.95	19.5	4.20	9.9	112	325,181	2.11	686,125	45.0	161	685,320	1.79
714		0.146	0.098	24.4	3.33	12.7	2.35	5.6	44	82,342	1.85	152,497	40.0	50	151,408	2.19
804		0.133	0.095	33.1	3.92	17.2	2.77	6.5	36	92,961	0.87	80,657	40.0	25	80,377	0.99
810		0.147	0.167	48.6	7.74	25.3	5.47	12.9	71	267,236	1.85	493,919	50.0	101	493,780	1.37
820		0.088	0.218	15.1	4.02	7.8	2.84	6.7	253	295,500	2.40	710,118	35.0	292	707,269	3.59
824		0.121	0.113	39.9	4.95	20.7	3.50	8.3	51	157,588	1.95	307,167	45.0	70	306,460	1.62
830		0.088	0.202	14.4	3.73	7.5	2.63	6.2	231	256,828	2.39	612,914	35.0	259	607,571	3.66
840		0.136	0.146	53.1	7.44	27.6	5.26	12.4	56	231,423	1.89	436,328	50.0	82	436,099	1.29
842		0.154	0.210	48.6	9.34	25.3	6.60	15.6	107	402,357	1.83	734,488	50.0	152	733,957	1.37
844		0.140	0.201	35.7	7.00	18.6	4.94	11.7	167	460,600	1.87	861,565	45.0	221	860,656	1.74
850		0.156	0.203	41.6	7.99	21.6	5.64	13.3	113	362,833	1.65	597,107	50.0	142	596,571	1.42
910		0.148	0.194	55.9	9.81	29.1	6.93	16.4	85	369,353	1.51	556,557	55.0	107	556,467	1.05
930		0.130	0.176	51.9	8.50	27.0	6.01	14.2	95	381,368	1.75	666,036	55.0	131	665,408	1.24
940		0.146	0.183	50.7	8.62	26.4	6.09	14.4	84	330,766	1.82	600,944	55.0	119	600,428	1.30
950		0.145	0.199	61.5	10.88	32.0	7.69	18.1	85	402,531	1.82	732,364	60.0	126	732,285	1.14
960		0.106	0.101	26.2	3.54	13.6	2.50	5.9	67	136,125	2.07	281,583	40.0	84	280,301	2.23
1032		0.092	0.076	18.8	2.60	9.8	1.84	4.3	24	34,775	1.67	58,108	35.0	22	56,586	2.25
1108		0.120	0.038	29.1	2.36	15.1	1.67	3.9	7	14,665	0.99	14,547	40.0	5	14,230	1.16
1110		0.116	0.073	45.2	4.03	23.5	2.85	6.7	18	62,872	1.05	65,757	45.0	15	65,633	0.87
1116		0.109	0.126	35.1	4.89	18.3	3.45	8.1	81	218,962	1.61	351,628	45.0	91	350,841	1.51
1124		0.131	0.099	41.8	4.69	21.7	3.32	7.8	33	105,996	1.26	133,355	45.0	32	133,075	1.11
1132		0.130	0.093	32.3	3.80	16.8	2.69	6.3	37	92,384	0.89	81,965	40.0	26	81,623	1.03
1126		0.139	0.145	18.4	3.56	9.6	2.52	5.9	153	218,889	0.83	181,408	35.0	91	180,150	1.51
1140		0.140	0.197	34.8	6.76	18.1	4.78	11.3	162	437,451	0.93	407,907	45.0	124	407,522	1.03

		Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
Catchment Name/ID	User Comment for Catchment	CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
1142		0.090	0.107	26.7	3.68	13.9	2.60	6.1	33	68,026	1.74	118,700	40.0	35	118,241	1.85
1144		0.114	0.145	27.2	4.53	14.1	3.20	7.5	140	294,502	1.26	370,058	40.0	122	368,683	1.50
1148		0.112	0.165	48.3	7.61	25.1	5.38	12.7	106	394,944	1.21	477,996	50.0	103	477,932	0.94
1150		0.125	0.129	67.5	8.19	35.1	5.79	13.7	39	205,095	1.32	270,105	55.0	44	270,009	0.78
1152		0.137	0.089	37.3	4.06	19.4	2.87	6.8	27	76,883	1.88	144,732	45.0	35	144,346	1.65
1154		0.122	0.125	54.4	6.74	28.3	4.77	11.2	47	198,597	1.79	355,661	50.0	66	355,644	1.21
1156		0.091	0.196	29.9	6.01	15.6	4.25	10.0	122	281,761	1.84	519,148	40.0	141	518,927	1.82
1164		0.091	0.237	21.7	5.45	11.3	3.85	9.1	255	427,396	2.30	981,692	40.0	325	979,443	2.76
1172		0.128	0.124	68.2	7.99	35.4	5.65	13.3	34	179,358	0.91	162,899	50.0	28	162,838	0.56
1180		0.093	0.086	29.4	3.45	15.3	2.44	5.7	21	47,916	1.95	93,656	40.0	25	93,202	1.92
1208		0.122	0.133	38.9	5.49	20.2	3.88	9.1	76	228,982	1.08	247,198	45.0	65	246,878	1.03
1210		0.152	0.195	56.6	9.96	29.4	7.04	16.6	81	353,344	0.85	301,070	50.0	62	300,949	0.64
1216		0.154	0.219	88.1	16.34	45.8	11.54	27.2	68	467,181	1.46	682,338	70.0	92	682,316	0.72
1224		0.146	0.173	58.7	9.31	30.5	6.58	15.5	64	292,614	1.69	494,862	55.0	89	494,597	1.11
1226		0.149	0.136	69.9	8.80	36.3	6.22	14.7	31	165,710	1.68	278,426	60.0	44	278,248	0.96
1228		0.142	0.118	65.1	7.41	33.8	5.24	12.4	26	132,967	1.57	208,264	55.0	35	208,208	0.95
1230		0.156	0.120	40.6	5.24	21.1	3.70	8.7	36	113,474	1.63	184,826	45.0	44	184,491	1.40
1232		0.093	0.232	17.9	4.70	9.3	3.32	7.8	327	454,149	2.18	992,049	35.0	373	987,204	2.98
1234		0.091	0.161	20.6	4.05	10.7	2.86	6.7	111	177,507	2.23	395,839	35.0	133	393,360	2.71
1236		0.091	0.197	34.4	6.71	17.9	4.74	11.2	104	276,025	2.24	617,878	45.0	151	617,497	1.98
1238		0.091	0.200	31.8	6.39	16.6	4.52	10.7	117	288,367	2.31	667,210	45.0	170	667,424	2.14
1240		0.132	0.093	36.0	4.08	18.7	2.88	6.8	32	90,060	1.74	156,860	45.0	40	156,504	1.60
1248		0.091	0.130	34.1	4.90	17.7	3.46	8.2	42	109,735	2.32	254,156	45.0	61	253,687	2.01
1256		0.090	0.179	30.2	5.66	15.7	4.00	9.4	91	213,045	2.25	479,282	40.0	126	478,599	2.14
1258		0.117	0.125	41.3	5.45	21.5	3.85	9.1	64	204,514	1.97	402,361	45.0	89	401,896	1.58
1260		0.119	0.132	58.3	7.41	30.3	5.24	12.4	51	229,598	1.95	448,727	55.0	78	448,700	1.23
1264		0.156	0.133	45.3	6.13	23.6	4.33	10.2	41	143,494	1.34	192,118	50.0	44	192,040	1.11
1272		0.157	0.105	59.8	6.34	31.1	4.48	10.6	18	83,926	0.82	68,817	50.0	14	68,841	0.58
1274		0.125	0.080	58.4	5.10	30.3	3.60	8.5	16	71,438	1.79	127,766	50.0	22	127,568	1.14
1308		0.148	0.156	60.2	8.70	31.3	6.15	14.5	49	227,565	1.55	352,608	55.0	63	352,320	1.01
1310		0.140	0.117	53.8	6.32	28.0	4.47	10.5	32	132,205	1.72	226,926	50.0	43	226,976	1.19
1316		0.140	0.185	47.9	8.30	24.9	5.87	13.8	100	369,607	1.71	633,454	50.0	133	633,144	1.31
1318		0.141	0.112	54.4	6.17	28.3	4.36	10.3	28	119,028	1.70	202,921	50.0	38	202,941	1.17
1320		0.140	0.141	22.8	3.97	11.9	2.81	6.6	115	202,881	1.71	346,183	40.0	122	344,218	2.18

		Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
Catchment Name/ID	User Comment for Catchment	CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
1322		0.136	0.153	43.1	6.57	22.4	4.64	10.9	77	258,202	1.86	480,716	50.0	106	480,864	1.49
1324		0.156	0.152	40.4	6.22	21.0	4.39	10.4	61	190,648	1.67	319,195	45.0	76	319,246	1.45
1328		0.111	0.050	82.8	4.69	43.0	3.32	7.8	4	28,350	2.03	57,653	65.0	7	57,598	0.96
1340		0.088	0.253	26.0	6.55	13.5	4.63	10.9	205	412,985	2.32	956,894	40.0	280	954,902	2.46
1348		0.132	0.148	42.6	6.34	22.1	4.48	10.6	77	252,793	1.88	474,961	50.0	105	475,056	1.51
1349		0.130	0.106	43.4	5.05	22.6	3.57	8.4	37	124,654	1.89	234,980	45.0	51	234,603	1.47
1352		0.148	0.208	54.2	10.15	28.2	7.18	16.9	102	427,614	1.82	777,901	55.0	148	777,636	1.26
1354		0.150	0.162	47.2	7.36	24.6	5.20	12.3	65	238,092	1.81	431,671	50.0	90	431,600	1.38
1356		0.130	0.168	45.1	7.32	23.4	5.17	12.2	99	344,233	1.88	645,614	50.0	138	645,049	1.46
1358		0.147	0.200	55.8	10.07	29.0	7.12	16.8	93	401,696	1.82	730,821	55.0	136	730,643	1.23
1368		0.092	0.124	28.2	4.18	14.7	2.95	7.0	49	106,686	2.29	244,118	40.0	67	243,324	2.27
1364		0.083	0.179	17.1	3.85	8.9	2.72	6.4	123	162,551	2.51	408,387	35.0	151	405,519	3.38
1372		0.150	0.210	48.0	9.24	25.0	6.53	15.4	119	441,626	1.82	803,756	50.0	167	803,396	1.37
1362		0.131	0.082	77.9	6.41	40.5	4.53	10.7	11	69,006	1.88	129,494	65.0	18	129,531	0.95
1382		0.146	0.183	75.8	12.18	39.4	8.61	20.3	57	332,581	1.66	553,503	65.0	83	553,507	0.90
1386		0.124	0.106	69.2	7.15	36.0	5.05	11.9	25	134,746	1.91	257,643	60.0	39	257,672	1.06
1388		0.152	0.212	35.2	7.23	18.3	5.11	12.1	158	428,848	1.82	779,941	45.0	204	778,802	1.73
1392		0.144	0.173	41.5	7.01	21.6	4.95	11.7	93	299,039	1.69	505,235	50.0	118	505,329	1.43
1394		0.151	0.199	55.9	10.04	29.1	7.10	16.7	86	372,438	1.81	675,733	55.0	126	675,578	1.23
1396		0.152	0.176	57.3	9.23	29.8	6.52	15.4	63	280,490	1.83	514,236	55.0	94	514,050	1.21
1398		0.121	0.122	48.7	6.07	25.3	4.29	10.1	50	190,139	1.95	371,689	50.0	74	371,703	1.41

								Depression Storage		Horton's Infiltration Parameters			DCIA Level and Fractions			
Catchment Name/ID	SWMM Node/ID	Raingage Name/ID	Area (sq.mi.)	Dist. to Centroid (miles)	Length (miles)	Slope (ft./ft.)	Percent Imperv.	Pervious (inches)	Imperv. (inches)	Initial Rate (in./hr.)	Final Rate (in.hr.)	Decay Coeff. (1/sec.)	DCIA Level	Dir. Con'ct Imperv. Fraction	Receiv. Perv. Fraction	Percent Eff. Imperv.
110	110	GOS GREELEY	0.111	0.506	0.975	0.027	4.8	0.35	0.10	3.00	0.50	0.0018	0.00	0.10	0.05	4.39
114	114	GOS GREELEY	0.175	0.346	0.914	0.031	3.8	0.40	0.10	3.00	0.50	0.0018	0.00	0.08	0.04	3.41
118	118	GOS GREELEY	0.059	0.278	0.474	0.048	2.0	0.40	0.10	3.00	0.50	0.0018	0.00	0.04	0.02	1.81
122	122	GOS GREELEY	0.192	0.486	1.184	0.027	39.3	0.35	0.10	3.00	0.50	0.0018	0.00	0.79	0.20	38.34
126	126	GOS GREELEY	0.032	0.133	0.286	0.013	21.2	0.40	0.10	4.50	0.60	0.0018	0.00	0.42	0.13	19.74
130	130	GOS GREELEY	0.073	0.318	0.607	0.038	14.3	0.35	0.10	3.00	0.50	0.0018	0.00	0.29	0.11	13.35
134	134	GOS GREELEY	0.084	0.217	0.593	0.028	53.9	0.35	0.10	3.00	0.50	0.0018	0.00	0.87	0.25	53.10
138	138	GOS GREELEY	0.130	0.176	0.483	0.017	69.3	0.35	0.10	3.00	0.50	0.0018	0.00	0.92	0.30	68.69
142	142	GOS GREELEY	0.031	0.233	0.500	0.034	11.9	0.40	0.10	3.00	0.50	0.0018	0.00	0.24	0.11	11.03
146	146	GOS GREELEY	0.062	0.463	0.831	0.033	28.7	0.35	0.10	3.00	0.50	0.0018	0.00	0.57	0.16	27.49
150	150	GOS GREELEY	0.093	0.272	0.641	0.040	20.1	0.35	0.10	3.00	0.50	0.0018	0.00	0.40	0.13	19.00
154	154	GOS GREELEY	0.139	0.231	0.515	0.027	53.0	0.35	0.10	3.00	0.50	0.0018	0.00	0.86	0.24	52.16
210	210	GOS GREELEY	0.076	0.155	0.506	0.042	4.6	0.35	0.10	3.00	0.50	0.0018	0.00	0.09	0.05	4.19
220	220	GOS GREELEY	0.156	0.410	0.800	0.034	2.2	0.40	0.10	3.00	0.50	0.0018	0.00	0.04	0.02	1.99
224	224	GOS GREELEY	0.100	0.239	0.642	0.041	2.8	0.35	0.10	3.00	0.50	0.0018	0.00	0.06	0.03	2.54
226	226	GOS GREELEY	0.095	0.307	0.593	0.034	44.6	0.35	0.10	3.00	0.50	0.0018	0.00	0.82	0.21	43.72
228	228	GOS GREELEY	0.103	0.359	0.664	0.026	40.9	0.35	0.10	3.00	0.50	0.0018	0.00	0.80	0.20	39.98
232	232	GOS GREELEY	0.166	0.432	0.945	0.034	3.6	0.35	0.10	3.00	0.50	0.0018	0.00	0.07	0.04	3.29
236	236	GOS GREELEY	0.094	0.355	0.753	0.036	31.5	0.35	0.10	3.00	0.50	0.0018	0.00	0.63	0.17	30.34
240	240	GOS GREELEY	0.034	0.160	0.395	0.051	2.2	0.40	0.10	3.00	0.50	0.0018	0.00	0.04	0.02	1.99
244	244	GOS GREELEY	0.141	0.480	0.830	0.038	53.9	0.35	0.10	3.00	0.50	0.0018	0.00	0.87	0.25	53.04
248	248	GOS GREELEY	0.151	0.284	0.543	0.016	75.5	0.35	0.10	3.00	0.50	0.0018	0.00	0.93	0.32	74.88
250	250	GOS GREELEY	0.068	0.120	0.339	0.022	66.1	0.35	0.10	3.00	0.50	0.0018	0.00	0.91	0.29	65.38
252	252	GOS GREELEY	0.098	0.393	0.739	0.021	68.6	0.35	0.10	3.00	0.50	0.0018	0.00	0.92	0.30	67.96
256	256	GOS GREELEY	0.146	0.554	0.954	0.032	43.8	0.35	0.10	4.50	0.60	0.0018	0.00	0.82	0.21	42.69
260	260	GOS GREELEY	0.101	0.321	0.670	0.050	9.8	0.35	0.10	3.00	0.50	0.0018	0.00	0.20	0.10	9.05
264	264	GOS GREELEY	0.107	0.331	0.854	0.024	66.3	0.35	0.10	3.00	0.50	0.0018	0.00	0.91	0.29	65.65
268	268	GOS GREELEY	0.092	0.287	0.637	0.018	57.0	0.35	0.10	3.00	0.50	0.0018	0.00	0.88	0.26	56.21
310	310	GOS GREELEY	0.138	0.389	0.760	0.038	2.4	0.40	0.10	4.50	0.60	0.0018	0.00	0.05	0.02	2.14
314	314	GOS GREELEY	0.108	0.245	0.526	0.038	35.0	0.35	0.10	4.50	0.60	0.0018	0.00	0.70	0.18	33.61
410	410	GOS GREELEY	0.021	0.189	0.311	0.073	4.8	0.40	0.10	3.00	0.50	0.0018	0.00	0.10	0.05	4.41
414	414	GOS GREELEY	0.019	0.143	0.263	0.087	2.9	0.40	0.10	3.00	0.50	0.0018	0.00	0.06	0.03	2.67
418	418	GOS GREELEY	0.062	0.276	0.605	0.047	3.7	0.35	0.10	3.00	0.50	0.0018	0.00	0.07	0.04	3.35

								Depression Storage		Horton's Infiltration Parameters			DCIA Level and Fractions			
Catchment Name/ID	SWMM Node/ID	Raingage Name/ID	Area (sq.mi.)	Dist. to Centroid (miles)	Length (miles)	Slope (ft./ft.)	Percent Imperv.	Pervious (inches)	Imperv. (inches)	Initial Rate (in./hr.)	Final Rate (in.hr.)	Decay Coeff. (1/sec.)	DCIA Level	Dir. Con'ct Imperv. Fraction	Receiv. Perv. Fraction	Percent Eff. Imperv.
422	422	GOS GREELEY	0.006	0.102	0.196	0.097	4.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.08	0.04	3.16
426	426	GOS GREELEY	0.068	0.320	0.635	0.046	4.7	0.35	0.10	4.50	0.60	0.0018	0.00	0.09	0.05	4.13
510	510	GOS GREELEY	0.193	0.483	0.920	0.033	14.9	0.35	0.10	3.00	0.50	0.0018	0.00	0.30	0.11	13.94
514	514	GOS GREELEY	0.138	0.457	0.927	0.025	60.9	0.35	0.10	3.00	0.50	0.0018	0.00	0.90	0.27	60.16
518	518	GOS GREELEY	0.125	0.298	0.642	0.024	51.8	0.35	0.10	3.00	0.50	0.0018	0.00	0.86	0.24	51.00
610	610	GOS GREELEY	0.166	0.452	0.971	0.032	16.8	0.35	0.10	3.00	0.50	0.0018	0.00	0.34	0.12	15.79
614	614	GOS GREELEY	0.157	0.330	0.607	0.036	52.4	0.35	0.10	3.00	0.50	0.0018	0.00	0.86	0.24	51.55
618	618	GOS GREELEY	0.084	0.185	0.446	0.026	76.9	0.35	0.10	3.00	0.50	0.0018	0.00	0.93	0.32	76.31
620	620	GREELEY	0.053	0.272	0.598	0.008	23.5	0.35	0.10	3.00	0.50	0.0018	0.00	0.47	0.14	22.34
622	622	GOS GREELEY	0.161	0.336	0.673	0.019	74.5	0.35	0.10	3.00	0.50	0.0018	0.00	0.93	0.31	73.87
712	712	GREELEY	0.140	0.346	0.764	0.033	30.2	0.35	0.10	3.00	0.50	0.0018	0.00	0.60	0.17	29.00
714	714	GREELEY	0.035	0.091	0.212	0.030	12.5	0.35	0.10	3.00	0.50	0.0018	0.00	0.25	0.11	11.63
804	804	GREELEY	0.040	0.085	0.381	0.018	10.0	0.35	0.10	5.00	1.00	0.0007	0.00	0.20	0.10	8.08
810	810	GREELEY	0.115	0.242	0.599	0.011	48.1	0.35	0.10	3.00	0.50	0.0018	0.00	0.84	0.22	47.23
820	820	GREELEY	0.127	0.170	0.537	0.021	69.8	0.35	0.10	3.00	0.50	0.0018	0.00	0.92	0.30	69.13
824	824	GREELEY	0.068	0.192	0.421	0.017	78.0	0.35	0.10	3.00	0.50	0.0018	0.00	0.94	0.32	77.40
830	830	GREELEY	0.111	0.121	0.541	0.019	67.8	0.35	0.10	3.00	0.50	0.0018	0.00	0.92	0.29	67.16
840	840	GREELEY	0.100	0.339	0.674	0.023	76.5	0.35	0.10	3.00	0.50	0.0018	0.00	0.93	0.32	75.96
842	842	GREELEY	0.173	0.312	0.834	0.016	68.6	0.35	0.10	3.00	0.50	0.0018	0.00	0.92	0.30	67.93
844	844	GREELEY	0.198	0.278	0.542	0.016	76.2	0.35	0.10	3.00	0.50	0.0018	0.00	0.93	0.32	75.62
850	850	GREELEY	0.156	0.361	0.569	0.023	60.1	0.35	0.10	4.50	0.60	0.0018	0.00	0.90	0.27	59.16
910	910	GREELEY	0.159	0.415	0.843	0.019	27.8	0.35	0.10	4.30	0.70	0.0014	0.00	0.56	0.16	26.02
930	930	GREELEY	0.164	0.350	0.704	0.011	76.2	0.35	0.10	3.50	0.60	0.0016	0.00	0.93	0.32	75.45
940	940	GREELEY	0.142	0.346	0.667	0.015	22.5	0.35	0.10	3.70	0.50	0.0018	0.00	0.45	0.14	21.28
950	950	GREELEY	0.173	0.439	0.819	0.011	22.7	0.35	0.10	3.70	0.50	0.0018	0.00	0.45	0.14	21.46
960	960	GREELEY	0.059	0.083	0.394	0.014	26.6	0.35	0.10	3.40	0.50	0.0018	0.00	0.53	0.16	25.39
1032	1032	GREELEY	0.015	0.070	0.215	0.022	47.3	0.35	0.10	5.00	1.00	0.0007	0.00	0.84	0.22	45.30
1108	1108	GREELEY	0.006	0.064	0.152	0.080	35.3	0.35	0.10	5.00	1.00	0.0007	0.00	0.71	0.19	32.82
1110	1110	GREELEY	0.027	0.183	0.364	0.036	41.0	0.35	0.10	5.00	1.00	0.0007	0.00	0.80	0.20	38.93
1116	1116	GREELEY	0.094	0.202	0.577	0.025	43.7	0.35	0.10	4.20	0.80	0.0011	0.00	0.82	0.21	42.17
1124	1124	GREELEY	0.046	0.115	0.500	0.017	46.2	0.35	0.10	4.40	0.90	0.0010	0.00	0.83	0.22	44.55
1132	1132	GREELEY	0.040	0.129	0.294	0.028	40.7	0.35	0.10	5.00	1.00	0.0007	0.00	0.80	0.20	38.64
1126	1126	GREELEY	0.094	0.053	0.406	0.019	56.9	0.35	0.10	5.00	1.00	0.0007	0.00	0.88	0.26	55.20
1140	1140	GREELEY	0.188	0.216	0.637	0.016	44.8	0.35	0.10	4.90	1.00	0.0008	0.00	0.82	0.21	42.86
1142	1142	GREELEY	0.029	0.158	0.370	0.018	67.1	0.35	0.10	4.90	1.00	0.0007	0.00	0.91	0.29	65.61
1144	1144	GREELEY	0.127	0.074	0.702	0.009	41.0	0.35	0.10	4.70	0.90	0.0008	0.00	0.81	0.20	39.21
1148	1148	GREELEY	0.170	0.376	0.793	0.016	44.8	0.35	0.10	4.90	1.00	0.0008	0.00	0.82	0.21	42.87

								Depression Storage		Horton's Infiltration Parameters			DCIA Level and Fractions			
Catchment Name/ID	SWMM Node/ID	Raingage Name/ID	Area (sq.mi.)	Dist. to Centroid (miles)	Length (miles)	Slope (ft./ft.)	Percent Imperv.	Pervious (inches)	Imperv. (inches)	Initial Rate (in./hr.)	Final Rate (in.hr.)	Decay Coeff. (1/sec.)	DCIA Level	Dir. Con'ct Imperv. Fraction	Receiv. Perv. Fraction	Percent Eff. Imperv.
1150	1150	GREELEY	0.088	0.262	0.862	0.010	12.0	0.35	0.10	4.70	0.90	0.0011	0.00	0.24	0.11	10.31
1152	1152	GREELEY	0.033	0.142	0.303	0.028	68.2	0.35	0.10	3.00	0.50	0.0018	0.00	0.92	0.29	67.55
1154	1154	GREELEY	0.085	0.390	0.513	0.019	75.8	0.35	0.10	3.50	0.60	0.0016	0.00	0.93	0.32	75.14
1156	1156	GREELEY	0.121	0.378	0.684	0.018	47.5	0.35	0.10	4.80	0.90	0.0009	0.00	0.84	0.22	45.75
1164	1164	GREELEY	0.184	0.339	0.558	0.017	45.1	0.35	0.10	3.60	0.50	0.0018	0.00	0.83	0.22	44.17
1172	1172	GREELEY	0.077	0.464	0.708	0.026	12.6	0.35	0.10	4.90	1.00	0.0007	0.00	0.25	0.11	10.43
1180	1180	GREELEY	0.021	0.153	0.401	0.035	43.6	0.35	0.10	4.30	0.80	0.0011	0.00	0.82	0.21	42.10
1208	1208	GREELEY	0.099	0.242	0.585	0.029	36.0	0.35	0.10	4.80	1.00	0.0008	0.00	0.72	0.19	33.75
1210	1210	GREELEY	0.152	0.280	0.852	0.009	13.3	0.35	0.10	5.00	1.00	0.0008	0.00	0.27	0.11	11.14
1216	1216	GREELEY	0.201	0.643	0.873	0.005	12.7	0.35	0.10	4.10	0.70	0.0013	0.00	0.25	0.11	11.34
1224	1224	GREELEY	0.126	0.300	0.851	0.013	15.8	0.35	0.10	4.20	0.60	0.0018	0.00	0.32	0.12	14.51
1226	1226	GREELEY	0.071	0.345	0.619	0.013	29.8	0.35	0.10	4.30	0.60	0.0018	0.00	0.60	0.17	28.33
1228	1228	GREELEY	0.057	0.233	0.623	0.012	15.1	0.35	0.10	4.60	0.70	0.0016	0.00	0.30	0.12	13.64
1230	1230	GREELEY	0.049	0.143	0.443	0.022	12.0	0.35	0.10	4.50	0.60	0.0017	0.00	0.24	0.11	10.83
1232	1232	GREELEY	0.195	0.209	0.603	0.019	46.4	0.35	0.10	4.10	0.60	0.0018	0.00	0.83	0.22	45.30
1234	1234	GREELEY	0.076	0.147	0.501	0.016	45.3	0.35	0.10	3.90	0.60	0.0018	0.00	0.83	0.22	44.21
1236	1236	GREELEY	0.119	0.414	0.752	0.014	46.4	0.35	0.10	3.50	0.60	0.0017	0.00	0.83	0.22	45.36
1238	1238	GREELEY	0.124	0.207	0.519	0.002	45.0	0.35	0.10	3.20	0.50	0.0018	0.00	0.83	0.22	44.10
1240	1240	GREELEY	0.039	0.139	0.244	0.015	14.2	0.35	0.10	4.20	0.60	0.0018	0.00	0.28	0.11	12.97
1248	1248	GREELEY	0.047	0.284	0.466	0.015	48.1	0.35	0.10	3.20	0.50	0.0018	0.00	0.84	0.22	47.17
1256	1256	GREELEY	0.092	0.319	0.557	0.011	55.6	0.35	0.10	4.30	0.60	0.0018	0.00	0.88	0.25	54.59
1258	1258	GREELEY	0.088	0.171	0.420	0.007	16.3	0.35	0.10	3.30	0.50	0.0018	0.00	0.33	0.12	15.24
1260	1260	GREELEY	0.099	0.286	0.709	0.011	15.7	0.35	0.10	3.30	0.50	0.0018	0.00	0.31	0.12	14.66
1264	1264	GREELEY	0.062	0.215	0.527	0.028	12.2	0.35	0.10	4.70	0.80	0.0013	0.00	0.24	0.11	10.64
1272	1272	GREELEY	0.036	0.253	0.484	0.029	11.6	0.35	0.10	5.00	1.00	0.0008	0.00	0.23	0.10	9.64
1274	1274	GREELEY	0.031	0.165	0.408	0.012	20.3	0.35	0.10	3.80	0.60	0.0018	0.00	0.41	0.13	18.91
1308	1308	GREELEY	0.098	0.378	0.680	0.019	11.3	0.35	0.10	4.50	0.70	0.0016	0.00	0.23	0.10	10.08
1310	1310	GREELEY	0.057	0.241	0.486	0.017	13.0	0.35	0.10	4.10	0.60	0.0018	0.00	0.26	0.11	11.88
1316	1316	GREELEY	0.159	0.339	0.650	0.014	13.0	0.35	0.10	4.20	0.60	0.0018	0.00	0.26	0.11	11.83
1318	1318	GREELEY	0.051	0.228	0.406	0.012	12.5	0.35	0.10	4.40	0.60	0.0018	0.00	0.25	0.11	11.29
1320	1320	GREELEY	0.087	0.094	0.369	0.023	12.1	0.35	0.10	4.50	0.60	0.0018	0.00	0.24	0.11	10.92
1322	1322	GREELEY	0.111	0.234	0.582	0.016	12.0	0.35	0.10	3.50	0.50	0.0018	0.00	0.24	0.11	11.06
1324	1324	GREELEY	0.082	0.182	0.397	0.011	12.0	0.35	0.10	3.80	0.60	0.0018	0.00	0.24	0.11	10.92
1328	1328	GREELEY	0.012	0.167	0.289	0.006	20.8	0.35	0.10	3.00	0.50	0.0018	0.00	0.42	0.13	19.69
1340	1340	GREELEY	0.178	0.227	1.029	0.008	53.8	0.35	0.10	4.20	0.60	0.0018	0.00	0.87	0.25	52.76

								Depression Storage		Horton's Infiltration Parameters			DCIA Level and Fractions			
Catchment Name/ID	SWMM Node/ID	Raingage Name/ID	Area (sq.mi.)	Dist. to Centroid (miles)	Length (miles)	Slope (ft./ft.)	Percent Imperv.	Pervious (inches)	Imperv. (inches)	Initial Rate (in./hr.)	Final Rate (in.hr.)	Decay Coeff. (1/sec.)	DCIA Level	Dir. Con'ct Imperv. Fraction	Receiv. Perv. Fraction	Percent Eff. Imperv.
1348	1348	GREELEY	0.109	0.234	0.535	0.015	13.7	0.35	0.10	3.40	0.50	0.0018	0.00	0.27	0.11	12.67
1349	1349	GREELEY	0.054	0.159	0.399	0.013	13.3	0.35	0.10	3.40	0.50	0.0018	0.00	0.27	0.11	12.36
1352	1352	GREELEY	0.184	0.396	0.801	0.013	12.0	0.35	0.10	3.50	0.50	0.0018	0.00	0.24	0.11	11.06
1354	1354	GREELEY	0.102	0.237	0.660	0.018	12.0	0.35	0.10	3.50	0.50	0.0018	0.00	0.24	0.11	11.06
1356	1356	GREELEY	0.148	0.269	0.586	0.010	14.3	0.35	0.10	3.60	0.50	0.0018	0.00	0.29	0.11	13.30
1358	1358	GREELEY	0.173	0.440	0.675	0.012	13.3	0.35	0.10	3.60	0.50	0.0018	0.00	0.27	0.11	12.33
1368	1368	GREELEY	0.046	0.184	0.389	0.013	69.4	0.35	0.10	3.00	0.50	0.0018	0.00	0.92	0.30	68.72
1364	1364	GREELEY	0.070	0.113	0.457	0.007	77.1	0.35	0.10	3.40	0.50	0.0018	0.00	0.93	0.32	76.54
1372	1372	GREELEY	0.190	0.306	0.504	0.005	12.5	0.35	0.10	3.40	0.50	0.0018	0.00	0.25	0.11	11.51
1362	1362	GREELEY	0.030	0.265	0.400	0.009	16.1	0.35	0.10	3.50	0.50	0.0018	0.00	0.32	0.12	15.01
1382	1382	GREELEY	0.143	0.590	0.881	0.014	12.0	0.35	0.10	4.50	0.60	0.0017	0.00	0.24	0.11	10.81
1386	1386	GREELEY	0.058	0.181	0.708	0.006	12.1	0.35	0.10	3.40	0.50	0.0018	0.00	0.24	0.11	11.14
1388	1388	GREELEY	0.185	0.300	0.506	0.019	12.8	0.35	0.10	3.30	0.50	0.0018	0.00	0.26	0.11	11.82
1392	1392	GREELEY	0.129	0.204	0.668	0.014	27.1	0.35	0.10	4.00	0.60	0.0017	0.00	0.54	0.16	25.63
1394	1394	GREELEY	0.160	0.234	1.013	0.009	25.6	0.35	0.10	3.40	0.50	0.0018	0.00	0.51	0.15	24.38
1396	1396	GREELEY	0.121	0.336	0.678	0.012	76.6	0.35	0.10	3.00	0.50	0.0018	0.00	0.93	0.32	76.03
1398	1398	GREELEY	0.082	0.188	0.534	0.008	75.6	0.35	0.10	3.00	0.50	0.0018	0.00	0.93	0.32	75.04

		Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
Catchment Name/ID	User Comment for Catchment	CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
110		0.147	0.164	71.2	10.46	37.0	7.39	17.4	47	257,766	1.84	474,217	65.0	73	474,118	1.02
114		0.150	0.206	45.3	8.65	23.5	6.11	14.4	116	406,013	1.78	722,616	50.0	157	722,227	1.41
118		0.156	0.131	43.8	5.91	22.8	4.17	9.8	40	136,996	1.76	241,055	50.0	53	241,032	1.41
122		0.094	0.221	36.3	7.67	18.9	5.42	12.8	158	445,075	2.24	997,480	45.0	235	997,044	1.92
126		0.111	0.077	39.8	3.86	20.7	2.73	6.4	24	74,154	1.84	136,604	45.0	31	136,226	1.52
130		0.120	0.116	48.5	5.82	25.2	4.11	9.7	45	169,548	1.95	330,199	50.0	65	330,051	1.40
134		0.087	0.183	19.6	4.25	10.2	3.00	7.1	128	194,175	2.41	468,921	35.0	159	465,903	2.98
138		0.081	0.246	12.5	3.87	6.5	2.73	6.4	311	301,853	2.60	784,559	35.0	336	768,545	4.04
142		0.124	0.080	58.3	5.08	30.3	3.59	8.5	16	71,765	1.88	134,597	50.0	23	134,384	1.17
146		0.102	0.111	61.8	6.75	32.2	4.77	11.3	30	143,818	2.12	304,228	55.0	49	304,292	1.23
150		0.112	0.126	39.1	5.28	20.3	3.73	8.8	71	216,576	2.02	436,422	45.0	100	435,614	1.67
154		0.087	0.229	15.4	4.20	8.0	2.97	7.0	272	323,632	2.40	777,953	35.0	316	775,954	3.55
210		0.147	0.139	31.3	4.84	16.3	3.42	8.1	73	177,186	1.84	325,543	45.0	90	324,625	1.85
220		0.156	0.202	47.5	8.88	24.7	6.27	14.8	99	363,101	1.76	639,699	50.0	134	639,319	1.34
224		0.154	0.163	38.6	6.34	20.1	4.48	10.6	77	231,887	1.82	421,418	45.0	102	421,597	1.60
226		0.091	0.177	24.0	4.76	12.5	3.36	7.9	119	221,759	2.30	511,028	40.0	157	509,840	2.57
228		0.093	0.174	30.1	5.53	15.7	3.91	9.2	103	240,005	2.26	542,481	40.0	143	541,487	2.16
232		0.151	0.201	51.6	9.48	26.8	6.70	15.8	96	384,902	1.83	703,012	55.0	139	702,732	1.31
236		0.099	0.141	38.7	5.70	20.1	4.03	9.5	73	217,622	2.15	467,589	45.0	106	467,188	1.76
240		0.156	0.102	38.8	4.54	20.2	3.21	7.6	26	79,324	1.76	139,756	45.0	33	139,419	1.53
244		0.087	0.232	24.8	5.91	12.9	4.18	9.8	171	328,035	2.41	791,952	40.0	237	791,106	2.62
248		0.079	0.270	14.9	4.59	7.7	3.24	7.6	304	350,880	2.67	937,745	35.0	372	935,833	3.85
250		0.082	0.181	11.3	3.07	5.9	2.17	5.1	180	158,220	2.56	405,007	35.0	182	395,380	4.17
252		0.081	0.216	24.5	5.57	12.7	3.94	9.3	120	228,783	2.59	592,665	40.0	173	591,856	2.74
256		0.092	0.212	34.3	7.08	17.8	5.00	11.8	128	339,970	2.19	743,565	45.0	183	742,632	1.95
260		0.129	0.141	42.3	6.07	22.0	4.29	10.1	72	234,503	1.90	444,526	50.0	99	444,535	1.53
264		0.082	0.223	23.0	5.42	11.9	3.83	9.0	140	249,635	2.56	639,828	40.0	196	639,310	2.84
268		0.085	0.196	23.7	5.06	12.3	3.57	8.4	116	212,597	2.45	521,161	40.0	158	520,104	2.70
310		0.155	0.190	46.6	8.30	24.2	5.87	13.8	89	319,565	1.59	508,872	50.0	111	508,663	1.26
314		0.097	0.160	23.2	4.36	12.1	3.08	7.3	140	251,527	2.07	519,856	40.0	168	518,128	2.43
410		0.147	0.077	42.8	4.04	22.3	2.86	6.7	15	48,596	1.79	87,101	45.0	19	86,893	1.43
414		0.153	0.077	34.7	3.55	18.0	2.51	5.9	16	43,852	1.77	77,639	45.0	20	77,363	1.64
418		0.151	0.129	48.3	6.29	25.1	4.44	10.5	38	143,829	1.83	262,791	50.0	54	262,861	1.36

		Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
Catchment Name/ID	User Comment for Catchment	CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
422		0.151	0.047	40.3	2.95	21.0	2.09	4.9	5	15,040	0.70	10,522	40.0	3	10,437	0.70
426		0.148	0.132	51.1	6.69	26.6	4.73	11.2	40	157,878	1.67	263,342	50.0	53	263,415	1.21
510		0.119	0.176	48.8	8.09	25.4	5.72	13.5	119	448,125	1.95	875,916	50.0	175	875,407	1.42
514		0.084	0.242	26.0	6.32	13.5	4.47	10.5	160	321,518	2.50	803,112	40.0	229	801,722	2.59
518		0.088	0.215	21.1	4.99	11.0	3.53	8.3	177	289,290	2.39	691,491	40.0	227	688,176	2.85
610		0.116	0.165	50.9	7.95	26.5	5.62	13.3	98	384,646	1.98	760,376	50.0	146	759,926	1.38
614		0.087	0.240	17.6	4.74	9.1	3.35	7.9	267	364,132	2.40	872,731	35.0	322	868,005	3.21
618		0.078	0.208	12.8	3.55	6.7	2.51	5.9	197	195,193	2.69	524,983	35.0	217	513,071	4.03
620		0.107	0.097	70.0	6.69	36.4	4.73	11.1	23	122,352	2.07	252,663	60.0	37	252,726	1.10
622		0.079	0.276	17.0	5.11	8.9	3.61	8.5	283	373,312	2.66	993,228	35.0	359	986,212	3.50
712		0.100	0.165	34.2	5.83	17.8	4.12	9.7	123	325,181	2.14	696,996	45.0	173	696,646	1.93
714		0.123	0.085	23.7	3.04	12.3	2.15	5.1	45	82,342	1.94	159,503	40.0	51	157,367	2.27
804		0.133	0.095	33.1	3.92	17.2	2.77	6.5	36	92,961	0.87	80,701	40.0	25	80,421	0.99
810		0.090	0.200	24.7	5.29	12.8	3.74	8.8	140	267,236	2.36	629,730	40.0	190	628,295	2.58
820		0.080	0.244	12.3	3.81	6.4	2.69	6.4	310	295,500	2.62	772,751	35.0	331	753,342	4.07
824		0.078	0.190	15.2	3.71	7.9	2.62	6.2	134	157,588	2.71	427,581	35.0	165	425,111	3.80
830		0.081	0.227	11.7	3.54	6.1	2.50	5.9	283	256,828	2.59	665,619	35.0	294	649,995	4.15
840		0.078	0.224	19.9	4.92	10.3	3.48	8.2	150	231,423	2.70	623,972	40.0	200	618,994	3.13
842		0.081	0.279	19.2	5.61	10.0	3.96	9.3	271	402,357	2.60	1,046,455	40.0	353	1,041,854	3.19
844		0.078	0.299	13.3	4.57	6.9	3.23	7.6	446	460,600	2.69	1,240,016	35.0	523	1,235,897	4.13
850		0.084	0.254	17.9	4.99	9.3	3.53	8.3	262	362,833	2.42	878,086	35.0	316	873,638	3.16
910		0.103	0.163	46.4	7.32	24.1	5.17	12.2	103	369,353	1.84	679,359	50.0	141	679,244	1.38
930		0.078	0.280	19.6	5.72	10.2	4.04	9.5	251	381,368	2.65	1,008,830	40.0	335	1,005,595	3.19
940		0.109	0.151	45.6	6.80	23.7	4.80	11.3	94	330,766	2.02	669,613	50.0	137	669,345	1.51
950		0.109	0.165	55.2	8.51	28.7	6.01	14.2	94	402,531	2.03	815,786	55.0	146	815,288	1.31
960		0.104	0.103	25.5	3.51	13.2	2.48	5.8	69	136,125	2.09	283,940	40.0	86	282,519	2.29
1032		0.090	0.078	18.0	2.58	9.4	1.83	4.3	25	34,775	1.73	60,001	35.0	23	58,285	2.36
1108		0.097	0.044	20.6	2.20	10.7	1.55	3.7	9	14,665	1.44	21,063	35.0	8	20,338	1.88
1110		0.094	0.094	28.3	3.54	14.7	2.50	5.9	29	62,872	1.58	99,278	40.0	29	98,824	1.65
1116		0.092	0.173	21.6	4.36	11.2	3.08	7.3	131	218,962	1.97	432,140	40.0	145	429,577	2.40
1124		0.091	0.128	22.5	3.71	11.7	2.62	6.2	61	105,996	1.93	204,711	40.0	66	202,945	2.26
1132		0.094	0.111	19.5	3.16	10.1	2.24	5.3	61	92,384	1.57	145,266	35.0	54	143,657	2.14
1126		0.086	0.197	8.4	2.77	4.4	1.96	4.6	336	218,889	1.95	427,542	30.0	232	413,125	3.84
1140		0.092	0.235	19.1	4.95	10.0	3.50	8.3	295	437,451	1.73	758,025	40.0	278	753,009	2.31

		Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
Catchment Name/ID	User Comment for Catchment	CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
1142		0.082	0.124	20.8	3.48	10.8	2.46	5.8	42	68,026	2.20	149,410	35.0	49	148,289	2.59
1144		0.094	0.189	17.2	3.99	8.9	2.82	6.7	221	294,502	1.71	503,546	35.0	204	499,679	2.51
1148		0.092	0.227	28.8	6.52	15.0	4.61	10.9	177	394,944	1.73	684,443	40.0	194	684,713	1.79
1150		0.125	0.129	67.5	8.19	35.1	5.79	13.7	39	205,095	1.32	270,105	55.0	44	270,009	0.78
1152		0.081	0.132	14.9	3.01	7.8	2.13	5.0	67	76,883	2.60	199,613	35.0	77	195,257	3.66
1154		0.078	0.209	21.0	4.87	10.9	3.44	8.1	122	198,597	2.64	524,505	40.0	165	521,839	3.01
1156		0.090	0.202	28.7	5.95	14.9	4.21	9.9	127	281,761	1.89	532,594	40.0	148	532,212	1.91
1164		0.091	0.239	21.5	5.44	11.2	3.85	9.1	257	427,396	2.30	984,394	40.0	328	981,834	2.78
1172		0.125	0.122	67.8	7.83	35.2	5.53	13.0	34	179,358	0.93	167,331	50.0	28	167,288	0.57
1180		0.092	0.087	29.0	3.44	15.1	2.43	5.7	21	47,916	1.97	94,246	40.0	26	93,767	1.95
1208		0.097	0.154	26.8	4.67	13.9	3.30	7.8	110	228,982	1.54	352,930	40.0	109	351,710	1.73
1210		0.124	0.164	55.0	8.42	28.6	5.95	14.0	83	353,344	1.03	362,941	50.0	73	362,696	0.75
1216		0.124	0.182	85.4	13.40	44.4	9.47	22.3	71	467,181	1.60	745,533	70.0	101	745,491	0.78
1224		0.118	0.147	55.9	7.81	29.1	5.52	13.0	68	292,614	1.83	534,876	55.0	97	534,707	1.20
1226		0.101	0.120	53.8	6.46	28.0	4.56	10.8	40	165,710	2.01	333,328	50.0	60	333,397	1.32
1228		0.120	0.104	62.6	6.48	32.5	4.58	10.8	27	132,967	1.69	224,068	55.0	38	224,133	1.03
1230		0.124	0.099	39.4	4.48	20.5	3.17	7.5	37	113,474	1.75	198,801	45.0	47	198,272	1.50
1232		0.090	0.245	16.6	4.62	8.6	3.27	7.7	353	454,149	2.24	1,017,458	35.0	402	1,012,372	3.21
1234		0.091	0.161	20.6	4.05	10.7	2.86	6.7	111	177,507	2.23	396,080	35.0	133	393,614	2.72
1236		0.090	0.199	34.0	6.69	17.7	4.73	11.2	105	276,025	2.25	620,455	45.0	153	620,418	2.01
1238		0.091	0.200	31.8	6.39	16.6	4.52	10.7	117	288,367	2.31	667,210	45.0	170	667,424	2.14
1240		0.121	0.087	35.1	3.85	18.2	2.72	6.4	33	90,060	1.81	162,723	45.0	41	162,284	1.66
1248		0.090	0.134	32.5	4.85	16.9	3.42	8.1	44	109,735	2.35	257,921	45.0	63	257,224	2.09
1256		0.086	0.193	26.8	5.48	13.9	3.87	9.1	103	213,045	2.36	503,120	40.0	142	501,678	2.42
1258		0.117	0.125	41.3	5.45	21.5	3.85	9.1	64	204,514	1.97	402,361	45.0	89	401,896	1.58
1260		0.118	0.132	58.1	7.37	30.2	5.21	12.3	51	229,598	1.96	450,097	55.0	78	450,053	1.23
1264		0.125	0.110	44.1	5.21	22.9	3.68	8.7	42	143,494	1.48	211,798	45.0	48	211,531	1.21
1272		0.127	0.087	58.4	5.42	30.4	3.83	9.0	19	83,926	0.99	83,478	50.0	16	83,395	0.69
1274		0.112	0.076	54.9	4.72	28.5	3.33	7.9	17	71,438	1.90	135,959	50.0	24	135,777	1.24
1308		0.126	0.136	58.9	7.63	30.6	5.40	12.7	50	227,565	1.63	371,973	55.0	67	371,907	1.06
1310		0.123	0.105	52.4	5.71	27.2	4.03	9.5	33	132,205	1.79	237,299	50.0	45	237,206	1.24
1316		0.123	0.166	46.6	7.46	24.3	5.27	12.4	102	369,607	1.79	662,013	50.0	140	661,917	1.37
1318		0.124	0.100	53.1	5.59	27.6	3.95	9.3	29	119,028	1.78	211,645	50.0	40	211,504	1.22
1320		0.124	0.128	22.3	3.70	11.6	2.61	6.2	117	202,881	1.77	359,103	40.0	125	355,945	2.24

		Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
Catchment Name/ID	User Comment for Catchment	CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
1322		0.124	0.142	42.4	6.13	22.0	4.33	10.2	79	258,202	1.91	492,454	50.0	109	492,506	1.53
1324		0.124	0.124	39.2	5.25	20.4	3.71	8.7	63	190,648	1.80	342,303	45.0	81	341,639	1.55
1328		0.111	0.050	82.8	4.69	43.0	3.32	7.8	4	28,350	2.03	57,653	65.0	7	57,598	0.96
1340		0.087	0.257	25.4	6.51	13.2	4.60	10.8	210	412,985	2.34	965,830	40.0	287	964,158	2.52
1348		0.121	0.139	41.6	5.95	21.6	4.21	9.9	78	252,793	1.93	488,297	45.0	108	488,282	1.56
1349		0.122	0.102	42.6	4.82	22.2	3.41	8.0	38	124,654	1.93	240,302	45.0	52	239,847	1.52
1352		0.124	0.179	52.7	8.74	27.4	6.17	14.6	105	427,614	1.91	815,564	55.0	155	814,930	1.31
1354		0.124	0.137	45.9	6.34	23.9	4.48	10.6	67	238,092	1.91	454,099	50.0	95	453,895	1.44
1356		0.120	0.159	44.0	6.88	22.9	4.86	11.5	101	344,233	1.93	664,525	50.0	143	664,447	1.51
1358		0.122	0.172	53.9	8.62	28.0	6.09	14.4	96	401,696	1.92	770,591	55.0	143	770,101	1.29
1368		0.081	0.154	19.7	3.83	10.3	2.71	6.4	70	106,686	2.61	278,470	35.0	92	276,541	3.12
1364		0.078	0.192	14.9	3.69	7.8	2.61	6.2	141	162,551	2.70	438,650	35.0	171	435,388	3.82
1372		0.123	0.178	46.6	7.87	24.2	5.56	13.1	122	441,626	1.92	846,762	50.0	176	846,486	1.45
1362		0.118	0.076	75.0	5.90	39.0	4.17	9.8	12	69,006	1.96	134,975	60.0	19	134,944	1.00
1382		0.124	0.160	73.9	10.58	38.5	7.48	17.6	58	332,581	1.75	582,544	65.0	87	582,404	0.95
1386		0.124	0.106	69.2	7.14	36.0	5.05	11.9	25	134,746	1.91	257,742	60.0	39	257,772	1.06
1388		0.123	0.178	34.0	6.14	17.7	4.34	10.2	163	428,848	1.93	825,846	45.0	215	826,006	1.82
1392		0.104	0.147	35.0	5.46	18.2	3.86	9.1	110	299,039	1.97	589,235	45.0	147	588,324	1.78
1394		0.105	0.159	48.5	7.43	25.2	5.25	12.4	99	372,438	2.07	772,381	50.0	151	772,355	1.47
1396		0.078	0.245	21.2	5.48	11.0	3.87	9.1	171	280,490	2.70	756,491	40.0	238	754,369	3.08
1398		0.078	0.205	18.9	4.47	9.8	3.16	7.5	130	190,139	2.69	510,588	35.0	171	507,902	3.26

Design Point		Existing Conditions Peak Flows (cfs)						Future Conditions Peak Flow (cfs)					
Number	Type	Q_2	Q_5	Q_{10}	Q_{25}	Q_{50}	Q_{100}	Q_2	Q_5	Q_{10}	Q_{25}	Q_{50}	Q_{100}
109	JUNCTION	24	73	183	499	734	1,049	136	235	388	785	1,081	1,460
110	JUNCTION	1	5	13	35	51	73	1	5	13	35	51	73
113	JUNCTION	23	69	172	465	684	976	135	230	374	750	1,031	1,389
114	JUNCTION	2	6	26	75	111	157	2	6	26	75	111	157
115	JUNCTION	26	74	167	419	604	846	157	256	389	719	968	1,278
117	JUNCTION	15	43	100	258	374	527	104	167	251	462	622	821
118	JUNCTION	0	2	8	25	37	53	0	2	8	25	37	53
119	JUNCTION	15	42	93	236	340	477	104	165	244	438	586	769
121	JUNCTION	3	11	29	80	117	168	28	47	72	136	186	251
122	JUNCTION	2	10	27	69	101	143	28	46	71	132	178	235
126	JUNCTION	2	3	6	15	22	31	2	3	6	15	22	31
129	JUNCTION	13	31	65	157	224	311	78	120	173	302	401	522
130	JUNCTION	2	5	13	31	45	63	3	7	15	34	47	65
133	JUNCTION	13	31	59	132	186	255	84	125	173	283	369	474
134	JUNCTION	3	9	18	43	61	84	26	40	57	94	124	159
138	JUNCTION	13	27	47	96	133	177	71	101	135	205	262	336
139	JUNCTION	13	35	72	167	237	326	57	94	144	263	354	465
141	JUNCTION	12	33	68	156	220	303	56	92	140	253	338	444
142	JUNCTION	1	2	4	11	17	23	1	2	4	11	17	23
146	JUNCTION	1	3	7	18	27	38	4	7	13	26	36	49
149	JUNCTION	12	31	62	139	196	269	53	87	130	230	307	401
150	JUNCTION	2	7	18	45	64	90	6	14	25	53	73	100
154	JUNCTION	12	26	46	97	135	181	51	78	113	186	245	316
210	JUNCTION	1	7	18	45	65	90	1	7	18	45	65	90
220	JUNCTION	1	4	21	63	94	134	1	4	21	63	94	134
221	JUNCTION	17	75	213	606	895	1,282	273	435	657	1,216	1,633	2,160
223	JUNCTION	12	31	65	154	218	302	38	68	111	217	297	397
224	JUNCTION	1	7	19	50	73	102	1	7	20	50	73	102
225	JUNCTION	12	26	48	105	148	202	38	62	94	169	227	297
226	JUNCTION	12	22	36	69	94	124	21	34	51	90	120	157
228	JUNCTION	1	5	15	41	60	84	18	29	45	81	109	143
231	JUNCTION	11	54	163	472	699	1,002	239	374	555	1,008	1,346	1,772
232	JUNCTION	1	9	25	67	97	138	2	10	26	68	98	139
235	JUNCTION	13	56	154	423	619	877	262	393	562	969	1,278	1,663
236	JUNCTION	0	5	14	36	53	75	10	18	29	57	79	106
237	JUNCTION	13	52	142	388	567	803	252	376	533	911	1,200	1,558
239	JUNCTION	13	51	138	374	546	772	252	375	528	896	1,177	1,525
240	JUNCTION	0	1	5	16	23	33	0	1	5	16	23	33

Design Point		Existing Conditions Peak Flows (cfs)						Future Conditions Peak Flow (cfs)					
Number	Type	Q_2	Q_5	Q_{10}	Q_{25}	Q_{50}	Q_{100}	Q_2	Q_5	Q_{10}	Q_{25}	Q_{50}	Q_{100}
241	JUNCTION	12	50	127	332	481	677	230	343	477	796	1,041	1,343
243	JUNCTION	4	26	74	200	293	414	166	243	331	540	702	901
244	JUNCTION	2	9	22	57	82	116	38	58	83	140	184	237
245	JUNCTION	3	20	55	147	214	302	137	196	262	414	533	680
247	JUNCTION	2	15	42	112	164	232	102	146	196	309	398	509
248	JUNCTION	2	11	30	75	109	152	83	117	154	232	295	372
250	JUNCTION	1	6	17	43	63	87	37	53	72	109	141	182
252	JUNCTION	1	5	13	35	51	71	35	50	67	106	136	173
256	JUNCTION	1	1	12	44	66	97	24	34	53	102	138	183
259	JUNCTION	8	24	54	132	188	263	64	100	146	257	341	445
260	JUNCTION	1	6	18	47	68	95	3	10	21	50	71	99
263	JUNCTION	9	20	39	88	124	171	64	94	129	211	274	351
264	JUNCTION	5	11	21	47	65	90	38	55	74	119	153	196
268	JUNCTION	4	10	19	42	59	82	27	40	56	94	123	158
310	JUNCTION	1	1	10	49	75	111	1	1	10	49	75	111
314	JUNCTION	14	22	39	83	115	155	18	26	45	92	126	168
410	JUNCTION	0	1	3	9	13	19	0	1	3	9	13	19
414	JUNCTION	0	1	3	9	14	20	0	1	3	9	14	20
418	JUNCTION	1	4	10	26	38	54	1	4	10	26	38	54
422	JUNCTION	0	0	0	0	1	3	0	0	0	0	1	3
426	JUNCTION	1	1	7	25	37	53	1	1	7	25	37	53
510	JUNCTION	8	20	39	90	126	174	8	20	40	90	127	175
513	JUNCTION	2	15	40	105	153	214	77	116	162	271	354	456
514	JUNCTION	1	6	18	49	71	101	41	61	84	138	179	229
518	JUNCTION	1	9	22	58	83	117	36	55	78	133	175	227
610	JUNCTION	2	10	25	66	95	135	8	18	34	76	106	146
613	JUNCTION	10	31	76	198	287	404	152	225	309	508	660	847
614	JUNCTION	10	23	44	95	133	182	51	78	114	189	250	322
617	JUNCTION	4	18	46	117	169	237	118	166	220	340	435	550
618	JUNCTION	2	9	20	48	68	95	50	70	91	134	170	217
620	JUNCTION	3	5	9	19	27	37	3	5	9	19	27	37
622	JUNCTION	2	11	29	74	107	149	79	111	148	224	286	359
708	JUNCTION	13	24	42	85	118	160	15	28	47	93	128	172
709	JUNCTION	13	25	42	85	118	160	15	28	47	93	128	172
710	JUNCTION	13	25	42	85	118	160	15	28	47	93	128	172
711	JUNCTION	13	25	42	85	118	160	15	28	47	93	128	173
712	JUNCTION	13	25	42	86	119	161	16	29	47	93	129	173
713	JUNCTION	13	25	42	85	118	160	15	29	47	93	129	173
714	JUNCTION	1	4	10	25	36	50	2	6	12	27	38	52

Design Point		Existing Conditions Peak Flows (cfs)						Future Conditions Peak Flow (cfs)					
Number	Type	Q_2	Q_5	Q_{10}	Q_{25}	Q_{50}	Q_{100}	Q_2	Q_5	Q_{10}	Q_{25}	Q_{50}	Q_{100}
804	JUNCTION	0	1	2	5	14	25	0	1	2	5	14	25
808	JUNCTION	66	112	192	491	716	1,024	353	520	714	1,206	1,586	2,058
809	JUNCTION	66	112	192	491	716	1,024	353	520	714	1,206	1,586	2,058
810	JUNCTION	1	8	19	50	72	101	28	43	63	110	146	190
811	JUNCTION	65	105	177	448	649	928	333	486	664	1,109	1,455	1,882
819	JUNCTION	67	108	178	448	651	929	337	490	669	1,113	1,460	1,887
820	JUNCTION	47	72	103	170	226	292	70	100	133	201	259	331
822	JUNCTION	2	6	12	32	47	66	28	40	54	87	114	146
823	JUNCTION	40	62	130	343	500	711	284	406	550	900	1,176	1,511
824	JUNCTION	3	8	16	36	51	70	38	53	69	102	130	165
829	JUNCTION	40	63	130	345	500	711	284	407	550	900	1,176	1,511
830	JUNCTION	40	63	91	150	199	259	61	87	117	177	228	294
831	JUNCTION	6	31	94	274	405	576	249	354	477	774	1,008	1,290
834	JUNCTION	7	33	96	283	407	577	263	361	484	782	1,017	1,299
836	DIVIDER	7	33	96	275	407	577	251	361	485	782	1,017	1,300
838	JUNCTION	7	33	96	275	407	578	252	362	485	782	1,018	1,300
839	JUNCTION	3	18	59	176	262	372	158	228	309	506	661	846
840	JUNCTION	2	7	17	41	59	82	44	63	82	124	160	200
841	JUNCTION	1	11	43	136	203	290	117	169	232	385	505	649
842	JUNCTION	1	10	28	74	108	152	71	102	137	215	277	353
843	JUNCTION	7	34	96	275	407	578	252	362	485	782	1,018	1,300
844	JUNCTION	5	19	45	111	160	221	118	166	218	325	415	523
850	JUNCTION	1	2	18	65	99	142	56	80	112	186	247	316
910	JUNCTION	1	2	8	44	71	107	11	17	26	68	99	141
911	JUNCTION	11	29	73	207	304	434	77	113	169	328	447	602
912	JUNCTION	11	29	73	207	304	434	78	113	169	328	447	602
929	JUNCTION	11	29	73	207	304	434	78	113	169	328	447	602
930	JUNCTION	4	7	21	62	92	131	74	100	132	206	264	335
931	JUNCTION	10	26	60	157	226	315	26	49	86	189	263	359
940	JUNCTION	2	8	21	58	84	119	9	18	32	72	100	137
950	JUNCTION	2	8	21	61	88	126	10	19	34	76	106	146
960	JUNCTION	7	13	22	45	63	84	7	13	23	46	64	86
1002	JUNCTION	314	693	1,502	4,069	6,140	9,020	1,175	1,895	2,960	6,053	8,502	11,827
1004	JUNCTION	317	694	1,502	4,059	6,117	8,976	1,184	1,900	2,960	6,038	8,472	11,772
1008	JUNCTION	300	630	1,318	3,507	5,264	7,699	1,006	1,608	2,498	5,095	7,149	9,917
1010	JUNCTION	300	629	1,317	3,503	5,254	7,678	1,006	1,607	2,497	5,090	7,136	9,893
1012	JUNCTION	296	622	1,299	3,441	5,150	7,510	1,001	1,596	2,473	5,011	7,009	9,693
1014	JUNCTION	239	524	1,141	3,051	4,531	6,560	836	1,342	2,114	4,332	6,037	8,298
1016	JUNCTION	239	524	1,139	3,045	4,522	6,546	836	1,342	2,112	4,325	6,026	8,282

Design Point		Existing Conditions Peak Flows (cfs)						Future Conditions Peak Flow (cfs)					
Number	Type	Q_2	Q_5	Q_{10}	Q_{25}	Q_{50}	Q_{100}	Q_2	Q_5	Q_{10}	Q_{25}	Q_{50}	Q_{100}
1018	JUNCTION	238	522	1,137	3,040	4,514	6,532	835	1,339	2,109	4,318	6,016	8,265
1020	JUNCTION	238	522	1,135	3,035	4,505	6,519	835	1,339	2,107	4,312	6,006	8,249
1022	JUNCTION	238	521	1,130	3,018	4,478	6,477	836	1,337	2,101	4,293	5,975	8,203
1024	JUNCTION	238	521	1,131	3,019	4,478	6,476	836	1,338	2,101	4,293	5,976	8,202
1026	JUNCTION	237	519	1,128	3,007	4,455	6,434	829	1,327	2,087	4,265	5,930	8,129
1028	JUNCTION	237	519	1,124	2,991	4,428	6,391	830	1,327	2,083	4,246	5,901	8,082
1030	JUNCTION	232	497	1,067	2,830	4,186	6,035	775	1,238	1,945	3,974	5,526	7,567
1032	JUNCTION	3	4	6	10	15	22	4	5	7	11	16	23
1034	JUNCTION	129	312	725	1,978	2,926	4,212	591	938	1,469	2,959	4,088	5,554
1036	JUNCTION	129	312	725	1,978	2,926	4,212	591	939	1,469	2,959	4,089	5,554
1038	JUNCTION	128	309	717	1,962	2,902	4,177	590	934	1,461	2,941	4,063	5,519
1040	JUNCTION	128	309	717	1,961	2,898	4,167	590	935	1,461	2,939	4,057	5,506
1042	JUNCTION	119	291	686	1,891	2,797	4,025	576	910	1,420	2,854	3,938	5,344
1044	JUNCTION	119	290	683	1,878	2,777	3,994	575	907	1,414	2,837	3,912	5,305
1046	JUNCTION	118	289	674	1,844	2,723	3,912	573	903	1,401	2,797	3,853	5,220
1048	JUNCTION	118	289	674	1,844	2,723	3,912	573	903	1,401	2,797	3,853	5,220
1050	JUNCTION	65	113	264	725	1,076	1,558	428	635	889	1,562	2,089	2,751
1108	JUNCTION	0	0	1	1	3	5	1	1	2	3	5	8
1110	JUNCTION	1	1	2	4	9	15	4	5	7	13	20	29
1115	JUNCTION	57	99	159	400	652	1,029	167	255	361	705	1,034	1,507
1116	JUNCTION	6	9	13	40	62	91	18	28	37	75	106	145
1123	JUNCTION	56	97	154	378	611	952	159	242	342	663	965	1,394
1124	JUNCTION	0	1	2	11	20	32	9	14	18	34	48	66
1125	JUNCTION	1	2	5	18	50	91	46	61	80	122	178	232
1126	JUNCTION	1	2	5	18	50	91	46	61	80	122	178	232
1127	JUNCTION	57	97	154	373	598	927	156	236	334	645	937	1,348
1130	JUNCTION	57	97	154	369	585	893	149	225	319	622	903	1,289
1132	JUNCTION	0	1	2	6	15	26	8	10	14	24	38	54
1139	JUNCTION	56	96	153	366	576	876	146	220	312	609	882	1,255
1140	JUNCTION	1	3	6	30	70	124	42	57	77	134	200	278
1141	JUNCTION	64	107	167	375	563	817	142	211	298	566	801	1,109
1142	JUNCTION	6	7	10	17	25	35	10	14	18	27	37	49
1144	JUNCTION	6	11	16	45	79	122	27	38	52	96	144	204
1147	JUNCTION	61	103	161	363	545	790	137	203	287	547	774	1,071
1148	JUNCTION	5	10	15	36	64	103	29	39	52	94	140	195
1150	JUNCTION	1	2	3	16	27	44	1	2	3	16	27	44
1151	JUNCTION	44	73	117	229	313	416	86	128	184	320	425	551
1152	JUNCTION	1	3	7	17	25	35	16	23	31	47	60	77
1153	JUNCTION	43	70	109	211	288	381	73	110	159	279	371	482

Design Point		Existing Conditions Peak Flows (cfs)						Future Conditions Peak Flow (cfs)					
Number	Type	Q_2	Q_5	Q_{10}	Q_{25}	Q_{50}	Q_{100}	Q_2	Q_5	Q_{10}	Q_{25}	Q_{50}	Q_{100}
1154	JUNCTION	3	5	11	32	47	66	36	50	65	101	130	165
1155	JUNCTION	64	102	158	329	472	660	123	181	254	463	638	861
1156	JUNCTION	20	28	37	71	102	141	22	31	41	76	108	148
1163	JUNCTION	44	69	103	186	249	325	45	70	104	187	251	328
1164	JUNCTION	44	69	103	186	249	325	45	70	104	187	251	328
1170	JUNCTION	20	28	37	71	102	141	22	31	41	76	108	148
1172	JUNCTION	0	1	2	6	15	28	1	1	2	7	16	28
1180	JUNCTION	3	5	6	13	19	25	3	5	6	13	19	26
1208	JUNCTION	2	4	6	20	39	65	12	18	24	48	76	109
1209	JUNCTION	0	1	2	12	33	62	2	4	6	21	43	73
1210	JUNCTION	0	1	2	12	33	62	2	4	6	21	43	73
1215	JUNCTION	94	151	258	618	909	1,309	115	184	300	673	972	1,380
1216	JUNCTION	1	1	5	34	58	92	3	5	11	42	66	101
1217	JUNCTION	95	153	261	623	914	1,314	116	186	303	677	977	1,384
1223	JUNCTION	96	153	259	585	836	1,173	114	180	291	625	882	1,225
1224	JUNCTION	1	3	13	41	62	89	4	8	18	48	69	97
1226	JUNCTION	1	1	6	20	30	44	5	8	14	31	44	60
1228	JUNCTION	1	1	3	15	23	35	2	3	5	17	26	38
1230	JUNCTION	0	0	5	20	30	44	2	3	8	22	33	47
1231	JUNCTION	120	183	287	571	786	1,063	133	202	309	597	816	1,097
1232	JUNCTION	48	72	112	207	284	373	56	83	126	226	308	402
1233	JUNCTION	65	100	151	280	377	499	67	102	153	283	381	504
1234	JUNCTION	18	27	41	75	101	133	18	27	42	75	101	133
1235	JUNCTION	20	30	45	85	114	151	21	31	46	86	115	153
1236	JUNCTION	20	30	45	85	114	151	21	31	46	86	115	153
1237	JUNCTION	23	36	53	96	129	170	23	36	53	96	129	170
1238	JUNCTION	23	36	53	96	129	170	23	36	53	96	129	170
1239	JUNCTION	20	35	65	155	223	316	26	42	72	164	233	327
1240	JUNCTION	1	2	7	19	28	40	2	3	8	20	30	41
1247	JUNCTION	31	49	72	131	175	230	32	50	74	132	177	233
1248	JUNCTION	8	13	19	34	46	61	9	14	21	36	49	63
1249	JUNCTION	23	36	53	96	129	170	23	36	53	96	129	170
1255	JUNCTION	19	33	58	131	187	261	24	37	63	137	194	269
1256	JUNCTION	18	26	39	71	96	126	23	33	48	83	110	142
1257	JUNCTION	6	15	31	78	113	158	6	15	32	78	113	159
1258	JUNCTION	5	10	20	46	65	89	5	10	20	46	65	89
1259	JUNCTION	4	8	17	39	56	78	4	9	17	40	56	78
1260	JUNCTION	4	8	17	39	56	78	4	9	17	40	56	78
1264	JUNCTION	0	0	1	16	28	44	1	3	4	19	32	48

Design Point		Existing Conditions Peak Flows (cfs)						Future Conditions Peak Flow (cfs)					
Number	Type	Q_2	Q_5	Q_{10}	Q_{25}	Q_{50}	Q_{100}	Q_2	Q_5	Q_{10}	Q_{25}	Q_{50}	Q_{100}
1272	JUNCTION	0	0	0	2	7	14	0	1	1	4	9	16
1273	JUNCTION	20	34	61	141	202	283	26	39	67	149	210	292
1274	JUNCTION	1	2	4	11	16	22	1	3	5	12	18	24
1308	JUNCTION	1	1	6	27	43	63	2	3	9	30	46	67
1310	JUNCTION	1	2	7	20	30	43	2	3	8	22	32	45
1315	JUNCTION	75	179	410	1,103	1,616	2,302	188	341	604	1,354	1,911	2,640
1316	JUNCTION	68	147	314	809	1,174	1,659	109	207	382	891	1,267	1,762
1318	JUNCTION	1	1	6	18	27	38	1	3	7	19	28	40
1319	JUNCTION	3	5	20	59	88	122	5	8	23	62	91	125
1320	JUNCTION	3	5	20	59	88	122	5	8	23	62	91	125
1321	JUNCTION	3	9	20	53	76	106	4	11	23	55	78	109
1322	JUNCTION	3	9	20	53	76	106	4	11	23	55	78	109
1323	JUNCTION	0	2	11	36	54	76	3	6	15	40	58	81
1324	JUNCTION	0	2	11	36	54	76	3	6	15	40	58	81
1327	JUNCTION	0	1	2	4	5	7	0	1	2	4	5	7
1328	JUNCTION	0	1	2	4	5	7	0	1	2	4	5	7
1340	JUNCTION	63	134	271	665	954	1,339	101	187	330	736	1,034	1,428
1341	JUNCTION	0	2	11	36	53	76	3	6	15	40	58	81
1347	JUNCTION	4	19	49	131	191	269	11	28	58	142	203	281
1348	JUNCTION	3	9	21	53	76	105	5	12	23	55	79	108
1349	JUNCTION	32	73	150	371	532	747	60	110	192	420	588	808
1351	JUNCTION	9	24	56	146	211	296	23	43	77	172	240	329
1352	JUNCTION	2	9	26	72	105	148	6	15	31	77	111	155
1353	JUNCTION	8	17	33	76	108	150	18	30	48	96	131	176
1354	JUNCTION	1	6	16	44	64	90	3	9	19	48	68	95
1355	JUNCTION	25	48	89	207	292	405	38	66	110	230	317	432
1356	JUNCTION	4	12	27	69	99	138	6	15	30	73	103	143
1357	JUNCTION	22	39	67	145	201	274	34	54	84	163	221	296
1358	JUNCTION	2	9	23	66	96	136	6	14	29	72	103	143
1361	JUNCTION	27	41	57	95	126	162	38	54	72	111	144	183
1362	JUNCTION	0	1	3	9	13	18	1	2	4	10	14	19
1363	JUNCTION	28	41	57	90	118	151	39	54	71	106	135	171
1364	JUNCTION	28	41	57	90	118	151	39	54	71	106	135	171
1367	JUNCTION	9	14	21	38	51	67	19	27	36	56	72	92
1368	JUNCTION	9	14	21	38	51	67	19	27	36	56	72	92
1371	JUNCTION	2	11	30	81	119	167	7	17	37	89	127	176
1372	JUNCTION	2	11	30	81	119	167	7	17	37	89	127	176
1382	JUNCTION	1	2	10	36	56	83	3	5	13	40	60	87
1386	JUNCTION	1	4	8	19	28	39	1	4	8	20	28	39

Design Point		Existing Conditions Peak Flows (cfs)						Future Conditions Peak Flow (cfs)					
Number	Type	Q_2	Q_5	Q_{10}	Q_{25}	Q_{50}	Q_{100}	Q_2	Q_5	Q_{10}	Q_{25}	Q_{50}	Q_{100}
1387	JUNCTION	2	14	38	100	146	204	9	23	47	110	157	216
1388	JUNCTION	2	14	38	100	146	204	9	23	47	110	157	216
1392	JUNCTION	2	4	17	55	83	118	12	18	34	75	107	147
1393	JUNCTION	1	8	22	61	89	126	12	22	38	80	111	151
1394	JUNCTION	1	8	22	61	89	126	12	22	38	80	111	151
1395	JUNCTION	4	14	33	82	119	166	89	125	165	251	321	406
1396	JUNCTION	1	6	17	45	66	94	53	73	96	148	189	238
1398	JUNCTION	3	8	16	38	53	74	38	53	70	106	136	171
1006_RR	JUNCTION	300	630	1,318	3,507	5,263	7,698	1,006	1,608	2,497	5,094	7,147	9,916
1233_Lake	JUNCTION	65	100	151	280	377	499	67	102	153	283	381	503
1239_Lake	JUNCTION	20	35	65	155	223	316	26	42	72	164	233	327
CulvertOut_1233	JUNCTION	65	100	151	280	377	499	67	102	153	283	381	504
O_100	OUTFALL	24	73	183	499	734	1,049	136	235	388	785	1,081	1,460
O_1000	OUTFALL	314	693	1,502	4,069	6,140	9,020	1,175	1,895	2,960	6,053	8,502	11,827
O_1107	JUNCTION	57	99	160	400	653	1,031	167	256	362	706	1,036	1,511
O_1263	JUNCTION	94	152	259	627	927	1,340	116	186	303	684	992	1,415
O_1307	JUNCTION	73	177	410	1,119	1,647	2,356	188	341	606	1,373	1,945	2,697
O_220	JUNCTION	17	75	224	653	971	1,401	263	426	660	1,261	1,707	2,273
O_300	JUNCTION	12	20	44	125	183	258	15	24	49	133	192	270
O_500	JUNCTION	8	27	68	182	266	378	74	121	185	343	460	609
O_600	JUNCTION	9	34	88	244	362	521	134	209	304	542	720	945
O_708	JUNCTION	13	24	42	85	118	160	15	28	47	93	128	172
O_803	JUNCTION	63	108	192	494	722	1,039	349	515	709	1,203	1,591	2,072
O_909	JUNCTION	10	27	74	235	358	527	79	123	187	383	531	728

Design Point		Existing Conditions Peak Volume (ac-ft)						Future Conditions Peak Volume (ac-ft)					
Number	Type	V_2	V_5	V_{10}	V_{25}	V_{50}	V_{100}	V_2	V_5	V_{10}	V_{25}	V_{50}	V_{100}
109	JUNCTION	4	11	24	57	84	120	15	24	39	72	99	135
110	JUNCTION	0	1	2	5	8	11	0	1	2	5	8	11
113	JUNCTION	4	10	22	52	77	109	15	24	37	67	92	124
114	JUNCTION	0	1	3	7	11	17	0	1	3	7	11	17
115	JUNCTION	4	9	19	44	64	91	14	22	34	58	79	106
117	JUNCTION	2	5	12	28	41	58	10	15	22	38	51	68
118	JUNCTION	0	0	1	2	4	6	0	0	1	2	4	6
119	JUNCTION	2	5	11	25	37	52	10	15	21	35	47	63
121	JUNCTION	0	2	4	10	15	22	3	5	8	14	20	26
122	JUNCTION	0	1	3	9	13	19	3	5	7	13	17	23
126	JUNCTION	0	0	1	1	2	3	0	0	1	1	2	3
129	JUNCTION	2	4	7	15	22	30	6	9	13	21	28	36
130	JUNCTION	0	1	1	3	5	7	0	1	2	4	5	8
133	JUNCTION	1	3	6	12	16	23	6	8	11	17	22	28
134	JUNCTION	0	1	2	4	6	8	2	3	4	6	8	11
138	JUNCTION	1	2	4	7	10	14	4	5	7	11	14	18
139	JUNCTION	1	3	7	16	24	33	5	7	12	21	28	38
141	JUNCTION	1	3	7	15	22	30	4	7	11	19	26	35
142	JUNCTION	0	0	1	1	2	3	0	0	1	1	2	3
146	JUNCTION	0	0	1	3	4	6	1	1	2	4	5	7
149	JUNCTION	1	3	5	12	17	24	4	6	9	15	21	28
150	JUNCTION	0	1	2	4	6	9	1	1	2	5	7	10
154	JUNCTION	1	2	4	8	11	15	3	5	7	10	14	18
210	JUNCTION	0	0	1	3	5	7	0	0	1	3	5	7
220	JUNCTION	0	0	2	6	10	15	0	0	2	6	10	15
221	JUNCTION	3	11	27	69	103	148	27	41	60	102	137	181
223	JUNCTION	1	3	7	15	22	31	4	6	10	18	25	34
224	JUNCTION	0	1	2	4	7	10	0	1	2	4	7	10
225	JUNCTION	1	3	5	10	15	21	3	5	8	14	18	24
226	JUNCTION	1	2	3	6	8	11	2	3	4	7	9	12
228	JUNCTION	0	1	2	5	7	10	2	3	4	7	9	12
231	JUNCTION	2	8	21	55	81	118	23	35	51	84	112	148
232	JUNCTION	0	1	3	7	11	16	0	1	3	7	11	16
235	JUNCTION	2	7	18	47	70	101	22	33	47	75	100	130
236	JUNCTION	0	0	1	4	6	9	1	2	3	6	8	11
237	JUNCTION	2	6	16	43	64	92	21	31	44	70	92	120
239	JUNCTION	2	6	16	41	61	89	21	31	44	68	90	117
240	JUNCTION	0	0	0	1	2	3	0	0	0	1	2	3

Design Point		Existing Conditions Peak Volume (ac-ft)						Future Conditions Peak Volume (ac-ft)					
Number	Type	V_2	V_5	V_{10}	V_{25}	V_{50}	V_{100}	V_2	V_5	V_{10}	V_{25}	V_{50}	V_{100}
241	JUNCTION	2	6	15	36	53	76	19	27	38	59	77	99
243	JUNCTION	1	3	8	21	31	45	13	19	25	38	49	63
244	JUNCTION	0	1	3	6	10	14	3	5	7	11	14	18
245	JUNCTION	0	2	5	14	21	31	10	14	19	27	35	44
247	JUNCTION	0	1	4	10	15	21	7	10	13	19	24	31
248	JUNCTION	0	1	3	7	10	15	5	7	9	13	17	21
250	JUNCTION	0	0	1	3	4	7	2	3	4	5	7	9
252	JUNCTION	0	1	2	4	7	10	3	4	6	8	11	14
256	JUNCTION	0	0	1	5	8	13	3	4	5	9	13	17
259	JUNCTION	1	3	7	15	22	31	6	9	13	21	28	37
260	JUNCTION	0	1	2	4	7	10	0	1	2	5	7	10
263	JUNCTION	1	2	5	10	15	21	5	8	10	16	21	27
264	JUNCTION	1	1	3	6	8	11	3	4	6	9	12	15
268	JUNCTION	1	1	2	5	7	10	2	3	5	7	9	12
310	JUNCTION	0	0	1	5	8	12	0	0	1	5	8	12
314	JUNCTION	1	2	3	6	8	12	1	2	3	6	9	12
410	JUNCTION	0	0	0	1	1	2	0	0	0	1	1	2
414	JUNCTION	0	0	0	1	1	2	0	0	0	1	1	2
418	JUNCTION	0	0	1	3	4	6	0	0	1	3	4	6
422	JUNCTION	0	0	0	0	0	0	0	0	0	0	0	0
426	JUNCTION	0	0	1	3	4	6	0	0	1	3	4	6
510	JUNCTION	1	2	4	10	14	20	1	2	5	10	14	20
513	JUNCTION	0	1	4	12	17	25	6	9	13	20	26	34
514	JUNCTION	0	1	2	6	9	13	4	5	7	11	14	18
518	JUNCTION	0	1	2	6	8	12	3	4	6	9	12	16
610	JUNCTION	0	1	3	7	11	16	1	2	4	9	12	17
613	JUNCTION	1	4	8	20	29	41	11	16	22	33	43	55
614	JUNCTION	1	2	4	8	12	17	3	5	7	12	15	20
617	JUNCTION	0	2	4	11	17	24	8	11	15	21	27	34
618	JUNCTION	0	1	2	4	6	8	3	4	5	7	9	12
620	JUNCTION	0	1	2	3	4	6	0	1	2	3	4	6
622	JUNCTION	0	1	3	7	11	16	5	7	10	14	18	23
708	JUNCTION	1	3	4	8	12	16	2	3	5	8	12	16
709	JUNCTION	1	3	4	8	12	16	2	3	5	8	12	16
710	JUNCTION	1	3	4	8	12	16	2	3	5	8	12	16
711	JUNCTION	1	3	4	8	12	16	2	3	5	8	12	16
712	JUNCTION	1	3	4	8	12	16	2	3	5	8	12	16
713	JUNCTION	1	3	4	8	12	16	2	3	5	8	12	16
714	JUNCTION	0	0	1	2	2	3	0	0	1	2	3	4

Design Point		Existing Conditions Peak Volume (ac-ft)						Future Conditions Peak Volume (ac-ft)					
Number	Type	V_2	V_5	V_{10}	V_{25}	V_{50}	V_{100}	V_2	V_5	V_{10}	V_{25}	V_{50}	V_{100}
804	JUNCTION	0	0	0	0	1	2	0	0	0	0	1	2
808	JUNCTION	7	13	25	54	78	110	31	44	59	87	113	144
809	JUNCTION	7	13	25	54	78	110	31	44	59	87	113	144
810	JUNCTION	0	1	2	5	8	11	2	3	5	8	11	14
811	JUNCTION	6	12	23	49	70	98	28	40	54	79	102	129
819	JUNCTION	6	12	23	49	70	98	28	40	54	79	102	129
820	JUNCTION	3	4	6	9	12	16	4	5	7	11	14	17
822	JUNCTION	0	1	2	4	5	7	2	3	4	6	8	10
823	JUNCTION	3	7	15	36	52	75	22	31	42	62	80	102
824	JUNCTION	0	1	2	3	5	7	2	3	4	6	8	10
829	JUNCTION	3	7	15	36	52	75	22	31	42	62	80	102
830	JUNCTION	2	3	5	8	11	14	3	4	6	9	12	15
831	JUNCTION	1	3	10	28	42	61	19	27	36	53	69	87
834	JUNCTION	1	3	10	27	41	60	19	27	36	53	68	87
836	DIVIDER	1	3	10	27	41	60	19	27	36	53	68	87
838	JUNCTION	1	3	10	27	41	60	19	27	36	53	68	87
839	JUNCTION	0	2	6	18	28	41	12	17	24	35	46	58
840	JUNCTION	0	1	2	5	7	10	3	5	6	9	11	14
841	JUNCTION	0	1	4	13	21	31	9	13	17	26	34	44
842	JUNCTION	0	1	3	8	12	17	5	7	10	15	19	24
843	JUNCTION	1	3	10	27	41	60	19	27	36	53	68	87
844	JUNCTION	0	1	4	9	14	20	6	9	12	18	23	28
850	JUNCTION	0	0	1	6	9	14	4	5	8	12	16	20
910	JUNCTION	0	0	1	5	8	13	1	2	3	7	11	16
911	JUNCTION	1	4	9	24	37	53	8	13	20	35	48	64
912	JUNCTION	1	4	9	24	37	53	8	13	20	35	48	64
929	JUNCTION	1	4	9	24	37	53	8	13	20	35	48	64
930	JUNCTION	0	1	2	7	10	15	5	7	10	14	18	23
931	JUNCTION	1	3	7	17	26	37	3	6	10	21	29	41
940	JUNCTION	0	1	2	6	9	14	1	2	4	8	11	15
950	JUNCTION	0	1	3	8	12	17	1	3	5	10	14	19
960	JUNCTION	1	1	2	3	5	6	1	1	2	3	5	6
1002	JUNCTION	55	107	214	503	749	1,077	162	249	374	666	924	1,249
1004	JUNCTION	54	106	212	500	743	1,068	161	247	371	663	914	1,240
1008	JUNCTION	50	95	182	423	629	905	135	206	310	552	767	1,043
1010	JUNCTION	50	94	182	420	626	902	134	205	310	552	767	1,040
1012	JUNCTION	49	92	178	411	611	878	133	203	305	543	749	1,016
1014	JUNCTION	40	78	156	368	540	773	109	169	259	469	651	881
1016	JUNCTION	40	78	156	365	540	773	109	169	259	469	647	878

Design Point		Existing Conditions Peak Volume (ac-ft)						Future Conditions Peak Volume (ac-ft)					
Number	Type	V_2	V_5	V_{10}	V_{25}	V_{50}	V_{100}	V_2	V_5	V_{10}	V_{25}	V_{50}	V_{100}
1018	JUNCTION	39	77	156	365	537	770	108	168	258	466	647	875
1020	JUNCTION	39	77	155	365	537	767	108	168	258	466	644	875
1022	JUNCTION	39	77	154	362	534	761	108	168	257	463	641	868
1024	JUNCTION	39	77	154	362	534	761	108	168	257	463	641	868
1026	JUNCTION	39	77	153	359	531	755	107	166	255	460	635	859
1028	JUNCTION	39	76	153	356	525	752	107	166	254	457	632	853
1030	JUNCTION	38	73	144	334	494	706	99	154	236	427	589	798
1032	JUNCTION	0	0	0	1	1	1	0	0	0	1	1	1
1034	JUNCTION	22	45	95	229	338	485	69	108	166	299	411	555
1036	JUNCTION	22	45	95	229	338	485	69	108	166	299	411	555
1038	JUNCTION	21	44	94	226	334	479	68	107	164	296	408	549
1040	JUNCTION	21	44	94	226	334	479	68	107	164	295	408	549
1042	JUNCTION	20	41	89	218	322	460	67	104	160	287	396	534
1044	JUNCTION	20	41	88	216	319	457	67	103	159	285	393	528
1046	JUNCTION	19	41	87	211	310	445	66	103	157	279	384	515
1048	JUNCTION	19	41	87	211	310	445	66	103	157	279	384	515
1050	JUNCTION	8	17	35	84	124	178	41	60	83	131	174	226
1108	JUNCTION	0	0	0	0	0	0	0	0	0	0	0	0
1110	JUNCTION	0	0	0	0	1	2	0	1	1	1	2	2
1115	JUNCTION	9	14	21	44	68	104	24	34	45	72	100	136
1116	JUNCTION	1	1	1	3	5	8	1	2	3	5	7	10
1123	JUNCTION	8	13	20	40	62	94	22	31	41	66	91	124
1124	JUNCTION	0	0	0	1	2	3	1	1	1	2	3	5
1125	JUNCTION	0	0	0	1	2	4	2	3	4	5	7	9
1126	JUNCTION	0	0	0	1	2	4	2	3	4	5	7	9
1127	JUNCTION	8	13	19	39	60	91	21	30	40	64	88	119
1130	JUNCTION	8	13	19	38	58	87	19	27	37	58	80	110
1132	JUNCTION	0	0	0	0	1	2	1	1	1	2	2	3
1139	JUNCTION	8	13	19	37	57	85	19	26	35	57	78	106
1140	JUNCTION	0	0	0	2	5	9	3	4	6	9	12	17
1141	JUNCTION	8	12	18	35	52	75	15	22	29	47	65	88
1142	JUNCTION	1	1	1	1	2	3	1	1	1	2	3	3
1144	JUNCTION	0	1	1	3	5	8	2	3	3	6	8	11
1147	JUNCTION	7	12	17	33	50	72	14	20	28	45	63	85
1148	JUNCTION	1	1	2	4	7	11	3	4	5	8	11	16
1150	JUNCTION	0	0	1	2	4	6	0	0	1	2	4	6
1151	JUNCTION	4	6	10	18	25	34	7	10	15	23	30	39
1152	JUNCTION	0	0	1	2	2	3	1	1	2	3	4	4
1153	JUNCTION	4	6	9	16	23	31	6	9	13	20	27	35

Design Point		Existing Conditions Peak Volume (ac-ft)						Future Conditions Peak Volume (ac-ft)					
Number	Type	V_2	V_5	V_{10}	V_{25}	V_{50}	V_{100}	V_2	V_5	V_{10}	V_{25}	V_{50}	V_{100}
1154	JUNCTION	0	1	1	4	6	8	3	4	5	7	10	12
1155	JUNCTION	6	10	15	27	39	55	11	16	22	35	47	63
1156	JUNCTION	2	3	4	6	9	12	2	3	4	6	9	12
1163	JUNCTION	3	5	7	13	17	22	3	5	8	13	17	23
1164	JUNCTION	3	5	7	13	17	22	3	5	8	13	17	23
1170	JUNCTION	2	3	4	6	9	12	2	3	4	6	9	12
1172	JUNCTION	0	0	0	1	2	4	0	0	0	1	2	4
1180	JUNCTION	0	0	1	1	2	2	0	0	1	1	2	2
1208	JUNCTION	0	0	1	2	3	6	1	2	2	4	6	8
1209	JUNCTION	0	0	0	1	3	7	0	1	1	2	5	8
1210	JUNCTION	0	0	0	1	3	7	0	1	1	2	5	8
1215	JUNCTION	14	22	37	77	111	157	17	27	43	83	119	165
1216	JUNCTION	0	0	1	6	10	16	1	1	2	7	11	17
1217	JUNCTION	14	22	37	77	111	157	17	27	43	83	119	164
1223	JUNCTION	14	22	36	70	98	134	16	25	40	74	102	139
1224	JUNCTION	0	0	1	5	8	11	1	1	2	6	9	12
1226	JUNCTION	0	0	1	3	4	6	1	1	2	4	6	8
1228	JUNCTION	0	0	0	2	3	5	0	0	1	2	3	5
1230	JUNCTION	0	0	0	2	3	4	0	0	1	2	3	5
1231	JUNCTION	13	20	31	56	77	104	14	21	33	58	79	106
1232	JUNCTION	3	5	7	12	17	23	4	5	8	13	18	23
1233	JUNCTION	7	10	15	25	33	44	7	10	15	25	34	44
1234	JUNCTION	1	2	3	5	7	9	1	2	3	5	7	9
1235	JUNCTION	2	3	5	8	11	14	2	3	5	8	11	14
1236	JUNCTION	2	3	5	8	11	14	2	3	5	8	11	14
1237	JUNCTION	2	4	5	9	12	15	2	4	5	9	12	15
1238	JUNCTION	2	4	5	9	12	15	2	4	5	9	12	15
1239	JUNCTION	3	5	9	19	27	37	3	6	10	20	28	38
1240	JUNCTION	0	0	1	2	2	4	0	0	1	2	3	4
1247	JUNCTION	3	5	7	12	16	21	3	5	7	12	16	21
1248	JUNCTION	1	1	2	3	4	6	1	1	2	3	5	6
1249	JUNCTION	2	4	5	9	12	15	2	4	5	9	12	15
1255	JUNCTION	3	5	8	16	22	31	3	5	9	16	23	31
1256	JUNCTION	2	3	4	6	8	11	2	3	4	7	9	12
1257	JUNCTION	1	2	4	10	14	20	1	2	4	10	14	20
1258	JUNCTION	0	1	2	5	7	9	0	1	2	5	7	9
1259	JUNCTION	0	1	2	5	7	10	1	1	2	5	7	10
1260	JUNCTION	0	1	2	5	7	10	1	1	2	5	7	10
1264	JUNCTION	0	0	0	1	3	4	0	0	0	2	3	5

Design Point		Existing Conditions Peak Volume (ac-ft)						Future Conditions Peak Volume (ac-ft)					
Number	Type	V_2	V_5	V_{10}	V_{25}	V_{50}	V_{100}	V_2	V_5	V_{10}	V_{25}	V_{50}	V_{100}
1272	JUNCTION	0	0	0	0	1	2	0	0	0	1	1	2
1273	JUNCTION	3	5	9	17	24	34	3	6	9	18	25	34
1274	JUNCTION	0	0	0	1	2	3	0	0	1	2	2	3
1308	JUNCTION	0	0	1	3	5	8	0	0	1	4	6	9
1310	JUNCTION	0	0	1	2	4	5	0	0	1	2	4	5
1315	JUNCTION	11	23	51	123	181	259	25	42	72	144	204	281
1316	JUNCTION	9	19	38	88	129	183	14	25	45	96	137	191
1318	JUNCTION	0	0	1	2	3	5	0	0	1	2	3	5
1319	JUNCTION	0	0	1	3	5	8	0	1	1	4	6	8
1320	JUNCTION	0	0	1	3	5	8	0	1	1	4	6	8
1321	JUNCTION	0	1	2	5	8	11	0	1	2	5	8	11
1322	JUNCTION	0	1	2	5	8	11	0	1	2	5	8	11
1323	JUNCTION	0	0	1	3	5	7	0	1	1	4	5	8
1324	JUNCTION	0	0	1	3	5	7	0	1	1	4	5	8
1327	JUNCTION	0	0	0	1	1	1	0	0	0	1	1	1
1328	JUNCTION	0	0	0	1	1	1	0	0	0	1	1	1
1340	JUNCTION	9	17	33	73	106	149	12	22	39	79	113	156
1341	JUNCTION	0	0	1	3	5	7	0	1	1	4	5	8
1347	JUNCTION	0	2	5	14	20	29	1	3	6	15	22	31
1348	JUNCTION	0	1	2	5	8	11	0	1	2	5	8	11
1349	JUNCTION	4	9	18	41	60	85	7	13	22	45	64	89
1351	JUNCTION	1	3	6	16	23	33	2	5	9	18	26	36
1352	JUNCTION	0	1	3	8	12	18	1	2	4	9	13	19
1353	JUNCTION	1	2	4	8	11	16	2	3	5	9	12	17
1354	JUNCTION	0	1	2	5	7	10	0	1	2	5	7	10
1355	JUNCTION	3	5	10	22	32	44	4	7	12	24	34	47
1356	JUNCTION	0	1	3	7	10	15	1	2	3	7	11	15
1357	JUNCTION	2	4	7	15	21	30	3	6	9	17	23	31
1358	JUNCTION	0	1	3	8	12	17	1	2	4	9	12	18
1361	JUNCTION	2	3	4	7	9	12	2	4	5	8	10	13
1362	JUNCTION	0	0	1	1	2	3	0	0	1	2	2	3
1363	JUNCTION	2	3	4	6	7	9	2	3	4	6	8	10
1364	JUNCTION	2	3	4	6	7	9	2	3	4	6	8	10
1367	JUNCTION	1	1	2	3	4	6	1	2	3	4	5	6
1368	JUNCTION	1	1	2	3	4	6	1	2	3	4	5	6
1371	JUNCTION	0	1	3	8	13	18	1	2	4	9	14	19
1372	JUNCTION	0	1	3	8	13	18	1	2	4	9	14	19
1382	JUNCTION	0	0	1	5	8	13	0	1	2	6	9	13
1386	JUNCTION	0	1	1	3	4	6	0	1	1	3	4	6

Design Point		Existing Conditions Peak Volume (ac-ft)						Future Conditions Peak Volume (ac-ft)					
Number	Type	V_2	V_5	V_{10}	V_{25}	V_{50}	V_{100}	V_2	V_5	V_{10}	V_{25}	V_{50}	V_{100}
1371	JUNCTION	0	1	3	8	13	18	1	2	4	9	14	19
1372	JUNCTION	0	1	3	8	13	18	1	2	4	9	14	19
1382	JUNCTION	0	0	1	5	8	13	0	1	2	6	9	13
1386	JUNCTION	0	1	1	3	4	6	0	1	1	3	4	6
1387	JUNCTION	0	1	3	8	12	18	1	2	4	9	13	19
1388	JUNCTION	0	1	3	8	12	18	1	2	4	9	13	19
1392	JUNCTION	0	0	1	5	8	12	1	2	3	7	10	14
1393	JUNCTION	0	1	3	7	11	15	1	3	5	9	13	18
1394	JUNCTION	0	1	3	7	11	15	1	3	5	9	13	18
1395	JUNCTION	0	2	4	10	14	20	7	9	12	18	23	29
1396	JUNCTION	0	1	2	5	8	12	4	6	7	11	14	17
1398	JUNCTION	0	1	2	4	6	9	3	4	5	7	9	12
1006_RR	JUNCTION	50	95	182	423	629	905	135	206	310	552	767	1,043
1233_Lake	JUNCTION	7	10	15	25	33	44	7	10	15	25	34	44
1239_Lake	JUNCTION	3	5	9	19	27	37	3	6	10	20	28	38
CulvertOut_1233	JUNCTION	7	10	15	25	33	44	7	10	15	25	34	44
O_100	OUTFALL	4	11	24	57	84	120	15	24	39	72	99	135
O_1000	OUTFALL	55	107	214	503	749	1,077	162	249	374	666	924	1,249
O_1107	JUNCTION	9	14	21	44	69	104	24	34	45	72	100	137
O_1263	JUNCTION	14	22	37	78	114	162	18	27	43	85	122	170
O_1307	JUNCTION	11	24	52	127	187	268	25	43	74	148	210	290
O_220	JUNCTION	4	12	30	76	113	163	27	41	63	109	147	196
O_300	JUNCTION	1	2	4	11	16	23	2	2	4	11	16	24
O_500	JUNCTION	1	4	9	22	32	46	7	12	18	30	41	55
O_600	JUNCTION	2	5	12	28	41	58	13	19	27	42	56	73
O_708	JUNCTION	1	3	4	8	12	16	2	3	5	9	12	16
O_803	JUNCTION	7	13	25	55	79	112	31	44	59	88	114	146
O_909	JUNCTION	2	4	10	30	45	66	10	16	24	43	59	80

```
[TITLE]
;;Project Title/Notes
City of Greeley
Comprehensive Draingae Plan Oklahoma Basins
Baseline Hydrology
Matrix Design Group, Inc. 2025

[OPTIONS]
;;Option             Value
FLOW_UNITS           CFS
INFILTRATION         HORTON
FLOW_ROUTING         KINWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           01/01/2024
START_TIME           00:00:00
REPORT_START_DATE    01/01/2024
REPORT_START_TIME    00:00:00
END_DATE             01/02/2024
END_TIME             06:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:05:00
WET_STEP             00:05:00
DRY_STEP             01:00:00
ROUTING_STEP         0:00:20
RULE_STEP            00:00:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         12.566
MAX_TRIALS           8
HEAD_TOLERANCE       0.005
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              1

[FILES]
;;Interfacing Files
USE INFLOWS "R:\24.906.009 Greeley - Oklahoma Master Basin Study\200 Design\220 Drainage-WR\221 Models\01 CUHP_SWMM\01 CUHP\7_Ex_100yr_0mi^2_GOM_Outputs.txt"

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
CONSTANT         0.0
DRY_ONLY         NO

[JUNCTIONS]
;;Name           Elevation  MaxDepth   InitDepth  SurDepth   Aponded
;;-------------- ---------- ---------- ---------- ---------- ----------
1002             4757       0          0          0          0
1004             4768       0          0          0          0
1006_RR          4772       0          0          0          0
1008             4774       0          0          0          0
1010             4774.9     0          0          0          0
1012             4777.9     0          0          0          0
1014             4779       0          0          0          0
1016             4781       0          0          0          0
```

67	1018	4782	0	0	0	0
68	1020	4784	0	0	0	0
69	1022	4789	0	0	0	0
70	1024	4792	0	0	0	0
71	1026	4793	0	0	0	0
72	1028	4803.9	0	0	0	0
73	1030	4811.9	0	0	0	0
74	1032	4770	0	0	0	0
75	1034	4814.9	0	0	0	0
76	1036	4818	0	0	0	0
77	1038	4821	0	0	0	0
78	1040	4827.9	0	0	0	0
79	1042	4838	0	0	0	0
80	1044	4844	0	0	0	0
81	1046	4851	0	0	0	0
82	1048	4855	0	0	0	0
83	1050	4864	0	0	0	0
84	109	4779	0	0	0	0
85	110	4794	0	0	0	0
86	1108	4816	0	0	0	0
87	1110	4855	0	0	0	0
88	1115	4790	0	0	0	0
89	1116	4850	0	0	0	0
90	1123	4825	0	0	0	0
91	1124	4864	0	0	0	0
92	1125	4852	0	0	0	0
93	1126	4864	0	0	0	0
94	1127	4841	0	0	0	0
95	113	4784	0	0	0	0
96	1130	4854	0	0	0	0
97	1132	4874	0	0	0	0
98	1139	4857	10	0	0	0
99	114	4798	0	0	0	0
100	1140	4879	0	0	0	0
101	1141	4878	0	0	0	0
102	1142	4902	0	0	0	0
103	1144	4925	0	0	0	0
104	1147	4893	0	0	0	0
105	1148	4946	10	0	0	0
106	115	4816.7	0	0	0	0
107	1150	4955	0	0	0	0
108	1151	4941	0	0	0	0
109	1152	4966	0	0	0	0
110	1153	4943	0	0	0	0
111	1154	4976	0	0	0	0
112	1155	4898	0	0	0	0
113	1156	4935	0	0	0	0
114	1163	4953	0	0	0	0
115	1164	4958	0	0	0	0
116	117	4818	0	0	0	0
117	;Detention					
118	1170	4909	0	0	0	0
119	1172	4832	0	0	0	0
120	118	4830	0	0	0	0
121	1180	4838	0	0	0	0
122	119	4834	0	0	0	0
123	1208	4868	10	0	0	0
124	1209	4877	10	0	0	0
125	121	4835	0	0	0	0
126	1210	4889	0	0	0	0
127	1215	4868	0	0	0	0
128	1216	4882	0	0	0	0
129	1217	4873	0	0	0	0
130	122	4983	10	0	0	0
131	1223	4880	0	0	0	0
132	1224	4890	0	0	0	0

133	1226	4895	10	0	0	0
134	1228	4903	0	0	0	0
135	1230	4883	0	0	0	0
136	1231	4908	0	0	0	0
137	1232	4955	0	0	0	0
138	1233	4917	0	0	0	0
139	1233_Lake	4911	0	0	0	0
140	1234	4960	0	0	0	0
141	1235	4941	0	0	0	0
142	1236	4998	0	0	0	0
143	1237	4973	0	0	0	0
144	1238	5005	0	0	0	0
145	1239	4954	0	0	0	0
146	1239_Lake	4941	0	0	0	0
147	1240	4981	0	0	0	0
148	1247	4946	0	0	0	0
149	1248	4967	0	0	0	0
150	1249	4957	0	0	0	0
151	1255	4965	0	0	0	0
152	1256	4993	0	0	0	0
153	1257	4970	0	0	0	0
154	1258	4989	0	0	0	0
155	1259	4990	0	0	0	0
156	126	4999	0	0	0	0
157	1260	5019	0	0	0	0
158	1264	4876	0	0	0	0
159	1272	4880	0	0	0	0
160	1273	4959	0	0	0	0
161	1274	4978	0	0	0	0
162	129	4835	0	0	0	0
163	130	4910	0	0	0	0
164	1308	4891	0	0	0	0
165	1310	4912	0	0	0	0
166	1315	4893	0	0	0	0
167	1316	4904	0	0	0	0
168	1318	4923	0	0	0	0
169	1319	4929	0	0	0	0
170	1320	4970	0	0	0	0
171	1321	4931	0	0	0	0
172	1322	4975	0	0	0	0
173	1341	4957	0	0	0	0
174	1324	4975	0	0	0	0
175	1327	4984	0	0	0	0
176	1328	4989	0	0	0	0
177	133	4917	0	0	0	0
178	134	4945	0	0	0	0
179	1340	4946	0	0	0	0
180	1347	4949	0	0	0	0
181	1348	4981	0	0	0	0
182	1349	4952	0	0	0	0
183	1351	4979	0	0	0	0
184	1352	5019	0	0	0	0
185	1353	4985	0	0	0	0
186	1354	5028	0	0	0	0
187	1355	4971	0	0	0	0
188	1356	4989	0	0	0	0
189	1357	4981	0	0	0	0
190	1358	4993	0	0	0	0
191	1361	5024	0	0	0	0
192	1362	5035	0	0	0	0
193	1363	5038	0	0	0	0
194	1364	5058	0	0	0	0
195	1367	5033	0	0	0	0
196	1368	5059	0	0	0	0
197	1371	4971	0	0	0	0
198	1372	4988	0	0	0	0

199	138	4970	0	0	0	0
200	1382	4921	0	0	0	0
201	1386	4960	0	0	0	0
202	1387	4943	0	0	0	0
203	1388	4995	0	0	0	0
204	139	4817	0	0	0	0
205	1392	4938	0	0	0	0
206	1393	4940	0	0	0	0
207	1394	4997	0	0	0	0
208	1395	4947	0	0	0	0
209	1396	4969	0	0	0	0
210	1398	4972	0	0	0	0
211	141	4827	0	0	0	0
212	142	4820	0	0	0	0
213	146	4849	0	0	0	0
214	149	4869	0	0	0	0
215	150	4890	0	0	0	0
216	154	4904	0	0	0	0
217	210	4770	0	0	0	0
218	220	4777	0	0	0	0
219	221	4790.6	0	0	0	0
220	223	4793	0	0	0	0
221	224	4810	0	0	0	0
222	225	4840	0	0	0	0
223	226	4850	0	0	0	0
224	228	4864	0	0	0	0
225	231	4790.8	0	0	0	0
226	232	4810	0	0	0	0
227	235	4845	0	0	0	0
228	236	4847	0	0	0	0
229	237	4846	0	0	0	0
230	239	4850	0	0	0	0
231	240	4849	0	0	0	0
232	241	4862	0	0	0	0
233	243	4863	0	0	0	0
234	244	4894	0	0	0	0
235	245	4980	0	0	0	0
236	247	4981	0	0	0	0
237	248	4986	0	0	0	0
238	250	5015	0	0	0	0
239	252	4990	0	0	0	0
240	256	4851	0	0	0	0
241	259	4863	0	0	0	0
242	260	4905	0	0	0	0
243	263	4922	0	0	0	0
244	264	4991	0	0	0	0
245	268	4991	0	0	0	0
246	310	4778	0	0	0	0
247	314	4839	0	0	0	0
248	410	4793	0	0	0	0
249	414	4796	0	0	0	0
250	418	4802	0	0	0	0
251	422	4800	0	0	0	0
252	426	4810	0	0	0	0
253	510	4856	0	0	0	0
254	513	4880	0	0	0	0
255	514	4931	0	0	0	0
256	518	4940	0	0	0	0
257	610	4858	0	0	0	0
258	613	4888	0	0	0	0
259	614	4899	0	0	0	0
260	617	4942	0	0	0	0
261	618	4950	0	0	0	0
262	620	4920	0	0	0	0
263	622	4981	0	0	0	0
264	708	4851	0	0	0	0

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709              4866       0          0          0          0
710              4871       0          0          0          0
711              4889       0          0          0          0
712              4915       0          0          0          0
713              4898       0          0          0          0
714              4864       0          0          0          0
804              4882       0          0          0          0
808              4885       0          0          0          0
809              4890       0          0          0          0
810              4925       0          0          0          0
811              4893       0          0          0          0
819              4901       0          0          0          0
820              4945       0          0          0          0
822              4932       0          0          0          0
823              4908       0          0          0          0
824              4961       0          0          0          0
829              4918       15         0          0          0
830              4972       0          0          0          0
831              4928.5     0          0          0          0
834              4932       0          0          0          0
838              4949       0          0          0          0
839              4965       0          0          0          0
840              4990       0          0          0          0
841              4967       0          0          0          0
842              5000       0          0          0          0
843              4959       0          0          0          0
844              4995       0          0          0          0
850              4990       0          0          0          0
910              4916       0          0          0          0
911              4913       0          0          0          0
912              4920       0          0          0          0
929              4922       0          0          0          0
930              4927       0          0          0          0
931              4954       0          0          0          0
940              4986       0          0          0          0
950              4977       0          0          0          0
960              4970       0          0          0          0
O_1107           4778       0          0          0          0
O_1263           4812       0          0          0          0
O_1307           4865       0          0          0          0
O_220            4772       0          0          0          0
O_300            4778       0          0          0          0
O_500            4826       0          0          0          0
O_600            4815       0          0          0          0
O_708            4828       0          0          0          0
O_803            4865       0          0          0          0
O_909            4865       0          0          0          0
1323             4966       0          0          0          0
CulvertOut_1233  4914       0          0          0          0

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
O_100            4778       FREE                        NO
O_1000           4756       FREE                        NO

[DIVIDERS]
;;Name           Elevation  Diverted Link    Type       Parameters
;;-------------- ---------- ---------------- ---------- ----------
836              4945       Overflow_836     OVERFLOW   0          0          0          0

[CONDUITS]
;;Name           From Node        To Node          Length     Roughness  InOffset   OutOffset  InitFlow   MaxFlow
;;-------------- ---------------- ---------------- ---------- ---------- ---------- ---------- ---------- ----------
Dummy_1032       1032             1002             400        0.035      0          0          0          0
Dummy_1050       1050             1048             381        0.035      0          0          0          0
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331	Dummy_109	109	O_100	400	0.01	0	0	0	0
332	Dummy_110	110	109	400	0.01	0	0	0	0
333	Dummy_1107	O_1107	1012	400	0.01	0	0	0	0
334	Dummy_1108	1108	O_1107	400	0.035	0	0	0	0
335	Dummy_1110	1110	1115	400	0.035	0	0	0	0
336	Dummy_1116	1116	1115	400	0.035	0	0	0	0
337	Dummy_1124	1124	1123	400	0.035	0	0	0	0
338	Dummy_1126	1126	1125	400	0.035	0	0	0	0
339	Dummy_1132	1132	1130	400	0.035	0	0	0	0
340	Dummy_1139	1139	1130	300	0.013	0	0	0	0
341	Dummy_114	114	113	400	0.01	0	0	0	0
342	Dummy_1140	1140	1139	400	0.035	0	0	0	0
343	Dummy_1142	1142	1141	400	0.035	0	0	0	0
344	Dummy_1144	1144	1155	400	0.035	0	0	0	0
345	Dummy_1148	1148	1147	400	0.035	0	0	0	0
346	Dummy_1150	1150	1147	400	0.035	0	0	0	0
347	Dummy_1152	1152	1151	400	0.01	0	0	0	0
348	Dummy_1153	1153	1151	400	0.035	0	0	0	0
349	Dummy_1154	1154	1153	400	0.035	0	0	0	0
350	Dummy_1156	1156	1170	400	0.035	0	0	0	0
351	Dummy_1164	1164	1163	400	0.035	0	0	0	0
352	Dummy_1172	1172	1008	400	0.035	0	0	0	0
353	Dummy_118	118	117	400	0.01	0	0	0	0
354	Dummy_1180	1180	1016	400	0.035	0	0	0	0
355	Dummy_1208	1208	1024	400	0.035	0	0	0	0
356	Dummy_121	121	119	400	0.01	0	0	0	0
357	Dummy_1210	1210	1209	400	0.035	0	0	0	0
358	Dummy_1216	1216	1217	400	0.035	0	0	0	0
359	Dummy_122	122	121	400	0.01	0	0	0	0
360	Dummy_1224	1224	1223	400	0.035	0	0	0	0
361	Dummy_1226	1226	1223	400	0.035	0	0	0	0
362	Dummy_1228	1228	1223	400	0.035	0	0	0	0
363	Dummy_1230	1230	1223	400	0.035	0	0	0	0
364	Dummy_1232	1232	1231	400	0.035	0	0	0	0
365	Dummy_1233_Lake	1233_Lake	1231	400	0.01	0	0	0	0
366	Dummy_1234	1234	1233	400	0.01	0	0	0	0
367	Dummy_1236	1236	1235	400	0.01	0	0	0	0
368	Dummy_1238	1238	1237	400	0.01	0	0	0	0
369	Dummy_1239	1239_Lake	1231	400	0.01	0	0	0	0
370	Dummy_1240	1240	1239	400	0.01	0	0	0	0
371	Dummy_1248	1248	1247	400	0.01	0	0	0	0
372	Dummy_1249	1249	1247	400	0.01	0	0	0	0
373	Dummy_1256	1256	1255	400	0.01	0	0	0	0
374	Dummy_1258	1258	1257	400	0.01	0	0	0	0
375	Dummy_1260	1260	1259	400	0.01	0	0	0	0
376	Dummy_1263	O_1263	1030	400	0.01	0	0	0	0
377	Dummy_1264	1264	O_1263	400	0.035	0	0	0	0
378	Dummy_1272	1272	1038	400	0.035	0	0	0	0
379	Dummy_1274	1274	1273	400	0.01	0	0	0	0
380	Dummy_129	129	119	400	0.01	0	0	0	0
381	Dummy_130	130	129	400	0.01	0	0	0	0
382	Dummy_1307	O_1307	1048	400	0.01	0	0	0	0
383	Dummy_1308	1308	O_1307	400	0.01	0	0	0	0
384	Dummy_1310	1310	1315	400	0.01	0	0	0	0
385	Dummy_1318	1318	1315	400	0.01	0	0	0	0
386	Dummy_1320	1320	1319	400	0.01	0	0	0	0
387	Dummy_1322	1322	1321	400	0.01	0	0	0	0
388	Dummy_1341	1341	1340	400	0.01	0	0	0	0
389	Dummy_1328	1328	1327	400	0.01	0	0	0	0
390	Dummy_1337	1347	1340	400	0.01	0	0	0	0
391	Dummy_134	134	133	400	.01	0	0	0	0
392	Dummy_1348	1348	1347	400	0.01	0	0	0	0
393	Dummy_1349	1349	1340	400	0.01	0	0	0	0
394	Dummy_1352	1352	1351	400	0.01	0	0	0	0
395	Dummy_1354	1354	1353	400	0.01	0	0	0	0
396	Dummy_1356	1356	1355	400	0.01	0	0	0	0

397	Dummy_1358	1358	1357	400	0.01	0	0	0	0
398	Dummy_1362	1362	1361	400	0.01	0	0	0	0
399	Dummy_1364	1364	1363	400	0.01	0	0	0	0
400	Dummy_1368	1368	1367	400	0.01	0	0	0	0
401	Dummy_1372	1372	1371	400	0.01	0	0	0	0
402	Dummy_1382	1382	1044	400	0.01	0	0	0	0
403	Dummy_1386	1386	1340	400	0.01	0	0	0	0
404	Dummy_1388	1388	1387	400	0.01	0	0	0	0
405	Dummy_1392	1392	1315	400	0.01	0	0	0	0
406	Dummy_1394	1394	1393	400	0.01	0	0	0	0
407	Dummy_1396	1396	1395	400	0.01	0	0	0	0
408	Dummy_1398	1398	1395	400	0.01	0	0	0	0
409	Dummy_142	142	139	400	0.01	0	0	0	0
410	Dummy_150	150	149	400	0.01	0	0	0	0
411	Dummy_210	210	1002	400	0.035	0	0	0	0
412	Dummy_219	O_220	1004	400	0.035	0	0	0	0
413	Dummy_220	220	O_220	400	0.01	0	0	0	0
414	Dummy_223	223	221	400	0.01	0	0	0	0
415	Dummy_224	224	223	400	0.01	0	0	0	0
416	Dummy_226	226	225	400	0.01	0	0	0	0
417	Dummy_231	231	221	400	0.01	0	0	0	0
418	Dummy_232	232	231	400	0.01	0	0	0	0
419	Dummy_236	236	235	400	0.01	0	0	0	0
420	Dummy_237	237	235	400	0.01	0	0	0	0
421	Dummy_240	240	237	400	0.01	0	0	0	0
422	Dummy_243	243	241	400	0.01	0	0	0	0
423	Dummy_244	244	243	400	0.01	0	0	0	0
424	Dummy_247	247	245	400	0.01	0	0	0	0
425	Dummy_248	248	247	400	0.01	0	0	0	0
426	Dummy_252	252	245	400	0.01	0	0	0	0
427	Dummy_256	256	239	400	0.01	0	0	0	0
428	Dummy_259	259	241	400	0.01	0	0	0	0
429	Dummy_260	260	259	400	0.01	0	0	0	0
430	Dummy_264	264	263	400	0.01	0	0	0	0
431	Dummy_300	O_300	1010	400	0.01	0	0	0	0
432	Dummy_310	310	O_300	400	0.035	0	0	0	0
433	Dummy_410	410	1014	400	0.01	0	0	0	0
434	Dummy_414	414	1018	400	0.01	0	0	0	0
435	Dummy_418	418	1020	400	0.01	0	0	0	0
436	Dummy_422	422	1022	400	0.01	0	0	0	0
437	Dummy_426	426	1026	400	0.01	0	0	0	0
438	Dummy_500	O_500	1028	400	0.01	0	0	0	0
439	Dummy_510	510	O_500	400	0.01	0	0	0	0
440	Dummy_514	514	513	400	0.01	0	0	0	0
441	Dummy_518	518	513	400	0.01	0	0	0	0
442	Dummy_600	O_600	1030	400	0.01	0	0	0	0
443	Dummy_610	610	O_600	400	0.01	0	0	0	0
444	Dummy_614	614	613	400	0.01	0	0	0	0
445	Dummy_618	618	617	400	0.01	0	0	0	0
446	Dummy_620	620	1036	400	0.01	0	0	0	0
447	Dummy_708	O_708	1040	400	0.01	0	0	0	0
448	Dummy_714	714	1042	400	0.01	0	0	0	0
449	Dummy_803	O_803	1050	400	0.01	0	0	0	0
450	Dummy_804	804	O_803	400	0.01	0	0	0	0
451	Dummy_810	810	809	400	0.01	0	0	0	0
452	Dummy_820	820	819	400	0.01	0	0	0	0
453	Dummy_830	830	829	400	0.01	0	0	0	0
454	Dummy_840	840	839	400	0.01	0	0	0	0
455	Dummy_842	842	841	400	0.01	0	0	0	0
456	Dummy_844	844	843	400	0.01	0	0	0	0
457	Dummy_909	O_909	1050	400	0.01	0	0	0	0
458	Dummy_910	910	O_909	400	0.035	0	0	0	0
459	Dummy_929	929	912	75	0.013	0	0	0	0
460	Dummy_930	930	929	400	0.01	0	0	0	0
461	Dummy_940	940	931	400	0.035	0	0	0	0
462	Dummy_950	950	931	400	0.035	0	0	0	0

463	Dummy_960	960	931	400	0.035	0	0	0	0
464	Dummy_1002	1002	O_1000	400	0.044	0	0	0	0
465	L_1004	1004	1002	1497	0.075	0	0	0	0
466	L_1006	1006_RR	1004	461	0.055	0	0	0	0
467	L_1008	1008	1006_RR	473	0.044	0	0	0	0
468	L_1010	1010	1008	378	0.04	0	0	0	0
469	L_1012	1012	1010	896	0.075	0	0	0	0
470	L_1014	1014	1012	536	0.075	0	0	0	0
471	L_1016	1016	1014	319	0.055	0	0	0	0
472	L_1018	1018	1016	433	0.044	0	0	0	0
473	L_1020	1020	1018	373	0.044	0	0	0	0
474	L_1022	1022	1020	784	0.055	0	0	0	0
475	L_1024	1024	1022	543	0.055	0	0	0	0
476	L_1026	1026	1024	134	0.055	0	0	0	0
477	L_1028	1028	1026	1068	0.055	0	0	0	0
478	L_1030	1030	1028	474	0.055	0	0	0	0
479	L_1034	1034	1030	510	.055	0	0	0	0
480	L_1036	1036	1034	372	0.055	0	0	0	0
481	L_1038	1038	1036	567	0.055	0	0	0	0
482	L_1040	1040	1038	743	0.055	0	0	0	0
483	L_1042	1042	1040	601	0.055	0	0	0	0
484	L_1044	1044	1042	477	0.055	0	0	0	0
485	L_1046	1046	1044	402	0.044	0	0	0	0
486	L_1048	1048	1046	359	0.044	0	0	0	0
487	L_1115	1115	O_1107	432	0.055	0	0	0	0
488	L_1123	1123	1115	1593	0.055	0	0	0	0
489	L_1125	1125	1127	105	0.044	0	0	0	0
490	L_1127	1127	1123	873	0.055	0	0	0	0
491	L_1130	1130	1127	640	0.075	0	0	0	0
492	L_114	113	109	144	.035	0	0	0	0
493	L_1141	1141	1139	1900	0.055	0	0	0	0
494	L_1147	1147	1141	973	0.044	0	0	0	0
495	L_115	115	113	3260	.035	0	0	0	0
496	L_1151	1151	1155	2508	0.044	0	0	0	0
497	L_1156	1155	1147	1050	0.044	0	0	0	0
498	L_1163	1163	1153	1100	0.044	0	0	0	0
499	L_117	117	115	86	.035	0	0	0	0
500	L_1170	1170	1155	600	0.035	0	0	0	0
501	L_119	119	117	1087	.035	0	0	0	0
502	L_1209	1209	1217	930	0.044	0	0	0	0
503	Dummy_1215	1215	O_1263	1937.8	.01	0	0	0	0
504	L_1217	1217	1215	1800	0.044	0	0	0	0
505	L_1223	1223	1217	1649	0.044	0	0	0	0
506	L_1231	1231	1223	4880	0.044	0	0	0	0
507	L_1233	CulvertOut_1233	1233_Lake	315	0.044	0	0	0	0
508	L_1235	1235	1233	960	0.044	0	0	0	0
509	L_1237	1237	1249	920	0.020	0	0	0	0
510	L_1239	1239	1239_Lake	560	0.035	0	0	0	0
511	L_1247	1247	1233	1640	0.044	1	0	0	0
512	L_1255	1255	1273	650	0.055	0	0	0	0
513	L_1257	1257	1255	1580	.044	0	0	0	0
514	L_1259	1259	1257	2600	0.020	0	0	0	0
515	L_126	126	121	5178	.035	0	0	0	0
516	L_1273	1273	1239	795	0.075	0	0	0	0
517	L_1315	1315	O_1307	2154	0.055	0	0	0	0
518	L_1316	1316	1315	1157	0.055	0	0	0	0
519	L_1319	1319	1316	1841	0.044	0	0	0	0
520	L_1321	1321	1316	1813	0.044	0	0	0	0
521	L_1323	1323	1341	568	0.044	0	0	0	0
522	L_1327	1327	1349	2582	.020	0	0	0	0
523	L_133	133	129	2743	.035	0	0	0	0
524	L_1340	1340	1316	2275	.044	0	0	0	0
525	L_1351	1351	1349	2108.97	.044	0	0	0	0
526	L_1353	1353	1351	1021.71	.044	0	0	0	0
527	L_1355	1355	1349	957.73	0.044	0	0	0	0
528	L_1357	1357	1355	1049.12	0.044	0	0	0	0

L_1361	1361	1357	3566	0.044	0	0	0	0
L_1363	1363	1361	1016.32	0.020	0	0	0	0
L_1367	1367	1353	2810.21	0.044	0	0	0	0
L_1371	1371	1347	1116.44	0.044	0	0	0	0
L_138	138	133	2426	.035	0	0	0	0
L_1387	1387	1315	2272	.044	0	0	0	0
L_139	139	115	73	.035	0	0	0	0
L_1393	1393	1315	2179	.044	0	0	0	0
L_1395	1395	1315	3616	0.044	0	0	0	0
L_141	141	139	542	.035	0	0	0	0
L_146	146	141	165	.035	0	0	0	0
L_149	149	141	1479	.035	0	0	0	0
L_154	154	149	1625	.035	0	0	0	0
L_221	221	O_220	2511	.035	0	0	0	0
L_225	225	223	1810	.035	0	0	0	0
L_228	228	225	847	.035	0	0	0	0
L_235	235	231	3274	.035	0	0	0	0
L_239	239	237	288	.035	0	0	0	0
L_241	241	239	1092	.035	0	0	0	0
L_245	245	243	4101	.035	0	0	0	0
L_250	250	247	2063	.035	0	0	0	0
L_263	263	259	2459	.035	0	0	0	0
L_268	268	263	1464	.035	0	0	0	0
L_314	314	O_300	2623	.035	0	0	0	0
L_513	513	O_500	3358	.035	0	0	0	0
L_613	613	O_600	3854	.035	0	0	0	0
L_617	617	613	2214	.035	0	0	0	0
L_622	622	617	1661	.035	0	0	0	0
L_708	708	O_708	202	0.035	0	0	0	0
L_709	709	708	560.2	.03	0	0	0	0
L_710	710	709	154.3	.04	0	0	0	0
L_711	711	710	615.3	.04	0	0	0	0
L_712	712	713	485.4	.04	0	0	0	0
L_713	713	711	338.1	.07	0	0	0	0
L_808	808	O_803	1197	.07	0	0	0	0
L_809	809	808	90	.013	0	0	0	0
L_811	811	809	183	.045	0	0	0	0
L_819	819	811	761	0.07	0	0	0	0
L_822	822	819	671	0.04	0	0	0	0
L_823	823	819	943	0.04	0	0	0	0
L_824	824	822	1270	0.035	0	0	0	0
L_829	829	823	290	0.035	0	0	0	0
L_831	831	829	105	0.04	0	0	0	0
L_834	834	831	1040	.04	0	0	0	0
L_836	836	834	442	0.013	0	0	0	0
L_838	838	836	314.88	.048	0	0	0	0
L_839	839	843	541	.048	0	0	0	0
L_841	841	839	190	.044	0	0	0	0
L_843	843	838	304	0.035	0	0	0	0
L_850	850	841	1740	.044	0	0	0	0
L_911	911	O_909	2561	0.055	0	0	0	0
L_912	912	911	522	0.044	0	0	0	0
L_931	931	929	2763	0.044	0	0	0	0
Overflow_836	836	834	442	0.035	0	0	0	0
Dummy_1324	1324	1323	400	0.01	0	0	0	0
Dummy_1233	1233	CulvertOut_1233	400	0.035	0	0	0	0

[XSECTIONS]

;;Link	Shape	Geom1	Geom2	Geom3	Geom4	Barrels	Culvert
Dummy_1032	DUMMY	0	0	0	0	1	
Dummy_1050	DUMMY	0	0	0	0	1	
Dummy_109	DUMMY	0	0	0	0	1	
Dummy_110	DUMMY	0	0	0	0	1	
Dummy_1107	DUMMY	0	0	0	0	1	
Dummy_1108	DUMMY	0	0	0	0	1	

595	Dummy_1110	DUMMY	0	0	0	0	1
596	Dummy_1116	DUMMY	0	0	0	0	1
597	Dummy_1124	DUMMY	0	0	0	0	1
598	Dummy_1126	DUMMY	0	0	0	0	1
599	Dummy_1132	DUMMY	0	0	0	0	1
600	Dummy_1139	DUMMY	0	0	0	0	1
601	Dummy_114	DUMMY	0	0	0	0	1
602	Dummy_1140	DUMMY	0	0	0	0	1
603	Dummy_1142	DUMMY	0	0	0	0	1
604	Dummy_1144	DUMMY	0	0	0	0	1
605	Dummy_1148	DUMMY	0	0	0	0	1
606	Dummy_1150	DUMMY	0	0	0	0	1
607	Dummy_1152	DUMMY	0	0	0	0	1
608	Dummy_1153	DUMMY	0	0	0	0	1
609	Dummy_1154	DUMMY	0	0	0	0	1
610	Dummy_1156	DUMMY	0	0	0	0	1
611	Dummy_1164	DUMMY	0	0	0	0	1
612	Dummy_1172	DUMMY	0	0	0	0	1
613	Dummy_118	DUMMY	0	0	0	0	1
614	Dummy_1180	DUMMY	0	0	0	0	1
615	Dummy_1208	DUMMY	0	0	0	0	1
616	Dummy_121	DUMMY	0	0	0	0	1
617	Dummy_1210	DUMMY	0	0	0	0	1
618	Dummy_1216	DUMMY	0	0	0	0	1
619	Dummy_122	DUMMY	0	0	0	0	1
620	Dummy_1224	DUMMY	0	0	0	0	1
621	Dummy_1226	DUMMY	0	0	0	0	1
622	Dummy_1228	DUMMY	0	0	0	0	1
623	Dummy_1230	DUMMY	0	0	0	0	1
624	Dummy_1232	DUMMY	0	0	0	0	1
625	Dummy_1233_Lake	DUMMY	0	0	0	0	1
626	Dummy_1234	DUMMY	0	0	0	0	1
627	Dummy_1236	DUMMY	0	0	0	0	1
628	Dummy_1238	DUMMY	0	0	0	0	1
629	Dummy_1239	DUMMY	0	0	0	0	1
630	Dummy_1240	DUMMY	0	0	0	0	1
631	Dummy_1248	DUMMY	0	0	0	0	1
632	Dummy_1249	DUMMY	0	0	0	0	1
633	Dummy_1256	DUMMY	0	0	0	0	1
634	Dummy_1258	DUMMY	0	0	0	0	1
635	Dummy_1260	DUMMY	0	0	0	0	1
636	Dummy_1263	DUMMY	0	0	0	0	1
637	Dummy_1264	DUMMY	0	0	0	0	1
638	Dummy_1272	DUMMY	0	0	0	0	1
639	Dummy_1274	DUMMY	0	0	0	0	1
640	Dummy_129	DUMMY	0	0	0	0	1
641	Dummy_130	DUMMY	0	0	0	0	1
642	Dummy_1307	DUMMY	0	0	0	0	1
643	Dummy_1308	DUMMY	0	0	0	0	1
644	Dummy_1310	DUMMY	0	0	0	0	1
645	Dummy_1318	DUMMY	0	0	0	0	1
646	Dummy_1320	DUMMY	0	0	0	0	1
647	Dummy_1322	DUMMY	0	0	0	0	1
648	Dummy_1341	DUMMY	0	0	0	0	1
649	Dummy_1328	DUMMY	0	0	0	0	1
650	Dummy_1337	DUMMY	0	0	0	0	1
651	Dummy_134	DUMMY	0	0	0	0	1
652	Dummy_1348	DUMMY	0	0	0	0	1
653	Dummy_1349	DUMMY	0	0	0	0	1
654	Dummy_1352	DUMMY	0	0	0	0	1
655	Dummy_1354	DUMMY	0	0	0	0	1
656	Dummy_1356	DUMMY	0	0	0	0	1
657	Dummy_1358	DUMMY	0	0	0	0	1
658	Dummy_1362	DUMMY	0	0	0	0	1
659	Dummy_1364	DUMMY	0	0	0	0	1
660	Dummy_1368	DUMMY	0	0	0	0	1

661	Dummy_1372	DUMMY	0	0	0	0	1
662	Dummy_1382	DUMMY	0	0	0	0	1
663	Dummy_1386	DUMMY	0	0	0	0	1
664	Dummy_1388	DUMMY	0	0	0	0	1
665	Dummy_1392	DUMMY	0	0	0	0	1
666	Dummy_1394	DUMMY	0	0	0	0	1
667	Dummy_1396	DUMMY	0	0	0	0	1
668	Dummy_1398	DUMMY	0	0	0	0	1
669	Dummy_142	DUMMY	0	0	0	0	1
670	Dummy_150	DUMMY	0	0	0	0	1
671	Dummy_210	DUMMY	0	0	0	0	1
672	Dummy_219	DUMMY	0	0	0	0	1
673	Dummy_220	DUMMY	0	0	0	0	1
674	Dummy_223	DUMMY	0	0	0	0	1
675	Dummy_224	DUMMY	0	0	0	0	1
676	Dummy_226	DUMMY	0	0	0	0	1
677	Dummy_231	DUMMY	0	0	0	0	1
678	Dummy_232	DUMMY	0	0	0	0	1
679	Dummy_236	DUMMY	0	0	0	0	1
680	Dummy_237	DUMMY	0	0	0	0	1
681	Dummy_240	DUMMY	0	0	0	0	1
682	Dummy_243	DUMMY	0	0	0	0	1
683	Dummy_244	DUMMY	0	0	0	0	1
684	Dummy_247	DUMMY	0	0	0	0	1
685	Dummy_248	DUMMY	0	0	0	0	1
686	Dummy_252	DUMMY	0	0	0	0	1
687	Dummy_256	DUMMY	0	0	0	0	1
688	Dummy_259	DUMMY	0	0	0	0	1
689	Dummy_260	DUMMY	0	0	0	0	1
690	Dummy_264	DUMMY	0	0	0	0	1
691	Dummy_300	DUMMY	0	0	0	0	1
692	Dummy_310	DUMMY	0	0	0	0	1
693	Dummy_410	DUMMY	0	0	0	0	1
694	Dummy_414	DUMMY	0	0	0	0	1
695	Dummy_418	DUMMY	0	0	0	0	1
696	Dummy_422	DUMMY	0	0	0	0	1
697	Dummy_426	DUMMY	0	0	0	0	1
698	Dummy_500	DUMMY	0	0	0	0	1
699	Dummy_510	DUMMY	0	0	0	0	1
700	Dummy_514	DUMMY	0	0	0	0	1
701	Dummy_518	DUMMY	0	0	0	0	1
702	Dummy_600	DUMMY	0	0	0	0	1
703	Dummy_610	DUMMY	0	0	0	0	1
704	Dummy_614	DUMMY	0	0	0	0	1
705	Dummy_618	DUMMY	0	0	0	0	1
706	Dummy_620	DUMMY	0	0	0	0	1
707	Dummy_708	DUMMY	0	0	0	0	1
708	Dummy_714	DUMMY	0	0	0	0	1
709	Dummy_803	DUMMY	0	0	0	0	1
710	Dummy_804	DUMMY	0	0	0	0	1
711	Dummy_810	DUMMY	0	0	0	0	1
712	Dummy_820	DUMMY	0	0	0	0	1
713	Dummy_830	DUMMY	0	0	0	0	1
714	Dummy_840	DUMMY	0	0	0	0	1
715	Dummy_842	DUMMY	0	0	0	0	1
716	Dummy_844	DUMMY	0	0	0	0	1
717	Dummy_909	DUMMY	0	0	0	0	1
718	Dummy_910	DUMMY	0	0	0	0	1
719	Dummy_929	DUMMY	0	0	0	0	1
720	Dummy_930	DUMMY	0	0	0	0	1
721	Dummy_940	DUMMY	0	0	0	0	1
722	Dummy_950	DUMMY	0	0	0	0	1
723	Dummy_960	DUMMY	0	0	0	0	1
724	Dummy_1002	DUMMY	0	0	0	0	1
725	L_1004	TRAPEZOIDAL	20	64	1.5	1.5	1
726	L_1006	TRAPEZOIDAL	30	40	2	2	1

727	L_1008	TRAPEZOIDAL	20	25	3	3	1
728	L_1010	TRAPEZOIDAL	20	25	3	3	1
729	L_1012	TRAPEZOIDAL	30	25	3	3	1
730	L_1014	TRAPEZOIDAL	30	65	2.5	2.5	1
731	L_1016	TRAPEZOIDAL	20	65	2.5	2.5	1
732	L_1018	TRAPEZOIDAL	20	55	2.5	2.5	1
733	L_1020	TRAPEZOIDAL	20	55	2.5	2.5	1
734	L_1022	TRAPEZOIDAL	20	42	2	2	1
735	L_1024	TRAPEZOIDAL	20	60	2.5	2.5	1
736	L_1026	TRAPEZOIDAL	20	60	2.5	2.5	1
737	L_1028	TRAPEZOIDAL	20	50	1	1	1
738	L_1030	TRAPEZOIDAL	20	50	1	1	1
739	L_1034	TRAPEZOIDAL	20	40	1	1	1
740	L_1036	TRAPEZOIDAL	20	40	1	1	1
741	L_1038	TRAPEZOIDAL	20	30	2.5	2.5	1
742	L_1040	TRAPEZOIDAL	20	25	3	3	1
743	L_1042	TRAPEZOIDAL	20	20	3	3	1
744	L_1044	TRAPEZOIDAL	20	20	3	3	1
745	L_1046	TRAPEZOIDAL	20	25	5	5	1
746	L_1048	TRAPEZOIDAL	20	25	5	5	1
747	L_1115	TRAPEZOIDAL	10	10	1.5	1.5	1
748	L_1123	TRAPEZOIDAL	10	75	3	3	1
749	L_1125	TRAPEZOIDAL	10	15	3.5	3.5	1
750	L_1127	TRAPEZOIDAL	10	90	2.5	2.5	1
751	L_1130	TRAPEZOIDAL	10	90	2.5	2.5	1
752	L_114	TRIANGULAR	10	200	0	0	1
753	L_1141	TRAPEZOIDAL	10	200	10	10	1
754	L_1147	TRAPEZOIDAL	10	25	5	5	1
755	L_115	TRAPEZOIDAL	10	100	5	5	1
756	L_1151	TRAPEZOIDAL	10	10	3	3	1
757	L_1156	TRAPEZOIDAL	10	300	10	10	1
758	L_1163	TRAPEZOIDAL	10	70	3	3	1
759	L_117	TRAPEZOIDAL	10	10	2	2	1
760	L_1170	TRAPEZOIDAL	10	250	7.5	7.5	1
761	L_119	TRAPEZOIDAL	10	10	2	2	1
762	L_1209	TRAPEZOIDAL	10	.001	15	15	1
763	Dummy_1215	DUMMY	0	0	0	0	1
764	L_1217	TRAPEZOIDAL	10	20	3	3	1
765	L_1223	TRAPEZOIDAL	10	.001	15	15	1
766	L_1231	TRAPEZOIDAL	10	.001	15	15	1
767	L_1233	TRAPEZOIDAL	10	20	4	4	1
768	L_1235	TRAPEZOIDAL	10	4	4	4	1
769	L_1237	TRAPEZOIDAL	10	6	0	0	1
770	L_1239	TRAPEZOIDAL	10	.001	4	4	1
771	L_1247	TRAPEZOIDAL	10	5	4	4	1
772	L_1255	TRAPEZOIDAL	10	.001	4	4	1
773	L_1257	TRAPEZOIDAL	10	4	2	2	1
774	L_1259	TRAPEZOIDAL	10	40	15	15	1
775	L_126	TRAPEZOIDAL	10	30	2	2	1
776	L_1273	TRAPEZOIDAL	10	.001	4	4	1
777	L_1315	TRAPEZOIDAL	10	90	3	3	1
778	L_1316	TRAPEZOIDAL	10	.001	15	15	1
779	L_1319	TRAPEZOIDAL	10	.001	15	15	1
780	L_1321	TRAPEZOIDAL	10	.001	15	15	1
781	L_1323	TRAPEZOIDAL	10	.001	15	15	1
782	L_1327	TRAPEZOIDAL	1	40	2	2	1
783	L_133	TRAPEZOIDAL	10	75	8	8	1
784	L_1340	TRAPEZOIDAL	10	.001	15	15	1
785	L_1351	TRAPEZOIDAL	10	.001	15	15	1
786	L_1353	TRAPEZOIDAL	10	0.001	15	15	1
787	L_1355	TRAPEZOIDAL	10	.001	15	15	1
788	L_1357	TRAPEZOIDAL	10	.001	15	15	1
789	L_1361	TRAPEZOIDAL	10	.001	15	15	1
790	L_1363	TRAPEZOIDAL	10	40	2	2	1
791	L_1367	TRAPEZOIDAL	10	.001	15	15	1
792	L_1371	TRAPEZOIDAL	10	.001	15	15	1

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L_138            TRAPEZOIDAL  10              50         8          8          1
L_1387           TRAPEZOIDAL  10              30         5          5          1
L_139            TRAPEZOIDAL  10              20         2          2          1
L_1393           TRAPEZOIDAL  10              .001       15         15         1
L_1395           TRAPEZOIDAL  10              25         15         15         1
L_141            TRAPEZOIDAL  10              20         2          2          1
L_146            TRAPEZOIDAL  10              20         10         10         1
L_149            TRAPEZOIDAL  10              30         2          2          1
L_154            TRAPEZOIDAL  10              50         2          2          1
L_221            TRAPEZOIDAL  10              40         4          4          1
L_225            TRAPEZOIDAL  10              40         2          2          1
L_228            TRAPEZOIDAL  10              20         2          2          1
L_235            TRAPEZOIDAL  10              100        3          3          1
L_239            TRAPEZOIDAL  10              75         2          2          1
L_241            TRAPEZOIDAL  10              30         2          2          1
L_245            TRAPEZOIDAL  10              10         2          2          1
L_250            TRAPEZOIDAL  10              10         50         50         1
L_263            TRAPEZOIDAL  10              20         2          2          1
L_268            TRAPEZOIDAL  10              20         2          2          1
L_314            TRAPEZOIDAL  10              50         2          2          1
L_513            TRAPEZOIDAL  10              50         2          2          1
L_613            TRAPEZOIDAL  10              100        3          3          1
L_617            TRAPEZOIDAL  10              80         2          2          1
L_622            TRAPEZOIDAL  10              20         10         10         1
L_708            TRAPEZOIDAL  10              22         2          2          1
L_709            TRAPEZOIDAL  10              50         4          4          1
L_710            TRAPEZOIDAL  10              70         2          2          1
L_711            TRAPEZOIDAL  10              73         4          4          1
L_712            TRAPEZOIDAL  10              106        15         15         1
L_713            TRAPEZOIDAL  10              55         10         10         1
L_808            TRAPEZOIDAL  10              65         3          3          1
L_809            RECT_CLOSED  15              5          0          0          1
L_811            TRAPEZOIDAL  10              107        6          6          1
L_819            TRAPEZOIDAL  10              115        3          3          1
L_822            TRAPEZOIDAL  10              235        5          5          1
L_823            TRAPEZOIDAL  10              235        5          5          1
L_824            TRAPEZOIDAL  10              657        30         30         1
L_829            TRAPEZOIDAL  10              75         3.5        6.5        1
L_831            TRAPEZOIDAL  15              65         6          6          1
L_834            TRAPEZOIDAL  15              64         6          6          1
L_836            CIRCULAR     4               0          0          0          1
L_838            TRAPEZOIDAL  15              24         15         15         1
L_839            TRAPEZOIDAL  15              100        27         10         1
L_841            TRIANGULAR   10              200        0          0          1
L_843            CIRCULAR     15              0          0          0          1
L_850            TRAPEZOIDAL  10              20         12         12         1
L_911            TRAPEZOIDAL  10              85         4          4          1
L_912            TRAPEZOIDAL  10              .001       15         15         1
L_931            TRAPEZOIDAL  10              .001       15         15         1
Overflow_836     TRAPEZOIDAL  15              40         15         15         1
Dummy_1324       DUMMY        0               0          0          0          1
Dummy_1233       DUMMY        0               0          0          0          1

[REPORT]
;;Reporting Options
INPUT      YES
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]
Link       Dummy_1153       Dummy_1152

[MAP]
DIMENSIONS 3145393.000 1386770.000 3180780.000 1409658.000
Units      Feet
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[COORDINATES]
;;Node           X-Coord            Y-Coord
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1002             3170619.149        1402564.338
1004             3169675.902        1401645.913
1006_RR          3169428.809        1401411.720
1008             3168851.250        1401189.918
1010             3168674.735        1401006.049
1012             3168039.211        1400554.818
1014             3167753.552        1400053.608
1016             3167742.617        1399994.737
1018             3167464.735        1399744.295
1020             3167206.542        1399579.227
1022             3166642.065        1399209.650
1024             3166345.932        1398969.986
1026             3166243.069        1398915.460
1028             3165721.676        1398175.698
1030             3165182.237        1397849.465
1032             3170291.764        1402598.774
1034             3164981.729        1397666.990
1036             3164734.293        1397340.880
1038             3164281.212        1397196.114
1040             3163554.937        1397152.211
1042             3162976.481        1397015.234
1044             3162506.853        1396951.740
1046             3162186.921        1396850.612
1048             3161914.795        1396591.357
1050             3161832.974        1396243.845
109              3172493.984        1401578.256
110              3173043.879        1401167.292
1108             3168014.254        1400672.563
1110             3167389.060        1401791.532
1115             3167772.078        1400732.774
1116             3167002.137        1400457.093
1123             3166576.791        1401482.270
1124             3165892.228        1401684.092
1125             3166242.512        1402334.051
1126             3166529.823        1402745.717
1127             3166181.400        1402195.122
113              3172464.883        1401459.245
1130             3165627.108        1402465.968
1132             3164987.475        1402037.559
1139             3165354.982        1402701.320
114              3172167.781        1400707.633
1140             3164034.092        1402675.928
1141             3163817.839        1403624.342
1142             3163815.859        1404392.551
1144             3163009.111        1405544.660
1147             3162688.718        1403824.464
1148             3162007.737        1403370.329
115              3173888.360        1398653.630
1150             3161990.346        1402766.892
1151             3159922.833        1404783.678
1152             3159447.152        1404354.176
1153             3159776.054        1404788.405
1154             3159355.340        1405109.370
1155             3162442.428        1404798.158
1156             3160414.028        1404986.553
1163             3159634.809        1405897.936
1164             3158849.608        1406407.727
117              3173880.064        1398564.270
1170             3161905.451        1405050.099
1172             3168596.213        1401742.560
118              3173540.426        1397983.668
1180             3167514.718        1400032.040
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925	119	3174325.889	1397711.087
926	1208	3165728.297	1399170.234
927	1209	3163919.886	1400320.218
928	121	3174321.334	1397296.283
929	1210	3163248.197	1401455.603
930	1215	3165126.655	1398419.867
931	1216	3163520.212	1398828.011
932	1217	3163868.402	1399430.293
933	122	3173547.646	1396590.755
934	1223	3162682.114	1399997.622
935	1224	3161001.796	1399832.688
936	1226	3161838.560	1400771.304
937	1228	3162600.045	1401680.060
938	1230	3162519.789	1399097.998
939	1231	3160070.878	1401221.136
940	1232	3159625.895	1400495.298
941	1233	3159542.835	1402283.661
942	1233_Lake	3159541.841	1401555.286
943	1234	3159086.367	1402604.291
944	1235	3159800.417	1402869.660
945	1236	3159039.870	1403440.456
946	1237	3156522.687	1403259.253
947	1238	3156929.190	1403998.708
948	1239	3157314.751	1401977.783
949	1239_Lake	3157831.632	1401981.044
950	1240	3156538.266	1401366.122
951	1247	3157771.959	1402312.639
952	1248	3157266.069	1402966.601
953	1249	3156883.302	1402547.683
954	1255	3155898.046	1402075.474
955	1256	3155685.602	1403011.436
956	1257	3154852.083	1402712.828
957	1258	3154316.384	1403685.347
958	1259	3152796.972	1402652.578
959	126	3175177.807	1392860.319
960	1260	3150086.735	1402714.626
961	1264	3164392.403	1398309.340
962	1272	3164007.677	1397483.113
963	1273	3156478.712	1402055.941
964	1274	3155826.533	1401770.234
965	129	3174515.175	1397463.621
966	130	3175024.012	1397213.094
967	1308	3160804.774	1396052.814
968	1310	3160242.230	1398705.345
969	1315	3159934.517	1396941.518
970	1316	3158833.347	1397434.801
971	1318	3159775.515	1398648.239
972	1319	3158330.271	1399075.426
973	1320	3157936.527	1399775.664
974	1321	3157712.138	1398616.006
975	1322	3156641.872	1400097.750
976	1341	3155638.438	1399342.483
977	1324	3155148.743	1401513.891
978	1327	3154755.683	1401616.430
979	1328	3154478.348	1401747.687
980	133	3175464.269	1395423.302
981	134	3176046.522	1395289.067
982	1340	3156642.822	1398565.551
983	1347	3154769.311	1398497.495
984	1348	3153791.786	1398067.739
985	1349	3154748.653	1399004.318
986	1351	3152674.464	1399549.808
987	1352	3150396.734	1400285.906
988	1353	3151953.756	1398758.487
989	1354	3150909.875	1398142.369
990	1355	3154031.417	1399715.290

991	1356	3154226.809	1400801.017
992	1357	3153310.143	1400207.459
993	1358	3152359.903	1400190.039
994	1361	3150350.361	1402083.521
995	1362	3149696.145	1401445.978
996	1363	3149352.158	1402071.015
997	1364	3147006.365	1402094.061
998	1367	3149312.708	1399099.909
999	1368	3148631.549	1400837.606
1000	1371	3153950.443	1397762.773
1001	1372	3153533.264	1396596.735
1002	138	3176551.687	1393911.435
1003	1382	3161448.977	1397769.125
1004	1386	3156582.485	1397690.432
1005	1387	3157599.393	1396856.128
1006	1388	3155482.211	1395998.927
1007	139	3174134.011	1398565.223
1008	1392	3159398.721	1396211.323
1009	1393	3158014.936	1396028.718
1010	1394	3157405.455	1395275.402
1011	1395	3159772.270	1393351.385
1012	1396	3159046.679	1393384.283
1013	1398	3158330.667	1392151.754
1014	141	3174496.025	1398349.144
1015	142	3174297.914	1398269.402
1016	146	3174839.133	1398440.554
1017	149	3175446.704	1397485.654
1018	150	3175725.937	1396655.858
1019	154	3176498.594	1396447.611
1020	210	3170690.309	1401930.818
1021	220	3169872.115	1400747.295
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1023	223	3171081.746	1399216.439
1024	224	3170483.894	1398942.244
1025	225	3170963.901	1397587.279
1026	226	3170034.862	1396684.770
1027	228	3171214.344	1396795.593
1028	231	3171281.556	1399242.427
1029	232	3171867.669	1398940.478
1030	235	3171942.755	1396376.089
1031	236	3172174.394	1396173.654
1032	237	3171836.304	1396218.308
1033	239	3171819.969	1396012.369
1034	240	3171465.769	1396047.353
1035	241	3171784.721	1395004.299
1036	243	3171603.976	1394740.098
1037	244	3170474.857	1393573.365
1038	245	3170953.011	1391537.235
1039	247	3170946.356	1391350.504
1040	248	3171725.770	1391016.584
1041	250	3171382.685	1389670.473
1042	252	3170076.201	1391227.161
1043	256	3171980.985	1396009.339
1044	259	3171945.493	1394701.859
1045	260	3172640.290	1393627.377
1046	263	3172027.210	1392879.765
1047	264	3172774.124	1392301.135
1048	268	3172567.091	1391586.184
1049	310	3168953.130	1400257.600
1050	314	3169136.183	1398444.247
1051	410	3168089.460	1399719.276
1052	414	3167712.276	1399364.914
1053	418	3167365.375	1399085.796
1054	422	3166914.751	1399053.119
1055	426	3166763.787	1398251.000
1056	510	3166117.900	1398031.442

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613              3166309.616        1394324.797
614              3166347.111        1393268.251
617              3167649.187        1392831.654
618              3168448.770        1392819.694
620              3164924.133        1396914.890
622              3168640.880        1391634.472
708              3163545.077        1396945.746
709              3163550.936        1396430.950
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711              3163849.475        1395585.088
712              3164170.730        1394893.693
713              3164026.296        1395321.455
714              3163045.486        1396594.989
804              3162382.792        1396464.970
808              3162610.739        1395282.210
809              3162680.609        1395190.276
810              3162469.592        1394272.390
811              3162750.666        1395067.439
819              3163126.566        1394286.019
820              3164083.921        1393947.644
822              3163648.877        1393689.740
823              3163178.026        1393090.738
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829              3163270.454        1392949.290
830              3162895.806        1391990.039
831              3163337.984        1392862.497
834              3164022.935        1391988.122
838              3164695.448        1391590.547
839              3165119.889        1391258.759
840              3168063.403        1389800.546
841              3165119.627        1391026.960
842              3167571.315        1387765.308
843              3164824.235        1391480.680
844              3164911.898        1389234.187
850              3166245.882        1389663.232
910              3161225.348        1395608.156
911              3161117.215        1394387.404
912              3161208.739        1393993.290
929              3161263.900        1393895.839
930              3161635.114        1393474.015
931              3161235.574        1391541.881
940              3161999.589        1390600.274
950              3160517.347        1390605.001
960              3159423.192        1391208.377
O_1107           3168039.352        1400578.156
O_1263           3165149.591        1397908.586
O_1307           3161737.362        1396517.809
O_220            3169737.387        1401574.286
O_300            3168738.081        1400926.155
O_500            3165794.745        1398081.909
O_600            3165200.073        1397783.747
O_708            3163559.256        1397095.344
O_803            3161952.489        1396183.168
O_909            3161899.167        1396072.847
1323             3155503.127        1399922.384
CulvertOut_1233  3159523.545        1402209.220
O_100            3172504.752        1401653.256
O_1000           3170676.148        1402586.402
836              3164431.711        1391798.762

[VERTICES]
;;Link           X-Coord            Y-Coord
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Dummy_1050       3161919.025        1396423.265
Dummy_1126       3166368.563        1402533.176
Dummy_1144       3162845.753        1405310.421
Dummy_1150       3162663.812        1403066.900
Dummy_118        3173863.043        1398495.625
Dummy_118        3173850.175        1398508.480
Dummy_1260       3150507.799        1402703.262
Dummy_1260       3150626.357        1402655.998
Dummy_1260       3150958.555        1402727.485
Dummy_1260       3151604.985        1402716.380
Dummy_1260       3151776.925        1402675.102
Dummy_1260       3152263.353        1402776.394
Dummy_1318       3159968.641        1398461.736
Dummy_1362       3150103.548        1401744.948
Dummy_1368       3149061.806        1399485.949
Dummy_1368       3149196.742        1399131.969
Dummy_260        3172073.946        1394857.871
Dummy_514        3167617.462        1394642.315
Dummy_514        3167540.795        1395192.423
Dummy_518        3168439.235        1395151.633
Dummy_518        3168094.922        1395389.332
Dummy_518        3167637.799        1395540.026
Dummy_810        3162504.273        1394740.838
Dummy_830        3163283.709        1392817.770
Dummy_840        3166938.664        1391078.963
Dummy_842        3165872.915        1388959.357
Dummy_844        3164953.929        1390984.328
Dummy_960        3159826.122        1391546.682
Dummy_960        3160354.259        1391540.858
Dummy_1002       3170670.373        1402576.937
L_1004           3169707.159        1401765.428
L_1004           3169730.143        1401868.394
L_1004           3169784.384        1401984.232
L_1004           3169993.995        1402069.731
L_1004           3170086.848        1402150.633
L_1004           3170197.170        1402210.390
L_1004           3170297.378        1402326.228
L_1004           3170395.748        1402470.565
L_1004           3170529.973        1402526.645
L_1006           3169563.828        1401496.313
L_1008           3168980.391        1401240.823
L_1008           3169131.680        1401257.077
L_1008           3169276.591        1401327.987
L_1008           3169397.337        1401374.754
L_1010           3168770.347        1401090.629
L_1010           3168823.669        1401188.079
L_1012           3168150.449        1400592.206
L_1012           3168308.356        1400688.915
L_1012           3168440.454        1400743.764
L_1012           3168575.446        1400860.793
L_1012           3168597.510        1400943.534
L_1012           3168666.132        1400966.034
L_1014           3167790.326        1400230.122
L_1014           3167880.422        1400316.541
L_1014           3167913.518        1400456.281
L_1018           3167609.008        1399837.991
L_1018           3167645.070        1399893.642
L_1018           3167683.682        1399945.126
L_1020           3167224.929        1399654.613
L_1022           3166702.741        1399301.585
L_1022           3166770.773        1399364.100
L_1022           3166871.065        1399418.864
L_1024           3166429.636        1398990.983
L_1024           3166500.527        1399066.632
L_1024           3166593.868        1399069.955
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1189	L_1028	3165823.189	1398310.828
1190	L_1028	3165968.191	1398384.998
1191	L_1028	3166068.145	1398494.510
1192	L_1028	3166127.232	1398652.527
1193	L_1028	3166191.586	1398818.009
1194	L_1030	3165206.390	1397863.964
1195	L_1030	3165309.297	1397889.066
1196	L_1030	3165428.542	1397969.642
1197	L_1030	3165596.138	1398088.884
1198	L_1034	3165011.148	1397788.344
1199	L_1036	3164972.535	1397525.411
1200	L_1036	3164974.374	1397604.475
1201	L_1038	3164468.098	1397286.420
1202	L_1038	3164625.937	1397321.995
1203	L_1038	3164728.999	1397331.766
1204	L_1040	3163645.002	1397185.254
1205	L_1040	3163753.484	1397218.350
1206	L_1040	3163903.222	1397207.292
1207	L_1040	3164073.797	1397202.665
1208	L_1042	3163112.894	1397037.559
1209	L_1042	3163212.770	1397127.712
1210	L_1044	3162636.868	1396941.144
1211	L_1044	3162768.843	1396957.591
1212	L_1044	3162902.337	1397006.631
1213	L_1046	3162343.210	1396970.127
1214	L_1046	3162424.112	1396971.966
1215	L_1048	3162069.639	1396691.146
1216	L_1048	3162161.180	1396795.451
1217	L_1115	3167825.332	1400717.314
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1219	L_1115	3167986.250	1400627.408
1220	L_1115	3168023.069	1400601.098
1221	L_1123	3166763.282	1401314.545
1222	L_1123	3166908.019	1401153.837
1223	L_1123	3166988.376	1401018.794
1224	L_1123	3167097.823	1400980.310
1225	L_1123	3167216.945	1400951.489
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1227	L_1123	3167526.000	1400861.756
1228	L_1125	3166223.364	1402282.042
1229	L_1127	3166271.447	1402085.829
1230	L_1127	3166290.626	1401960.369
1231	L_1127	3166380.592	1401780.292
1232	L_1127	3166518.892	1401622.794
1233	L_1130	3165805.076	1402288.938
1234	L_1130	3166123.806	1402212.085
1235	L_1141	3164287.888	1403619.025
1236	L_1141	3164526.096	1403406.820
1237	L_1141	3164893.086	1403098.179
1238	L_1141	3165176.467	1402937.537
1239	L_1147	3163104.180	1403853.903
1240	L_1147	3163464.840	1403835.013
1241	L_1147	3163628.956	1403725.806
1242	L_115	3173821.422	1398800.869
1243	L_115	3173750.684	1398936.004
1244	L_115	3173654.090	1399000.279
1245	L_115	3173538.357	1399238.381
1246	L_115	3173480.500	1399367.093
1247	L_115	3173442.037	1399547.335
1248	L_115	3173377.693	1399637.405
1249	L_115	3173268.391	1399862.637
1250	L_115	3173146.127	1400023.465
1251	L_115	3173062.594	1400242.290
1252	L_115	3173062.746	1400377.504
1253	L_115	3172979.105	1400499.748
1254	L_115	3172979.229	1400609.206

1255	L_115	3172734.700	1400930.867
1256	L_115	3172728.432	1401085.391
1257	L_115	3172516.022	1401316.944
1258	L_1151	3160129.658	1404780.849
1259	L_1151	3162299.560	1404803.169
1260	L_1156	3162461.228	1404129.364
1261	L_1156	3162499.588	1403858.976
1262	L_1163	3159755.282	1404776.528
1263	L_1170	3162129.672	1405043.028
1264	L_1170	3162310.039	1404972.408
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1266	L_1231	3161513.369	1400293.934
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1268	L_1235	3159861.592	1402296.540
1269	L_1237	3156554.885	1402988.792
1270	L_1237	3156757.731	1402914.737
1271	L_1237	3156822.599	1402727.223
1272	L_1239	3157517.597	1401984.222
1273	L_1239	3157852.454	1401993.882
1274	L_1247	3159548.601	1402287.817
1275	L_1255	3156111.556	1402081.647
1276	L_1257	3154890.017	1402234.294
1277	L_1257	3155886.354	1402223.595
1278	L_1259	3153235.901	1402706.413
1279	L_1259	3153443.472	1402706.653
1280	L_1259	3153751.973	1402801.816
1281	L_1259	3154030.829	1402902.868
1282	L_1259	3154415.900	1402530.015
1283	L_1259	3154576.007	1402512.425
1284	L_126	3175302.256	1393545.390
1285	L_126	3175064.397	1394066.661
1286	L_126	3174974.553	1394401.377
1287	L_126	3174968.444	1394697.554
1288	L_126	3174833.303	1394871.248
1289	L_126	3174788.358	1395019.290
1290	L_126	3174698.281	1395147.961
1291	L_126	3174569.534	1395276.588
1292	L_126	3174518.167	1395443.940
1293	L_126	3174602.202	1395669.395
1294	L_126	3174615.221	1395785.309
1295	L_126	3174589.560	1395888.300
1296	L_126	3174609.133	1396100.804
1297	L_126	3174609.251	1396203.826
1298	L_126	3174557.840	1396332.543
1299	L_126	3174545.083	1396448.427
1300	L_126	3174532.229	1396480.606
1301	L_126	3174461.383	1396519.158
1302	L_126	3174397.024	1396596.349
1303	L_126	3174410.037	1396705.825
1304	L_126	3174403.754	1396847.471
1305	L_126	3174339.453	1396976.175
1306	L_126	3174333.081	1397040.554
1307	L_126	3174320.294	1397130.685
1308	L_1315	3160627.526	1396758.864
1309	L_1315	3161516.105	1396541.100
1310	L_1321	3157866.633	1398461.653
1311	L_1321	3158270.175	1398180.860
1312	L_1327	3154771.683	1401516.644
1313	L_1327	3154794.709	1399082.794
1314	L_133	3175228.455	1395635.817
1315	L_133	3175183.511	1395783.859
1316	L_133	3175119.094	1395809.540
1317	L_133	3174926.456	1396427.445
1318	L_133	3174920.238	1396627.042
1319	L_133	3174868.818	1396749.320
1320	L_133	3174894.728	1396865.249

1321	L_133	3174746.772	1397103.315
1322	L_133	3174701.887	1397302.866
1323	L_133	3174547.289	1397367.076
1324	L_1340	3157613.575	1398099.417
1325	L_1357	3153632.497	1400167.769
1326	L_1357	3153677.333	1399945.811
1327	L_1357	3153841.385	1399781.908
1328	L_1357	3153963.685	1399714.481
1329	L_1367	3150169.515	1398817.590
1330	L_1367	3150414.189	1398624.708
1331	L_1367	3151483.986	1398625.943
1332	L_138	3176361.308	1394407.310
1333	L_138	3176290.585	1394555.322
1334	L_138	3176174.706	1394664.649
1335	L_138	3176097.554	1394825.530
1336	L_138	3175904.268	1394870.378
1337	L_138	3175749.831	1395076.242
1338	L_138	3175659.790	1395237.108
1339	L_1393	3158829.456	1396867.039
1340	L_149	3175323.968	1397591.897
1341	L_149	3175105.117	1397823.442
1342	L_149	3174918.362	1397945.564
1343	L_149	3174763.824	1398061.284
1344	L_149	3174641.516	1398183.483
1345	L_154	3176353.896	1396530.680
1346	L_154	3176250.901	1396633.583
1347	L_154	3176115.630	1396691.375
1348	L_154	3176044.879	1396813.633
1349	L_154	3175922.533	1396903.635
1350	L_154	3175845.336	1397025.883
1351	L_154	3175742.334	1397122.345
1352	L_154	3175690.917	1397244.626
1353	L_154	3175639.555	1397418.414
1354	L_221	3170139.216	1400943.140
1355	L_225	3170883.443	1398261.288
1356	L_225	3171017.537	1398839.166
1357	L_228	3171051.264	1397197.878
1358	L_228	3171006.897	1397298.557
1359	L_228	3171045.607	1397440.810
1360	L_235	3171943.934	1396569.466
1361	L_235	3171705.886	1396923.327
1362	L_235	3171609.539	1397206.523
1363	L_235	3171526.168	1397567.003
1364	L_235	3171526.400	1397773.045
1365	L_235	3171513.823	1398049.900
1366	L_235	3171533.610	1398449.130
1367	L_235	3171488.636	1398571.415
1368	L_235	3171482.455	1398803.206
1369	L_241	3171854.499	1395220.900
1370	L_241	3171767.631	1395294.804
1371	L_241	3171767.787	1395433.156
1372	L_241	3171742.104	1395503.913
1373	L_241	3171790.795	1395845.024
1374	L_245	3170699.047	1392363.125
1375	L_245	3170570.506	1392672.041
1376	L_245	3170699.782	1393013.449
1377	L_245	3170867.706	1393335.583
1378	L_245	3171099.974	1393567.649
1379	L_245	3171190.357	1393709.409
1380	L_245	3171203.646	1394063.559
1381	L_245	3171255.423	1394256.784
1382	L_245	3171261.991	1394366.250
1383	L_245	3171423.308	1394546.724
1384	L_245	3171519.917	1394495.326
1385	L_250	3171531.201	1389928.197
1386	L_250	3171454.835	1390784.474

1387	L_263	3171945.763	1392987.527
1388	L_263	3171934.731	1393156.686
1389	L_263	3171975.182	1393296.426
1390	L_263	3171997.246	1393483.973
1391	L_263	3171986.214	1393653.132
1392	L_263	3172008.322	1393814.704
1393	L_263	3172000.924	1393936.290
1394	L_263	3172040.895	1394123.806
1395	L_263	3172063.439	1394329.770
1396	L_263	3171931.905	1394625.909
1397	L_268	3172301.162	1391913.970
1398	L_268	3172121.186	1392332.287
1399	L_314	3169163.326	1398591.530
1400	L_314	3169099.195	1398835.987
1401	L_314	3169105.921	1399086.962
1402	L_314	3169044.877	1399215.592
1403	L_314	3169099.828	1399395.836
1404	L_314	3169141.989	1399656.503
1405	L_314	3169113.183	1399814.129
1406	L_314	3169113.492	1400087.618
1407	L_314	3169039.653	1400290.235
1408	L_314	3168985.012	1400383.481
1409	L_314	3168943.409	1400615.093
1410	L_513	3167642.974	1395670.249
1411	L_513	3167511.050	1395769.838
1412	L_513	3167488.712	1395949.994
1413	L_513	3167318.068	1395981.973
1414	L_513	3167298.842	1396065.605
1415	L_513	3167089.622	1396158.671
1416	L_513	3167044.819	1396409.587
1417	L_513	3166649.219	1396856.363
1418	L_513	3166581.805	1397046.120
1419	L_513	3166189.268	1397354.548
1420	L_513	3166070.168	1397402.672
1421	L_513	3166009.076	1397486.258
1422	L_513	3165861.096	1397624.440
1423	L_513	3165858.130	1397849.663
1424	L_513	3165761.674	1397987.904
1425	L_613	3166257.674	1394646.708
1426	L_613	3166283.679	1394846.341
1427	L_613	3166129.635	1395399.902
1428	L_613	3165949.420	1395605.738
1429	L_613	3165666.268	1395965.985
1430	L_613	3165563.207	1396010.937
1431	L_613	3165304.419	1396481.036
1432	L_613	3165282.354	1397128.254
1433	L_613	3165194.097	1397426.122
1434	L_617	3167523.238	1392974.567
1435	L_617	3167278.461	1393077.308
1436	L_617	3167100.818	1393175.073
1437	L_617	3166806.627	1393469.263
1438	L_617	3166652.178	1393682.551
1439	L_617	3166597.017	1393910.549
1440	L_617	3166396.858	1394228.841
1441	L_622	3168553.129	1391881.156
1442	L_622	3168360.127	1392177.121
1443	L_622	3168224.996	1392357.253
1444	L_622	3168077.069	1392621.072
1445	L_622	3167626.199	1392839.473
1446	L_808	3162548.726	1395451.782
1447	L_808	3162358.869	1395580.263
1448	L_808	3162352.645	1395770.088
1449	L_819	3162977.717	1394783.213
1450	L_822	3163291.565	1393821.246
1451	L_823	3163152.532	1393328.805
1452	L_834	3163524.959	1392573.517

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L_850            3165906.010        1389732.055
L_911            3161372.649        1394755.073
L_911            3161826.698        1395069.642
L_911            3162053.616        1395504.692
L_911            3161862.393        1395740.044
L_912            3161028.084        1394236.204
L_931            3160738.116        1392175.320
L_931            3161261.052        1393094.358
L_931            3161314.825        1393444.018
Overflow_836     3164268.225        1391934.133
Overflow_836     3164107.375        1391999.868

[Polygons]

[BACKDROP]
FILE       "R:\24.906.009 Greeley - Oklahoma Master Basin Study\200 Design\220 Drainage-WR\221 Models\01 CUHP_SWMM\02 SWMM\06 Alternatives\00 Background\2024_10_017 Subbasins.jpg"
DIMENSIONS 3145400.318 1386770.000 3180772.682 1409658.000

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EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)
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City of Greeley
Comprehensive Draingae Plan Oklahoma Basins
Baseline Hydrology
WARNING 04: minimum elevation drop used for Conduit Dummy_310

*************
Element Count
*************
Number of rain gages ...... 0
Number of subcatchments ... 0
Number of nodes ........... 257
Number of links ........... 256
Number of pollutants ...... 0
Number of land uses ....... 0


************
Node Summary
************
                                    Invert      Max.    Ponded    External
Name                 Type            Elev.     Depth      Area    Inflow
--------------------------------------------------------------------------
1002                 JUNCTION      4757.00     20.00       0.0
1004                 JUNCTION      4768.00     30.00       0.0
1006_RR              JUNCTION      4772.00     30.00       0.0
1008                 JUNCTION      4774.00     20.00       0.0
1010                 JUNCTION      4774.90     30.00       0.0
1012                 JUNCTION      4777.90     30.00       0.0
1014                 JUNCTION      4779.00     30.00       0.0
1016                 JUNCTION      4781.00     20.00       0.0
1018                 JUNCTION      4782.00     20.00       0.0
1020                 JUNCTION      4784.00     20.00       0.0
1022                 JUNCTION      4789.00     20.00       0.0
1024                 JUNCTION      4792.00     20.00       0.0
1026                 JUNCTION      4793.00     20.00       0.0
1028                 JUNCTION      4803.90     20.00       0.0
1030                 JUNCTION      4811.90     20.00       0.0
1032                 JUNCTION      4770.00      0.00       0.0
1034                 JUNCTION      4814.90     20.00       0.0
1036                 JUNCTION      4818.00     20.00       0.0
1038                 JUNCTION      4821.00     20.00       0.0
1040                 JUNCTION      4827.90     20.00       0.0
1042                 JUNCTION      4838.00     20.00       0.0
1044                 JUNCTION      4844.00     20.00       0.0
1046                 JUNCTION      4851.00     20.00       0.0
1048                 JUNCTION      4855.00     20.00       0.0
1050                 JUNCTION      4864.00      0.00       0.0
109                  JUNCTION      4779.00     10.00       0.0
110                  JUNCTION      4794.00      0.00       0.0
1108                 JUNCTION      4816.00      0.00       0.0
1110                 JUNCTION      4855.00      0.00       0.0
1115                 JUNCTION      4790.00     10.00       0.0
1116                 JUNCTION      4850.00      0.00       0.0
1123                 JUNCTION      4825.00     10.00       0.0
1124                 JUNCTION      4864.00      0.00       0.0
1125                 JUNCTION      4852.00     10.00       0.0
1126                 JUNCTION      4864.00      0.00       0.0
1127                 JUNCTION      4841.00     10.00       0.0
113                  JUNCTION      4784.00     10.00       0.0
1130                 JUNCTION      4854.00     10.00       0.0
1132                 JUNCTION      4874.00      0.00       0.0
1139                 JUNCTION      4857.00     10.00       0.0
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67	114	JUNCTION	4798.00	0.00	0.0
68	1140	JUNCTION	4879.00	0.00	0.0
69	1141	JUNCTION	4878.00	10.00	0.0
70	1142	JUNCTION	4902.00	0.00	0.0
71	1144	JUNCTION	4925.00	0.00	0.0
72	1147	JUNCTION	4893.00	10.00	0.0
73	1148	JUNCTION	4946.00	10.00	0.0
74	115	JUNCTION	4816.70	10.00	0.0
75	1150	JUNCTION	4955.00	0.00	0.0
76	1151	JUNCTION	4941.00	10.00	0.0
77	1152	JUNCTION	4966.00	0.00	0.0
78	1153	JUNCTION	4943.00	10.00	0.0
79	1154	JUNCTION	4976.00	0.00	0.0
80	1155	JUNCTION	4898.00	10.00	0.0
81	1156	JUNCTION	4935.00	0.00	0.0
82	1163	JUNCTION	4953.00	10.00	0.0
83	1164	JUNCTION	4958.00	0.00	0.0
84	117	JUNCTION	4818.00	10.00	0.0
85	1170	JUNCTION	4909.00	10.00	0.0
86	1172	JUNCTION	4832.00	0.00	0.0
87	118	JUNCTION	4830.00	0.00	0.0
88	1180	JUNCTION	4838.00	0.00	0.0
89	119	JUNCTION	4834.00	10.00	0.0
90	1208	JUNCTION	4868.00	10.00	0.0
91	1209	JUNCTION	4877.00	10.00	0.0
92	121	JUNCTION	4835.00	10.00	0.0
93	1210	JUNCTION	4889.00	0.00	0.0
94	1215	JUNCTION	4868.00	10.00	0.0
95	1216	JUNCTION	4882.00	0.00	0.0
96	1217	JUNCTION	4873.00	10.00	0.0
97	122	JUNCTION	4983.00	10.00	0.0
98	1223	JUNCTION	4880.00	10.00	0.0
99	1224	JUNCTION	4890.00	0.00	0.0
100	1226	JUNCTION	4895.00	10.00	0.0
101	1228	JUNCTION	4903.00	0.00	0.0
102	1230	JUNCTION	4883.00	0.00	0.0
103	1231	JUNCTION	4908.00	10.00	0.0
104	1232	JUNCTION	4955.00	0.00	0.0
105	1233	JUNCTION	4917.00	10.00	0.0
106	1233_Lake	JUNCTION	4911.00	10.00	0.0
107	1234	JUNCTION	4960.00	0.00	0.0
108	1235	JUNCTION	4941.00	10.00	0.0
109	1236	JUNCTION	4998.00	0.00	0.0
110	1237	JUNCTION	4973.00	10.00	0.0
111	1238	JUNCTION	5005.00	0.00	0.0
112	1239	JUNCTION	4954.00	10.00	0.0
113	1239_Lake	JUNCTION	4941.00	10.00	0.0
114	1240	JUNCTION	4981.00	0.00	0.0
115	1247	JUNCTION	4946.00	11.00	0.0
116	1248	JUNCTION	4967.00	0.00	0.0
117	1249	JUNCTION	4957.00	10.00	0.0
118	1255	JUNCTION	4965.00	10.00	0.0
119	1256	JUNCTION	4993.00	0.00	0.0
120	1257	JUNCTION	4970.00	10.00	0.0
121	1258	JUNCTION	4989.00	0.00	0.0
122	1259	JUNCTION	4990.00	10.00	0.0
123	126	JUNCTION	4999.00	10.00	0.0
124	1260	JUNCTION	5019.00	0.00	0.0
125	1264	JUNCTION	4876.00	0.00	0.0
126	1272	JUNCTION	4880.00	0.00	0.0
127	1273	JUNCTION	4959.00	10.00	0.0
128	1274	JUNCTION	4978.00	0.00	0.0
129	129	JUNCTION	4835.00	10.00	0.0
130	130	JUNCTION	4910.00	0.00	0.0
131	1308	JUNCTION	4891.00	0.00	0.0
132	1310	JUNCTION	4912.00	0.00	0.0

133	1315	JUNCTION	4893.00	10.00	0.0
134	1316	JUNCTION	4904.00	10.00	0.0
135	1318	JUNCTION	4923.00	0.00	0.0
136	1319	JUNCTION	4929.00	10.00	0.0
137	1320	JUNCTION	4970.00	0.00	0.0
138	1321	JUNCTION	4931.00	10.00	0.0
139	1322	JUNCTION	4975.00	0.00	0.0
140	1341	JUNCTION	4957.00	10.00	0.0
141	1324	JUNCTION	4975.00	0.00	0.0
142	1327	JUNCTION	4984.00	1.00	0.0
143	1328	JUNCTION	4989.00	0.00	0.0
144	133	JUNCTION	4917.00	10.00	0.0
145	134	JUNCTION	4945.00	0.00	0.0
146	1340	JUNCTION	4946.00	10.00	0.0
147	1347	JUNCTION	4949.00	10.00	0.0
148	1348	JUNCTION	4981.00	0.00	0.0
149	1349	JUNCTION	4952.00	10.00	0.0
150	1351	JUNCTION	4979.00	10.00	0.0
151	1352	JUNCTION	5019.00	0.00	0.0
152	1353	JUNCTION	4985.00	10.00	0.0
153	1354	JUNCTION	5028.00	0.00	0.0
154	1355	JUNCTION	4971.00	10.00	0.0
155	1356	JUNCTION	4989.00	0.00	0.0
156	1357	JUNCTION	4981.00	10.00	0.0
157	1358	JUNCTION	4993.00	0.00	0.0
158	1361	JUNCTION	5024.00	10.00	0.0
159	1362	JUNCTION	5035.00	0.00	0.0
160	1363	JUNCTION	5038.00	10.00	0.0
161	1364	JUNCTION	5058.00	0.00	0.0
162	1367	JUNCTION	5033.00	10.00	0.0
163	1368	JUNCTION	5059.00	0.00	0.0
164	1371	JUNCTION	4971.00	10.00	0.0
165	1372	JUNCTION	4988.00	0.00	0.0
166	138	JUNCTION	4970.00	10.00	0.0
167	1382	JUNCTION	4921.00	0.00	0.0
168	1386	JUNCTION	4960.00	0.00	0.0
169	1387	JUNCTION	4943.00	10.00	0.0
170	1388	JUNCTION	4995.00	0.00	0.0
171	139	JUNCTION	4817.00	10.00	0.0
172	1392	JUNCTION	4938.00	0.00	0.0
173	1393	JUNCTION	4940.00	10.00	0.0
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175	1395	JUNCTION	4947.00	10.00	0.0
176	1396	JUNCTION	4969.00	0.00	0.0
177	1398	JUNCTION	4972.00	0.00	0.0
178	141	JUNCTION	4827.00	10.00	0.0
179	142	JUNCTION	4820.00	0.00	0.0
180	146	JUNCTION	4849.00	10.00	0.0
181	149	JUNCTION	4869.00	10.00	0.0
182	150	JUNCTION	4890.00	0.00	0.0
183	154	JUNCTION	4904.00	10.00	0.0
184	210	JUNCTION	4770.00	0.00	0.0
185	220	JUNCTION	4777.00	0.00	0.0
186	221	JUNCTION	4790.60	10.00	0.0
187	223	JUNCTION	4793.00	10.00	0.0
188	224	JUNCTION	4810.00	0.00	0.0
189	225	JUNCTION	4840.00	10.00	0.0
190	226	JUNCTION	4850.00	0.00	0.0
191	228	JUNCTION	4864.00	10.00	0.0
192	231	JUNCTION	4790.80	10.00	0.0
193	232	JUNCTION	4810.00	0.00	0.0
194	235	JUNCTION	4845.00	10.00	0.0
195	236	JUNCTION	4847.00	0.00	0.0
196	237	JUNCTION	4846.00	10.00	0.0
197	239	JUNCTION	4850.00	10.00	0.0
198	240	JUNCTION	4849.00	0.00	0.0

199	241	JUNCTION	4862.00	10.00	0.0
200	243	JUNCTION	4863.00	10.00	0.0
201	244	JUNCTION	4894.00	0.00	0.0
202	245	JUNCTION	4980.00	10.00	0.0
203	247	JUNCTION	4981.00	10.00	0.0
204	248	JUNCTION	4986.00	0.00	0.0
205	250	JUNCTION	5015.00	10.00	0.0
206	252	JUNCTION	4990.00	0.00	0.0
207	256	JUNCTION	4851.00	0.00	0.0
208	259	JUNCTION	4863.00	10.00	0.0
209	260	JUNCTION	4905.00	0.00	0.0
210	263	JUNCTION	4922.00	10.00	0.0
211	264	JUNCTION	4991.00	0.00	0.0
212	268	JUNCTION	4991.00	10.00	0.0
213	310	JUNCTION	4778.00	0.00	0.0
214	314	JUNCTION	4839.00	10.00	0.0
215	410	JUNCTION	4793.00	0.00	0.0
216	414	JUNCTION	4796.00	0.00	0.0
217	418	JUNCTION	4802.00	0.00	0.0
218	422	JUNCTION	4800.00	0.00	0.0
219	426	JUNCTION	4810.00	0.00	0.0
220	510	JUNCTION	4856.00	0.00	0.0
221	513	JUNCTION	4880.00	10.00	0.0
222	514	JUNCTION	4931.00	0.00	0.0
223	518	JUNCTION	4940.00	0.00	0.0
224	610	JUNCTION	4858.00	0.00	0.0
225	613	JUNCTION	4888.00	10.00	0.0
226	614	JUNCTION	4899.00	0.00	0.0
227	617	JUNCTION	4942.00	10.00	0.0
228	618	JUNCTION	4950.00	0.00	0.0
229	620	JUNCTION	4920.00	0.00	0.0
230	622	JUNCTION	4981.00	10.00	0.0
231	708	JUNCTION	4851.00	10.00	0.0
232	709	JUNCTION	4866.00	10.00	0.0
233	710	JUNCTION	4871.00	10.00	0.0
234	711	JUNCTION	4889.00	10.00	0.0
235	712	JUNCTION	4915.00	10.00	0.0
236	713	JUNCTION	4898.00	10.00	0.0
237	714	JUNCTION	4864.00	0.00	0.0
238	804	JUNCTION	4882.00	0.00	0.0
239	808	JUNCTION	4885.00	15.00	0.0
240	809	JUNCTION	4890.00	15.00	0.0
241	810	JUNCTION	4925.00	0.00	0.0
242	811	JUNCTION	4893.00	10.00	0.0
243	819	JUNCTION	4901.00	10.00	0.0
244	820	JUNCTION	4945.00	0.00	0.0
245	822	JUNCTION	4932.00	10.00	0.0
246	823	JUNCTION	4908.00	10.00	0.0
247	824	JUNCTION	4961.00	10.00	0.0
248	829	JUNCTION	4918.00	15.00	0.0
249	830	JUNCTION	4972.00	0.00	0.0
250	831	JUNCTION	4928.50	15.00	0.0
251	834	JUNCTION	4932.00	15.00	0.0
252	838	JUNCTION	4949.00	15.00	0.0
253	839	JUNCTION	4965.00	15.00	0.0
254	840	JUNCTION	4990.00	0.00	0.0
255	841	JUNCTION	4967.00	10.00	0.0
256	842	JUNCTION	5000.00	0.00	0.0
257	843	JUNCTION	4959.00	15.00	0.0
258	844	JUNCTION	4995.00	0.00	0.0
259	850	JUNCTION	4990.00	10.00	0.0
260	910	JUNCTION	4916.00	0.00	0.0
261	911	JUNCTION	4913.00	10.00	0.0
262	912	JUNCTION	4920.00	10.00	0.0
263	929	JUNCTION	4922.00	10.00	0.0
264	930	JUNCTION	4927.00	0.00	0.0

931	JUNCTION	4954.00	10.00	0.0	
940	JUNCTION	4986.00	0.00	0.0	
950	JUNCTION	4977.00	0.00	0.0	
960	JUNCTION	4970.00	0.00	0.0	
O_1107	JUNCTION	4778.00	10.00	0.0	
O_1263	JUNCTION	4812.00	0.00	0.0	
O_1307	JUNCTION	4865.00	10.00	0.0	
O_220	JUNCTION	4772.00	10.00	0.0	
O_300	JUNCTION	4778.00	10.00	0.0	
O_500	JUNCTION	4826.00	10.00	0.0	
O_600	JUNCTION	4815.00	10.00	0.0	
O_708	JUNCTION	4828.00	10.00	0.0	
O_803	JUNCTION	4865.00	10.00	0.0	
O_909	JUNCTION	4865.00	10.00	0.0	
1323	JUNCTION	4966.00	10.00	0.0	
CulvertOut_1233	JUNCTION	4914.00	10.00	0.0	
O_100	OUTFALL	4778.00	0.00	0.0	
O_1000	OUTFALL	4756.00	0.00	0.0	
836	DIVIDER	4945.00	15.00	0.0	

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Link Summary
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Name	From Node	To Node	Type	Length	%Slope	Roughness
Dummy_1032	1032	1002	CONDUIT	400.0	3.2517	0.0350
Dummy_1050	1050	1048	CONDUIT	381.0	2.3629	0.0350
Dummy_109	109	O_100	CONDUIT	400.0	0.2500	0.0100
Dummy_110	110	109	CONDUIT	400.0	3.7526	0.0100
Dummy_1107	O_1107	1012	CONDUIT	400.0	0.0250	0.0100
Dummy_1108	1108	O_1107	CONDUIT	400.0	9.5432	0.0350
Dummy_1110	1110	1115	CONDUIT	400.0	16.4689	0.0350
Dummy_1116	1116	1115	CONDUIT	400.0	15.1717	0.0350
Dummy_1124	1124	1123	CONDUIT	400.0	9.7967	0.0350
Dummy_1126	1126	1125	CONDUIT	400.0	3.0014	0.0350
Dummy_1132	1132	1130	CONDUIT	400.0	5.0063	0.0350
Dummy_1139	1139	1130	CONDUIT	300.0	1.0001	0.0130
Dummy_114	114	113	CONDUIT	400.0	3.5021	0.0100
Dummy_1140	1140	1139	CONDUIT	400.0	5.5083	0.0350
Dummy_1142	1142	1141	CONDUIT	400.0	6.0108	0.0350
Dummy_1144	1144	1155	CONDUIT	400.0	6.7654	0.0350
Dummy_1148	1148	1147	CONDUIT	400.0	13.3679	0.0350
Dummy_1150	1150	1147	CONDUIT	400.0	15.6896	0.0350
Dummy_1152	1152	1151	CONDUIT	400.0	6.2622	0.0100
Dummy_1153	1153	1151	CONDUIT	400.0	0.5000	0.0350
Dummy_1154	1154	1153	CONDUIT	400.0	8.2782	0.0350
Dummy_1156	1156	1170	CONDUIT	400.0	6.5138	0.0350
Dummy_1164	1164	1163	CONDUIT	400.0	1.2501	0.0350
Dummy_1172	1172	1008	CONDUIT	400.0	14.6549	0.0350
Dummy_118	118	117	CONDUIT	400.0	3.0014	0.0100
Dummy_1180	1180	1016	CONDUIT	400.0	14.3969	0.0350
Dummy_1208	1208	1024	CONDUIT	400.0	19.3525	0.0350
Dummy_121	121	119	CONDUIT	400.0	0.2500	0.0100
Dummy_1210	1210	1209	CONDUIT	400.0	3.0014	0.0350
Dummy_1216	1216	1217	CONDUIT	400.0	2.2506	0.0350
Dummy_122	122	121	CONDUIT	400.0	39.8264	0.0100
Dummy_1224	1224	1223	CONDUIT	400.0	2.5008	0.0350
Dummy_1226	1226	1223	CONDUIT	400.0	3.7526	0.0350
Dummy_1228	1228	1223	CONDUIT	400.0	5.7595	0.0350
Dummy_1230	1230	1223	CONDUIT	400.0	0.7500	0.0350
Dummy_1232	1232	1231	CONDUIT	400.0	11.8320	0.0350
Dummy_1233_Lake	1233_Lake	1231	CONDUIT	400.0	0.7500	0.0100
Dummy_1234	1234	1233	CONDUIT	400.0	10.8127	0.0100
Dummy_1236	1236	1235	CONDUIT	400.0	14.3969	0.0100
Dummy_1238	1238	1237	CONDUIT	400.0	8.0257	0.0100

331	Dummy_1239	1239_Lake	1231	CONDUIT	400.0	8.2782	0.0100
332	Dummy_1240	1240	1239	CONDUIT	400.0	6.7654	0.0100
333	Dummy_1248	1248	1247	CONDUIT	400.0	5.2573	0.0100
334	Dummy_1249	1249	1247	CONDUIT	400.0	2.7510	0.0100
335	Dummy_1256	1256	1255	CONDUIT	400.0	7.0172	0.0100
336	Dummy_1258	1258	1257	CONDUIT	400.0	4.7554	0.0100
337	Dummy_1260	1260	1259	CONDUIT	400.0	7.2691	0.0100
338	Dummy_1263	O_1263	1030	CONDUIT	400.0	0.0250	0.0100
339	Dummy_1264	1264	O_1263	CONDUIT	400.0	16.2088	0.0350
340	Dummy_1272	1272	1038	CONDUIT	400.0	14.9131	0.0350
341	Dummy_1274	1274	1273	CONDUIT	400.0	4.7554	0.0100
342	Dummy_129	129	119	CONDUIT	400.0	0.2500	0.0100
343	Dummy_130	130	129	CONDUIT	400.0	19.0885	0.0100
344	Dummy_1307	O_1307	1048	CONDUIT	400.0	2.5008	0.0100
345	Dummy_1308	1308	O_1307	CONDUIT	400.0	6.5138	0.0100
346	Dummy_1310	1310	1315	CONDUIT	400.0	4.7554	0.0100
347	Dummy_1318	1318	1315	CONDUIT	400.0	7.5212	0.0100
348	Dummy_1320	1320	1319	CONDUIT	400.0	10.3043	0.0100
349	Dummy_1322	1322	1321	CONDUIT	400.0	11.0672	0.0100
350	Dummy_1341	1341	1340	CONDUIT	400.0	2.7510	0.0100
351	Dummy_1328	1328	1327	CONDUIT	400.0	1.2501	0.0100
352	Dummy_1337	1347	1340	CONDUIT	400.0	0.7500	0.0100
353	Dummy_134	134	133	CONDUIT	400.0	7.0172	0.0100
354	Dummy_1348	1348	1347	CONDUIT	400.0	8.0257	0.0100
355	Dummy_1349	1349	1340	CONDUIT	400.0	1.5002	0.0100
356	Dummy_1352	1352	1351	CONDUIT	400.0	10.0504	0.0100
357	Dummy_1354	1354	1353	CONDUIT	400.0	10.8127	0.0100
358	Dummy_1356	1356	1355	CONDUIT	400.0	4.5046	0.0100
359	Dummy_1358	1358	1357	CONDUIT	400.0	3.0014	0.0100
360	Dummy_1362	1362	1361	CONDUIT	400.0	2.7510	0.0100
361	Dummy_1364	1364	1363	CONDUIT	400.0	5.0063	0.0100
362	Dummy_1368	1368	1367	CONDUIT	400.0	6.5138	0.0100
363	Dummy_1372	1372	1371	CONDUIT	400.0	4.2538	0.0100
364	Dummy_1382	1382	1044	CONDUIT	400.0	19.6169	0.0100
365	Dummy_1386	1386	1340	CONDUIT	400.0	3.5021	0.0100
366	Dummy_1388	1388	1387	CONDUIT	400.0	13.1113	0.0100
367	Dummy_1392	1392	1315	CONDUIT	400.0	11.3219	0.0100
368	Dummy_1394	1394	1393	CONDUIT	400.0	14.3969	0.0100
369	Dummy_1396	1396	1395	CONDUIT	400.0	5.5083	0.0100
370	Dummy_1398	1398	1395	CONDUIT	400.0	6.2622	0.0100
371	Dummy_142	142	139	CONDUIT	400.0	0.7500	0.0100
372	Dummy_150	150	149	CONDUIT	400.0	5.2573	0.0100
373	Dummy_210	210	1002	CONDUIT	400.0	3.2517	0.0350
374	Dummy_219	O_220	1004	CONDUIT	400.0	1.0001	0.0350
375	Dummy_220	220	O_220	CONDUIT	400.0	1.2501	0.0100
376	Dummy_223	223	221	CONDUIT	400.0	0.6000	0.0100
377	Dummy_224	224	223	CONDUIT	400.0	4.2538	0.0100
378	Dummy_226	226	225	CONDUIT	400.0	2.5008	0.0100
379	Dummy_231	231	221	CONDUIT	400.0	0.0500	0.0100
380	Dummy_232	232	231	CONDUIT	400.0	4.8055	0.0100
381	Dummy_236	236	235	CONDUIT	400.0	0.5000	0.0100
382	Dummy_237	237	235	CONDUIT	400.0	0.2500	0.0100
383	Dummy_240	240	237	CONDUIT	400.0	0.7500	0.0100
384	Dummy_243	243	241	CONDUIT	400.0	0.2500	0.0100
385	Dummy_244	244	243	CONDUIT	400.0	7.7734	0.0100
386	Dummy_247	247	245	CONDUIT	400.0	0.2500	0.0100
387	Dummy_248	248	247	CONDUIT	400.0	1.2501	0.0100
388	Dummy_252	252	245	CONDUIT	400.0	2.5008	0.0100
389	Dummy_256	256	239	CONDUIT	400.0	0.2500	0.0100
390	Dummy_259	259	241	CONDUIT	400.0	0.2500	0.0100
391	Dummy_260	260	259	CONDUIT	400.0	10.5584	0.0100
392	Dummy_264	264	263	CONDUIT	400.0	17.5125	0.0100
393	Dummy_300	O_300	1010	CONDUIT	400.0	0.7750	0.0100
394	Dummy_310	310	O_300	CONDUIT	400.0	0.0003	0.0350
395	Dummy_410	410	1014	CONDUIT	400.0	3.5021	0.0100
396	Dummy_414	414	1018	CONDUIT	400.0	3.5021	0.0100

397	Dummy_418	418	1020	CONDUIT	400.0	4.5046	0.0100
398	Dummy_422	422	1022	CONDUIT	400.0	2.7510	0.0100
399	Dummy_426	426	1026	CONDUIT	400.0	4.2538	0.0100
400	Dummy_500	O_500	1028	CONDUIT	400.0	5.5335	0.0100
401	Dummy_510	510	O_500	CONDUIT	400.0	7.5212	0.0100
402	Dummy_514	514	513	CONDUIT	400.0	12.8549	0.0100
403	Dummy_518	518	513	CONDUIT	400.0	15.1717	0.0100
404	Dummy_600	O_600	1030	CONDUIT	400.0	0.7750	0.0100
405	Dummy_610	610	O_600	CONDUIT	400.0	10.8127	0.0100
406	Dummy_614	614	613	CONDUIT	400.0	2.7510	0.0100
407	Dummy_618	618	617	CONDUIT	400.0	2.0004	0.0100
408	Dummy_620	620	1036	CONDUIT	400.0	26.3718	0.0100
409	Dummy_708	O_708	1040	CONDUIT	400.0	0.0250	0.0100
410	Dummy_714	714	1042	CONDUIT	400.0	6.5138	0.0100
411	Dummy_803	O_803	1050	CONDUIT	400.0	0.2500	0.0100
412	Dummy_804	804	O_803	CONDUIT	400.0	4.2538	0.0100
413	Dummy_810	810	809	CONDUIT	400.0	8.7837	0.0100
414	Dummy_820	820	819	CONDUIT	400.0	11.0672	0.0100
415	Dummy_830	830	829	CONDUIT	400.0	13.6247	0.0100
416	Dummy_840	840	839	CONDUIT	400.0	6.2622	0.0100
417	Dummy_842	842	841	CONDUIT	400.0	8.2782	0.0100
418	Dummy_844	844	843	CONDUIT	400.0	9.0367	0.0100
419	Dummy_909	O_909	1050	CONDUIT	400.0	0.2500	0.0100
420	Dummy_910	910	O_909	CONDUIT	400.0	12.8549	0.0350
421	Dummy_929	929	912	CONDUIT	75.0	2.6676	0.0130
422	Dummy_930	930	929	CONDUIT	400.0	1.2501	0.0100
423	Dummy_940	940	931	CONDUIT	400.0	8.0257	0.0350
424	Dummy_950	950	931	CONDUIT	400.0	5.7595	0.0350
425	Dummy_960	960	931	CONDUIT	400.0	4.0032	0.0350
426	Dummy_1002	1002	O_1000	CONDUIT	400.0	0.2500	0.0440
427	L_1004	1004	1002	CONDUIT	1497.0	0.7348	0.0750
428	L_1006	1006_RR	1004	CONDUIT	461.0	0.8677	0.0550
429	L_1008	1008	1006_RR	CONDUIT	473.0	0.4228	0.0440
430	L_1010	1010	1008	CONDUIT	378.0	0.2381	0.0400
431	L_1012	1012	1010	CONDUIT	896.0	0.3348	0.0750
432	L_1014	1014	1012	CONDUIT	536.0	0.2052	0.0750
433	L_1016	1016	1014	CONDUIT	319.0	0.6270	0.0550
434	L_1018	1018	1016	CONDUIT	433.0	0.2309	0.0440
435	L_1020	1020	1018	CONDUIT	373.0	0.5362	0.0440
436	L_1022	1022	1020	CONDUIT	784.0	0.6378	0.0550
437	L_1024	1024	1022	CONDUIT	543.0	0.5525	0.0550
438	L_1026	1026	1024	CONDUIT	134.0	0.7463	0.0550
439	L_1028	1028	1026	CONDUIT	1068.0	1.0207	0.0550
440	L_1030	1030	1028	CONDUIT	474.0	1.6880	0.0550
441	L_1034	1034	1030	CONDUIT	510.0	0.5882	0.0550
442	L_1036	1036	1034	CONDUIT	372.0	0.8334	0.0550
443	L_1038	1038	1036	CONDUIT	567.0	0.5291	0.0550
444	L_1040	1040	1038	CONDUIT	743.0	0.9287	0.0550
445	L_1042	1042	1040	CONDUIT	601.0	1.6808	0.0550
446	L_1044	1044	1042	CONDUIT	477.0	1.2580	0.0550
447	L_1046	1046	1044	CONDUIT	402.0	1.7416	0.0440
448	L_1048	1048	1046	CONDUIT	359.0	1.1143	0.0440
449	L_1115	1115	O_1107	CONDUIT	432.0	2.7789	0.0550
450	L_1123	1123	1115	CONDUIT	1593.0	2.1976	0.0550
451	L_1125	1125	1127	CONDUIT	105.0	10.5342	0.0440
452	L_1127	1127	1123	CONDUIT	873.0	1.8331	0.0550
453	L_1130	1130	1127	CONDUIT	640.0	2.0317	0.0750
454	L_114	113	109	CONDUIT	144.0	3.4743	0.0350
455	L_1141	1141	1139	CONDUIT	1900.0	1.1053	0.0550
456	L_1147	1147	1141	CONDUIT	973.0	1.5418	0.0440
457	L_115	115	113	CONDUIT	3260.0	1.0031	0.0350
458	L_1151	1151	1155	CONDUIT	2508.0	1.7148	0.0440
459	L_1156	1155	1147	CONDUIT	1050.0	0.4762	0.0440
460	L_1163	1163	1153	CONDUIT	1100.0	0.9091	0.0440
461	L_117	117	115	CONDUIT	86.0	1.5118	0.0350
462	L_1170	1170	1155	CONDUIT	600.0	1.8336	0.0350

463	L_119	119	117	CONDUIT	1087.0	1.4721	0.0350
464	L_1209	1209	1217	CONDUIT	930.0	0.4301	0.0440
465	Dummy_1215	1215	O_1263	CONDUIT	1937.8	2.8911	0.0100
466	L_1217	1217	1215	CONDUIT	1800.0	0.2778	0.0440
467	L_1223	1223	1217	CONDUIT	1649.0	0.4245	0.0440
468	L_1231	1231	1223	CONDUIT	4880.0	0.5738	0.0440
469	L_1233	CulvertOut_1233	1233_Lake	CONDUIT	315.0	0.9524	0.0440
470	L_1235	1235	1233	CONDUIT	960.0	2.5008	0.0440
471	L_1237	1237	1249	CONDUIT	920.0	1.7394	0.0200
472	L_1239	1239	1239_Lake	CONDUIT	560.0	2.3221	0.0350
473	L_1247	1247	1233	CONDUIT	1640.0	1.8296	0.0440
474	L_1255	1255	1273	CONDUIT	650.0	0.9231	0.0550
475	L_1257	1257	1255	CONDUIT	1580.0	0.3165	0.0440
476	L_1259	1259	1257	CONDUIT	2600.0	0.7693	0.0200
477	L_126	126	121	CONDUIT	5178.0	3.1688	0.0350
478	L_1273	1273	1239	CONDUIT	795.0	0.6289	0.0750
479	L_1315	1315	O_1307	CONDUIT	2154.0	1.3000	0.0550
480	L_1316	1316	1315	CONDUIT	1157.0	0.9508	0.0550
481	L_1319	1319	1316	CONDUIT	1841.0	1.3581	0.0440
482	L_1321	1321	1316	CONDUIT	1813.0	1.4894	0.0440
483	L_1323	1323	1341	CONDUIT	568.0	1.5847	0.0440
484	L_1327	1327	1349	CONDUIT	2582.0	1.2394	0.0200
485	L_133	133	129	CONDUIT	2743.0	2.9908	0.0350
486	L_1340	1340	1316	CONDUIT	2275.0	1.8465	0.0440
487	L_1351	1351	1349	CONDUIT	2109.0	1.2804	0.0440
488	L_1353	1353	1351	CONDUIT	1021.7	0.5873	0.0440
489	L_1355	1355	1349	CONDUIT	957.7	1.9842	0.0440
490	L_1357	1357	1355	CONDUIT	1049.1	0.9532	0.0440
491	L_1361	1361	1357	CONDUIT	3566.0	1.2059	0.0440
492	L_1363	1363	1361	CONDUIT	1016.3	1.3776	0.0200
493	L_1367	1367	1353	CONDUIT	2810.2	1.7083	0.0440
494	L_1371	1371	1347	CONDUIT	1116.4	1.9709	0.0440
495	L_138	138	133	CONDUIT	2426.0	2.1852	0.0350
496	L_1387	1387	1315	CONDUIT	2272.0	2.2012	0.0440
497	L_139	139	115	CONDUIT	73.0	0.4110	0.0350
498	L_1393	1393	1315	CONDUIT	2179.0	2.1575	0.0440
499	L_1395	1395	1315	CONDUIT	3616.0	1.4935	0.0440
500	L_141	141	139	CONDUIT	542.0	1.8453	0.0350
501	L_146	146	141	CONDUIT	165.0	13.4535	0.0350
502	L_149	149	141	CONDUIT	1479.0	2.8409	0.0350
503	L_154	154	149	CONDUIT	1625.0	2.1543	0.0350
504	L_221	221	O_220	CONDUIT	2511.0	0.7408	0.0350
505	L_225	225	223	CONDUIT	1810.0	2.5976	0.0350
506	L_228	228	225	CONDUIT	847.0	2.8347	0.0350
507	L_235	235	231	CONDUIT	3274.0	1.6557	0.0350
508	L_239	239	237	CONDUIT	288.0	1.3890	0.0350
509	L_241	241	239	CONDUIT	1092.0	1.0990	0.0350
510	L_245	245	243	CONDUIT	4101.0	2.8541	0.0350
511	L_250	250	247	CONDUIT	2063.0	1.6483	0.0350
512	L_263	263	259	CONDUIT	2459.0	2.4000	0.0350
513	L_268	268	263	CONDUIT	1464.0	4.7184	0.0350
514	L_314	314	O_300	CONDUIT	2623.0	2.3262	0.0350
515	L_513	513	O_500	CONDUIT	3358.0	1.6083	0.0350
516	L_613	613	O_600	CONDUIT	3854.0	1.8945	0.0350
517	L_617	617	613	CONDUIT	2214.0	2.4398	0.0350
518	L_622	622	617	CONDUIT	1661.0	2.3486	0.0350
519	L_708	708	O_708	CONDUIT	202.0	11.4607	0.0350
520	L_709	709	708	CONDUIT	560.2	2.6786	0.0300
521	L_710	710	709	CONDUIT	154.3	3.2421	0.0400
522	L_711	711	710	CONDUIT	615.3	2.9267	0.0400
523	L_712	712	713	CONDUIT	485.4	3.5044	0.0400
524	L_713	713	711	CONDUIT	338.1	2.6629	0.0700
525	L_808	808	O_803	CONDUIT	1197.0	1.6711	0.0700
526	L_809	809	808	CONDUIT	90.0	5.5641	0.0130
527	L_811	811	809	CONDUIT	183.0	1.6396	0.0450
528	L_819	819	811	CONDUIT	761.0	1.0513	0.0700

L_822	822	819	CONDUIT	671.0	4.6249	0.0400
L_823	823	819	CONDUIT	943.0	0.7423	0.0400
L_824	824	822	CONDUIT	1270.0	2.2841	0.0350
L_829	829	823	CONDUIT	290.0	3.4503	0.0350
L_831	831	829	CONDUIT	105.0	10.0504	0.0400
L_834	834	831	CONDUIT	1040.0	0.3365	0.0400
L_836	836	834	CONDUIT	442.0	2.9424	0.0130
L_838	838	836	CONDUIT	314.9	1.2704	0.0480
L_839	839	843	CONDUIT	541.0	1.1091	0.0480
L_841	841	839	CONDUIT	190.0	1.0527	0.0440
L_843	843	838	CONDUIT	304.0	3.2913	0.0350
L_850	850	841	CONDUIT	1740.0	1.3220	0.0440
L_911	911	O_909	CONDUIT	2561.0	1.8746	0.0550
L_912	912	911	CONDUIT	522.0	1.3411	0.0440
L_931	931	929	CONDUIT	2763.0	1.1582	0.0440
Overflow_836	836	834	CONDUIT	442.0	2.9424	0.0350
Dummy_1324	1324	1323	CONDUIT	400.0	2.2506	0.0100
Dummy_1233	1233	CulvertOut_1233	CONDUIT	400.0	0.7500	0.0350

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Cross Section Summary
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Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
Dummy_1032	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1050	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_109	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_110	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1107	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1108	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1110	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1116	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1124	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1126	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1132	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1139	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_114	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1140	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1142	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1144	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1148	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1150	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1152	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1153	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1154	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1156	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1164	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1172	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_118	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1180	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1208	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_121	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1210	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1216	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_122	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1224	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1226	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1228	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1230	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1232	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1233_Lake	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1234	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1236	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1238	DUMMY	0.00	0.00	0.00	0.00	1	0.00

595	Dummy_1239	DUMMY	0.00	0.00	0.00	0.00	1	0.00
596	Dummy_1240	DUMMY	0.00	0.00	0.00	0.00	1	0.00
597	Dummy_1248	DUMMY	0.00	0.00	0.00	0.00	1	0.00
598	Dummy_1249	DUMMY	0.00	0.00	0.00	0.00	1	0.00
599	Dummy_1256	DUMMY	0.00	0.00	0.00	0.00	1	0.00
600	Dummy_1258	DUMMY	0.00	0.00	0.00	0.00	1	0.00
601	Dummy_1260	DUMMY	0.00	0.00	0.00	0.00	1	0.00
602	Dummy_1263	DUMMY	0.00	0.00	0.00	0.00	1	0.00
603	Dummy_1264	DUMMY	0.00	0.00	0.00	0.00	1	0.00
604	Dummy_1272	DUMMY	0.00	0.00	0.00	0.00	1	0.00
605	Dummy_1274	DUMMY	0.00	0.00	0.00	0.00	1	0.00
606	Dummy_129	DUMMY	0.00	0.00	0.00	0.00	1	0.00
607	Dummy_130	DUMMY	0.00	0.00	0.00	0.00	1	0.00
608	Dummy_1307	DUMMY	0.00	0.00	0.00	0.00	1	0.00
609	Dummy_1308	DUMMY	0.00	0.00	0.00	0.00	1	0.00
610	Dummy_1310	DUMMY	0.00	0.00	0.00	0.00	1	0.00
611	Dummy_1318	DUMMY	0.00	0.00	0.00	0.00	1	0.00
612	Dummy_1320	DUMMY	0.00	0.00	0.00	0.00	1	0.00
613	Dummy_1322	DUMMY	0.00	0.00	0.00	0.00	1	0.00
614	Dummy_1341	DUMMY	0.00	0.00	0.00	0.00	1	0.00
615	Dummy_1328	DUMMY	0.00	0.00	0.00	0.00	1	0.00
616	Dummy_1337	DUMMY	0.00	0.00	0.00	0.00	1	0.00
617	Dummy_134	DUMMY	0.00	0.00	0.00	0.00	1	0.00
618	Dummy_1348	DUMMY	0.00	0.00	0.00	0.00	1	0.00
619	Dummy_1349	DUMMY	0.00	0.00	0.00	0.00	1	0.00
620	Dummy_1352	DUMMY	0.00	0.00	0.00	0.00	1	0.00
621	Dummy_1354	DUMMY	0.00	0.00	0.00	0.00	1	0.00
622	Dummy_1356	DUMMY	0.00	0.00	0.00	0.00	1	0.00
623	Dummy_1358	DUMMY	0.00	0.00	0.00	0.00	1	0.00
624	Dummy_1362	DUMMY	0.00	0.00	0.00	0.00	1	0.00
625	Dummy_1364	DUMMY	0.00	0.00	0.00	0.00	1	0.00
626	Dummy_1368	DUMMY	0.00	0.00	0.00	0.00	1	0.00
627	Dummy_1372	DUMMY	0.00	0.00	0.00	0.00	1	0.00
628	Dummy_1382	DUMMY	0.00	0.00	0.00	0.00	1	0.00
629	Dummy_1386	DUMMY	0.00	0.00	0.00	0.00	1	0.00
630	Dummy_1388	DUMMY	0.00	0.00	0.00	0.00	1	0.00
631	Dummy_1392	DUMMY	0.00	0.00	0.00	0.00	1	0.00
632	Dummy_1394	DUMMY	0.00	0.00	0.00	0.00	1	0.00
633	Dummy_1396	DUMMY	0.00	0.00	0.00	0.00	1	0.00
634	Dummy_1398	DUMMY	0.00	0.00	0.00	0.00	1	0.00
635	Dummy_142	DUMMY	0.00	0.00	0.00	0.00	1	0.00
636	Dummy_150	DUMMY	0.00	0.00	0.00	0.00	1	0.00
637	Dummy_210	DUMMY	0.00	0.00	0.00	0.00	1	0.00
638	Dummy_219	DUMMY	0.00	0.00	0.00	0.00	1	0.00
639	Dummy_220	DUMMY	0.00	0.00	0.00	0.00	1	0.00
640	Dummy_223	DUMMY	0.00	0.00	0.00	0.00	1	0.00
641	Dummy_224	DUMMY	0.00	0.00	0.00	0.00	1	0.00
642	Dummy_226	DUMMY	0.00	0.00	0.00	0.00	1	0.00
643	Dummy_231	DUMMY	0.00	0.00	0.00	0.00	1	0.00
644	Dummy_232	DUMMY	0.00	0.00	0.00	0.00	1	0.00
645	Dummy_236	DUMMY	0.00	0.00	0.00	0.00	1	0.00
646	Dummy_237	DUMMY	0.00	0.00	0.00	0.00	1	0.00
647	Dummy_240	DUMMY	0.00	0.00	0.00	0.00	1	0.00
648	Dummy_243	DUMMY	0.00	0.00	0.00	0.00	1	0.00
649	Dummy_244	DUMMY	0.00	0.00	0.00	0.00	1	0.00
650	Dummy_247	DUMMY	0.00	0.00	0.00	0.00	1	0.00
651	Dummy_248	DUMMY	0.00	0.00	0.00	0.00	1	0.00
652	Dummy_252	DUMMY	0.00	0.00	0.00	0.00	1	0.00
653	Dummy_256	DUMMY	0.00	0.00	0.00	0.00	1	0.00
654	Dummy_259	DUMMY	0.00	0.00	0.00	0.00	1	0.00
655	Dummy_260	DUMMY	0.00	0.00	0.00	0.00	1	0.00
656	Dummy_264	DUMMY	0.00	0.00	0.00	0.00	1	0.00
657	Dummy_300	DUMMY	0.00	0.00	0.00	0.00	1	0.00
658	Dummy_310	DUMMY	0.00	0.00	0.00	0.00	1	0.00
659	Dummy_410	DUMMY	0.00	0.00	0.00	0.00	1	0.00
660	Dummy_414	DUMMY	0.00	0.00	0.00	0.00	1	0.00

661	Dummy_418	DUMMY	0.00	0.00	0.00	0.00	1	0.00
662	Dummy_422	DUMMY	0.00	0.00	0.00	0.00	1	0.00
663	Dummy_426	DUMMY	0.00	0.00	0.00	0.00	1	0.00
664	Dummy_500	DUMMY	0.00	0.00	0.00	0.00	1	0.00
665	Dummy_510	DUMMY	0.00	0.00	0.00	0.00	1	0.00
666	Dummy_514	DUMMY	0.00	0.00	0.00	0.00	1	0.00
667	Dummy_518	DUMMY	0.00	0.00	0.00	0.00	1	0.00
668	Dummy_600	DUMMY	0.00	0.00	0.00	0.00	1	0.00
669	Dummy_610	DUMMY	0.00	0.00	0.00	0.00	1	0.00
670	Dummy_614	DUMMY	0.00	0.00	0.00	0.00	1	0.00
671	Dummy_618	DUMMY	0.00	0.00	0.00	0.00	1	0.00
672	Dummy_620	DUMMY	0.00	0.00	0.00	0.00	1	0.00
673	Dummy_708	DUMMY	0.00	0.00	0.00	0.00	1	0.00
674	Dummy_714	DUMMY	0.00	0.00	0.00	0.00	1	0.00
675	Dummy_803	DUMMY	0.00	0.00	0.00	0.00	1	0.00
676	Dummy_804	DUMMY	0.00	0.00	0.00	0.00	1	0.00
677	Dummy_810	DUMMY	0.00	0.00	0.00	0.00	1	0.00
678	Dummy_820	DUMMY	0.00	0.00	0.00	0.00	1	0.00
679	Dummy_830	DUMMY	0.00	0.00	0.00	0.00	1	0.00
680	Dummy_840	DUMMY	0.00	0.00	0.00	0.00	1	0.00
681	Dummy_842	DUMMY	0.00	0.00	0.00	0.00	1	0.00
682	Dummy_844	DUMMY	0.00	0.00	0.00	0.00	1	0.00
683	Dummy_909	DUMMY	0.00	0.00	0.00	0.00	1	0.00
684	Dummy_910	DUMMY	0.00	0.00	0.00	0.00	1	0.00
685	Dummy_929	DUMMY	0.00	0.00	0.00	0.00	1	0.00
686	Dummy_930	DUMMY	0.00	0.00	0.00	0.00	1	0.00
687	Dummy_940	DUMMY	0.00	0.00	0.00	0.00	1	0.00
688	Dummy_950	DUMMY	0.00	0.00	0.00	0.00	1	0.00
689	Dummy_960	DUMMY	0.00	0.00	0.00	0.00	1	0.00
690	Dummy_1002	DUMMY	0.00	0.00	0.00	0.00	1	0.00
691	L_1004	TRAPEZOIDAL	20.00	1880.00	13.81	124.00	1	18381.59
692	L_1006	TRAPEZOIDAL	30.00	3000.00	17.23	160.00	1	50358.59
693	L_1008	TRAPEZOIDAL	20.00	1700.00	11.22	145.00	1	18712.97
694	L_1010	TRAPEZOIDAL	20.00	1700.00	11.22	145.00	1	15446.32
695	L_1012	TRAPEZOIDAL	30.00	3450.00	16.07	205.00	1	25184.10
696	L_1014	TRAPEZOIDAL	30.00	4200.00	18.54	215.00	1	26406.15
697	L_1016	TRAPEZOIDAL	20.00	2300.00	13.32	165.00	1	27645.60
698	L_1018	TRAPEZOIDAL	20.00	2100.00	12.91	155.00	1	18753.86
699	L_1020	TRAPEZOIDAL	20.00	2100.00	12.91	155.00	1	28575.76
700	L_1022	TRAPEZOIDAL	20.00	1640.00	12.48	122.00	1	19035.73
701	L_1024	TRAPEZOIDAL	20.00	2200.00	13.12	160.00	1	24575.19
702	L_1026	TRAPEZOIDAL	20.00	2200.00	13.12	160.00	1	28561.86
703	L_1028	TRAPEZOIDAL	20.00	1400.00	13.14	90.00	1	21275.96
704	L_1030	TRAPEZOIDAL	20.00	1400.00	13.14	90.00	1	27361.31
705	L_1034	TRAPEZOIDAL	20.00	1200.00	12.43	80.00	1	13340.75
706	L_1036	TRAPEZOIDAL	20.00	1200.00	12.43	80.00	1	15878.81
707	L_1038	TRAPEZOIDAL	20.00	1600.00	11.62	130.00	1	16131.15
708	L_1040	TRAPEZOIDAL	20.00	1700.00	11.22	145.00	1	22186.34
709	L_1042	TRAPEZOIDAL	20.00	1600.00	10.92	140.00	1	27589.00
710	L_1044	TRAPEZOIDAL	20.00	1600.00	10.92	140.00	1	23867.97
711	L_1046	TRAPEZOIDAL	20.00	2500.00	10.92	225.00	1	54839.61
712	L_1048	TRAPEZOIDAL	20.00	2500.00	10.92	225.00	1	43865.36
713	L_1115	TRAPEZOIDAL	10.00	250.00	5.43	40.00	1	3477.77
714	L_1123	TRAPEZOIDAL	10.00	1050.00	7.60	135.00	1	16249.85
715	L_1125	TRAPEZOIDAL	10.00	500.00	5.69	85.00	1	17477.64
716	L_1127	TRAPEZOIDAL	10.00	1150.00	7.99	140.00	1	16818.94
717	L_1130	TRAPEZOIDAL	10.00	1150.00	7.99	140.00	1	12984.86
718	L_114	TRIANGULAR	10.00	1000.00	4.98	200.00	1	23063.49
719	L_1141	TRAPEZOIDAL	10.00	3000.00	7.48	400.00	1	32596.92
720	L_1147	TRAPEZOIDAL	10.00	750.00	5.91	125.00	1	10276.82
721	L_115	TRAPEZOIDAL	10.00	1500.00	7.43	200.00	1	24279.48
722	L_1151	TRAPEZOIDAL	10.00	400.00	5.46	70.00	1	5485.90
723	L_1156	TRAPEZOIDAL	10.00	4000.00	7.98	500.00	1	37239.33
724	L_1163	TRAPEZOIDAL	10.00	1000.00	7.50	130.00	1	12343.65
725	L_117	TRAPEZOIDAL	10.00	300.00	5.48	50.00	1	4869.25
726	L_1170	TRAPEZOIDAL	10.00	3250.00	8.10	400.00	1	75349.61

727	L_119	TRAPEZOIDAL	10.00	300.00	5.48	50.00	1	4804.89
728	L_1209	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	9700.40
729	Dummy_1215	DUMMY	0.00	0.00	0.00	0.00	1	0.00
730	L_1217	TRAPEZOIDAL	10.00	500.00	6.01	80.00	1	2940.75
731	L_1223	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	9636.96
732	L_1231	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	11203.97
733	L_1233	TRAPEZOIDAL	10.00	600.00	5.86	100.00	1	6424.77
734	L_1235	TRAPEZOIDAL	10.00	440.00	5.09	84.00	1	6952.50
735	L_1237	TRAPEZOIDAL	10.00	60.00	2.31	6.00	1	1026.73
736	L_1239	TRAPEZOIDAL	10.00	400.01	4.85	80.00	1	7415.92
737	L_1247	TRAPEZOIDAL	10.00	450.00	5.15	85.00	1	6126.54
738	L_1255	TRAPEZOIDAL	10.00	400.01	4.85	80.00	1	2975.52
739	L_1257	TRAPEZOIDAL	10.00	240.00	4.93	44.00	1	1320.07
740	L_1259	TRAPEZOIDAL	10.00	1900.00	5.58	340.00	1	38939.80
741	L_126	TRAPEZOIDAL	10.00	500.00	6.69	70.00	1	13419.02
742	L_1273	TRAPEZOIDAL	10.00	400.01	4.85	80.00	1	1801.12
743	L_1315	TRAPEZOIDAL	10.00	1200.00	7.83	150.00	1	14577.20
744	L_1316	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	11537.95
745	L_1319	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	17237.03
746	L_1321	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	18051.21
747	L_1323	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	18619.74
748	L_1327	TRAPEZOIDAL	1.00	42.00	0.94	44.00	1	334.42
749	L_133	TRAPEZOIDAL	10.00	1550.00	6.56	235.00	1	39885.90
750	L_1340	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	20098.81
751	L_1351	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	16736.47
752	L_1353	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	11334.83
753	L_1355	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	20835.18
754	L_1357	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	14440.98
755	L_1361	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	16242.72
756	L_1363	TRAPEZOIDAL	10.00	600.00	7.08	80.00	1	19296.64
757	L_1367	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	19332.24
758	L_1371	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	20765.15
759	L_138	TRAPEZOIDAL	10.00	1300.00	6.15	210.00	1	27399.52
760	L_1387	TRAPEZOIDAL	10.00	800.00	6.06	130.00	1	13326.31
761	L_139	TRAPEZOIDAL	10.00	400.00	6.18	60.00	1	3666.51
762	L_1393	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	21725.52
763	L_1395	TRAPEZOIDAL	10.00	1750.00	5.37	325.00	1	22159.24
764	L_141	TRAPEZOIDAL	10.00	400.00	6.18	60.00	1	7769.44
765	L_146	TRAPEZOIDAL	10.00	1200.00	5.43	220.00	1	57731.32
766	L_149	TRAPEZOIDAL	10.00	500.00	6.69	70.00	1	12705.71
767	L_154	TRAPEZOIDAL	10.00	700.00	7.39	90.00	1	16550.33
768	L_221	TRAPEZOIDAL	10.00	800.00	6.53	120.00	1	10215.79
769	L_225	TRAPEZOIDAL	10.00	600.00	7.08	80.00	1	15141.09
770	L_228	TRAPEZOIDAL	10.00	400.00	6.18	60.00	1	9629.49
771	L_235	TRAPEZOIDAL	10.00	1300.00	7.96	160.00	1	28321.67
772	L_239	TRAPEZOIDAL	10.00	950.00	7.94	115.00	1	18911.69
773	L_241	TRAPEZOIDAL	10.00	500.00	6.69	70.00	1	7902.48
774	L_245	TRAPEZOIDAL	10.00	300.00	5.48	50.00	1	6690.39
775	L_250	TRAPEZOIDAL	10.00	5100.00	5.05	1010.00	1	81811.71
776	L_263	TRAPEZOIDAL	10.00	400.00	6.18	60.00	1	8860.57
777	L_268	TRAPEZOIDAL	10.00	400.00	6.18	60.00	1	12423.61
778	L_314	TRAPEZOIDAL	10.00	700.00	7.39	90.00	1	17197.82
779	L_513	TRAPEZOIDAL	10.00	700.00	7.39	90.00	1	14299.92
780	L_613	TRAPEZOIDAL	10.00	1300.00	7.96	160.00	1	30295.16
781	L_617	TRAPEZOIDAL	10.00	1000.00	8.02	120.00	1	26566.21
782	L_622	TRAPEZOIDAL	10.00	1200.00	5.43	220.00	1	24121.37
783	L_708	TRAPEZOIDAL	10.00	420.00	6.29	62.00	1	20580.76
784	L_709	TRAPEZOIDAL	10.00	900.00	6.79	130.00	1	26173.35
785	L_710	TRAPEZOIDAL	10.00	900.00	7.85	110.00	1	23769.29
786	L_711	TRAPEZOIDAL	10.00	1130.00	7.27	153.00	1	26947.94
787	L_712	TRAPEZOIDAL	10.00	2560.00	6.30	406.00	1	60698.05
788	L_713	TRAPEZOIDAL	10.00	1550.00	6.05	255.00	1	17837.15
789	L_808	TRAPEZOIDAL	10.00	950.00	7.41	125.00	1	9906.73
790	L_809	RECT_CLOSED	15.00	75.00	1.88	5.00	1	3074.94
791	L_811	TRAPEZOIDAL	10.00	1670.00	7.30	227.00	1	26581.36
792	L_819	TRAPEZOIDAL	10.00	1450.00	8.13	175.00	1	12765.94

L_822	TRAPEZOIDAL	10.00	2850.00	8.46	335.00	1	94518.19
L_823	TRAPEZOIDAL	10.00	2850.00	8.46	335.00	1	37867.18
L_824	TRAPEZOIDAL	10.00	9570.00	7.61	1257.00	1	237606.05
L_829	TRAPEZOIDAL	10.00	1250.00	7.06	175.00	1	36264.24
L_831	TRAPEZOIDAL	15.00	2325.00	9.39	245.00	1	121915.29
L_834	TRAPEZOIDAL	15.00	2310.00	9.37	244.00	1	22129.56
L_836	CIRCULAR	4.00	12.57	1.00	4.00	1	246.40
L_838	TRAPEZOIDAL	15.00	3735.00	7.86	474.00	1	51535.74
L_839	TRAPEZOIDAL	15.00	5662.50	8.63	655.00	1	77684.49
L_841	TRIANGULAR	10.00	1000.00	4.98	200.00	1	10098.48
L_843	CIRCULAR	15.00	176.71	3.75	15.00	1	3285.42
L_850	TRAPEZOIDAL	10.00	1400.00	5.37	260.00	1	16665.33
L_911	TRAPEZOIDAL	10.00	1250.00	7.46	165.00	1	17661.02
L_912	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	17129.02
L_931	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	15918.36
Overflow_836	TRAPEZOIDAL	15.00	3975.00	8.10	490.00	1	116720.41
Dummy_1324	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1233	DUMMY	0.00	0.00	0.00	0.00	1	0.00

```
****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ NO
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Flow Routing Method ...... KINWAVE
Starting Date ............ 01/01/2024 00:00:00
Ending Date .............. 01/02/2024 06:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:05:00
Routing Time Step ........ 20.00 sec
```

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	1182.633	385.379
External Outflow	1198.290	390.481
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.042	0.014
Continuity Error (%)	-1.327	

```
******************************
Highest Flow Instability Indexes
******************************
All links are stable.

************************
Routing Time Step Summary
************************
```

```
  Minimum Time Step           :    20.00 sec
  Average Time Step           :    20.00 sec
  Maximum Time Step           :    20.00 sec
  % of Time in Steady State   :     0.00
  Average Iterations per Step :     1.00
  % of Steps Not Converging   :     0.00


  ******************
  Node Depth Summary
  ******************

  --------------------------------------------------------------------------------
                               Average  Maximum  Maximum  Time of Max    Reported
                                 Depth    Depth      HGL   Occurrence   Max Depth
  Node                 Type       Feet     Feet     Feet  days hr:min        Feet
  --------------------------------------------------------------------------------
  1002                 JUNCTION   1.04    13.45  4770.45     0  01:22       13.43
  1004                 JUNCTION   1.04    13.46  4781.46     0  01:19       13.46
  1006_RR              JUNCTION   1.16    13.44  4785.44     0  01:20       13.44
  1008                 JUNCTION   1.27    14.65  4788.65     0  01:19       14.65
  1010                 JUNCTION   1.57    17.81  4792.71     0  01:19       17.80
  1012                 JUNCTION   1.55    17.81  4795.71     0  01:17       17.78
  1014                 JUNCTION   1.15    14.91  4793.91     0  01:17       14.89
  1016                 JUNCTION   0.89    11.65  4792.65     0  01:16       11.64
  1018                 JUNCTION   0.89    11.65  4793.65     0  01:15       11.65
  1020                 JUNCTION   0.87    11.52  4795.52     0  01:15       11.52
  1022                 JUNCTION   0.87    11.52  4800.52     0  01:14       11.52
  1024                 JUNCTION   0.74     9.96  4801.96     0  01:13        9.96
  1026                 JUNCTION   0.72    10.02  4803.02     0  01:13       10.01
  1028                 JUNCTION   0.71    10.02  4813.92     0  01:12       10.00
  1030                 JUNCTION   0.73    10.44  4822.34     0  01:11       10.43
  1032                 JUNCTION   0.00     0.00  4770.00     0  00:00        0.00
  1034                 JUNCTION   0.73    10.44  4825.34     0  01:11       10.44
  1036                 JUNCTION   0.78    10.50  4828.50     0  01:10       10.50
  1038                 JUNCTION   0.78    10.50  4831.50     0  01:09       10.50
  1040                 JUNCTION   0.70     9.30  4837.20     0  01:08        9.29
  1042                 JUNCTION   0.69     9.00  4847.00     0  01:08        8.99
  1044                 JUNCTION   0.68     9.00  4853.00     0  01:07        8.98
  1046                 JUNCTION   0.53     6.93  4857.93     0  01:07        6.92
  1048                 JUNCTION   0.53     6.93  4861.93     0  01:06        6.93
  1050                 JUNCTION   0.00     0.00  4864.00     0  00:00        0.00
  109                  JUNCTION   0.31     3.05  4782.05     0  01:04        3.05
  110                  JUNCTION   0.00     0.00  4794.00     0  00:00        0.00
  1108                 JUNCTION   0.00     0.00  4816.00     0  00:00        0.00
  1110                 JUNCTION   0.00     0.00  4855.00     0  00:00        0.00
  1115                 JUNCTION   0.40     5.54  4795.54     0  01:08        5.52
  1116                 JUNCTION   0.00     0.00  4850.00     0  00:00        0.00
  1123                 JUNCTION   0.13     1.97  4826.97     0  01:05        1.97
  1124                 JUNCTION   0.00     0.00  4864.00     0  00:00        0.00
  1125                 JUNCTION   0.02     0.68  4852.68     0  00:35        0.67
  1126                 JUNCTION   0.00     0.00  4864.00     0  00:00        0.00
  1127                 JUNCTION   0.13     2.10  4843.10     0  01:04        2.10
  113                  JUNCTION   0.32     3.05  4787.05     0  01:03        3.05
  1130                 JUNCTION   0.13     2.11  4856.11     0  01:02        2.10
  1132                 JUNCTION   0.00     0.00  4874.00     0  00:00        0.00
  1139                 JUNCTION   0.07     1.20  4858.20     0  01:03        1.20
  114                  JUNCTION   0.00     0.00  4798.00     0  00:00        0.00
  1140                 JUNCTION   0.00     0.00  4879.00     0  00:00        0.00
  1141                 JUNCTION   0.17     2.90  4880.90     0  00:55        2.90
  1142                 JUNCTION   0.00     0.00  4902.00     0  00:00        0.00
  1144                 JUNCTION   0.00     0.00  4925.00     0  00:00        0.00
  1147                 JUNCTION   0.17     2.91  4895.91     0  00:53        2.90
  1148                 JUNCTION   0.00     0.00  4946.00     0  00:00        0.00
  115                  JUNCTION   0.23     3.44  4820.14     0  00:58        3.44
  1150                 JUNCTION   0.00     0.00  4955.00     0  00:00        0.00
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925	1151	JUNCTION	0.16	3.08	4944.08	0	00:44	3.07
926	1152	JUNCTION	0.00	0.00	4966.00	0	00:00	0.00
927	1153	JUNCTION	0.05	1.22	4944.22	0	00:43	1.22
928	1154	JUNCTION	0.00	0.00	4976.00	0	00:00	0.00
929	1155	JUNCTION	0.16	3.05	4901.05	0	00:49	3.05
930	1156	JUNCTION	0.00	0.00	4935.00	0	00:00	0.00
931	1163	JUNCTION	0.05	1.23	4954.23	0	00:40	1.23
932	1164	JUNCTION	0.00	0.00	4958.00	0	00:00	0.00
933	117	JUNCTION	0.23	3.44	4821.44	0	00:58	3.44
934	1170	JUNCTION	0.01	0.25	4909.25	0	00:40	0.25
935	1172	JUNCTION	0.00	0.00	4832.00	0	00:00	0.00
936	118	JUNCTION	0.00	0.00	4830.00	0	00:00	0.00
937	1180	JUNCTION	0.00	0.00	4838.00	0	00:00	0.00
938	119	JUNCTION	0.22	3.29	4837.29	0	00:56	3.29
939	1208	JUNCTION	0.00	0.00	4868.00	0	00:00	0.00
940	1209	JUNCTION	0.12	1.50	4878.50	0	00:50	1.50
941	121	JUNCTION	0.02	0.28	4835.28	0	01:10	0.28
942	1210	JUNCTION	0.00	0.00	4889.00	0	00:00	0.00
943	1215	JUNCTION	0.54	6.81	4874.81	0	01:17	6.80
944	1216	JUNCTION	0.00	0.00	4882.00	0	00:00	0.00
945	1217	JUNCTION	0.59	6.82	4879.82	0	01:12	6.81
946	122	JUNCTION	0.00	0.00	4983.00	0	00:00	0.00
947	1223	JUNCTION	0.46	4.54	4884.54	0	01:06	4.54
948	1224	JUNCTION	0.00	0.00	4890.00	0	00:00	0.00
949	1226	JUNCTION	0.00	0.00	4895.00	0	00:00	0.00
950	1228	JUNCTION	0.00	0.00	4903.00	0	00:00	0.00
951	1230	JUNCTION	0.00	0.00	4883.00	0	00:00	0.00
952	1231	JUNCTION	0.34	4.13	4912.13	0	00:48	4.13
953	1232	JUNCTION	0.00	0.00	4955.00	0	00:00	0.00
954	1233	JUNCTION	0.15	2.54	4919.54	0	00:48	2.54
955	1233_Lake	JUNCTION	0.15	2.92	4913.92	0	00:47	2.91
956	1234	JUNCTION	0.00	0.00	4960.00	0	00:00	0.00
957	1235	JUNCTION	0.12	2.05	4943.05	0	00:45	2.05
958	1236	JUNCTION	0.00	0.00	4998.00	0	00:00	0.00
959	1237	JUNCTION	0.11	2.39	4975.39	0	00:45	2.39
960	1238	JUNCTION	0.00	0.00	5005.00	0	00:00	0.00
961	1239	JUNCTION	0.49	4.99	4958.99	0	01:04	4.99
962	1239_Lake	JUNCTION	0.30	3.06	4944.06	0	01:04	3.06
963	1240	JUNCTION	0.00	0.00	4981.00	0	00:00	0.00
964	1247	JUNCTION	1.14	3.55	4949.55	0	00:45	3.54
965	1248	JUNCTION	0.00	0.00	4967.00	0	00:00	0.00
966	1249	JUNCTION	0.11	2.39	4959.39	0	00:46	2.38
967	1255	JUNCTION	0.40	4.04	4969.04	0	01:06	4.04
968	1256	JUNCTION	0.00	0.00	4993.00	0	00:00	0.00
969	1257	JUNCTION	0.32	4.05	4974.05	0	00:58	4.05
970	1258	JUNCTION	0.00	0.00	4989.00	0	00:00	0.00
971	1259	JUNCTION	0.03	0.46	4990.46	0	00:55	0.46
972	126	JUNCTION	0.02	0.30	4999.30	0	00:45	0.30
973	1260	JUNCTION	0.00	0.00	5019.00	0	00:00	0.00
974	1264	JUNCTION	0.00	0.00	4876.00	0	00:00	0.00
975	1272	JUNCTION	0.00	0.00	4880.00	0	00:00	0.00
976	1273	JUNCTION	0.48	4.99	4963.99	0	01:00	4.99
977	1274	JUNCTION	0.00	0.00	4978.00	0	00:00	0.00
978	129	JUNCTION	0.03	0.61	4835.61	0	00:56	0.61
979	130	JUNCTION	0.00	0.00	4910.00	0	00:00	0.00
980	1308	JUNCTION	0.00	0.00	4891.00	0	00:00	0.00
981	1310	JUNCTION	0.00	0.00	4912.00	0	00:00	0.00
982	1315	JUNCTION	0.44	4.83	4897.83	0	01:05	4.83
983	1316	JUNCTION	0.43	4.83	4908.83	0	01:01	4.83
984	1318	JUNCTION	0.00	0.00	4923.00	0	00:00	0.00
985	1319	JUNCTION	0.07	1.56	4930.56	0	00:40	1.56
986	1320	JUNCTION	0.00	0.00	4970.00	0	00:00	0.00
987	1321	JUNCTION	0.10	1.46	4932.46	0	00:50	1.46
988	1322	JUNCTION	0.00	0.00	4975.00	0	00:00	0.00
989	1341	JUNCTION	0.08	1.27	4958.27	0	00:51	1.27
990	1324	JUNCTION	0.00	0.00	4975.00	0	00:00	0.00

991	1327	JUNCTION	0.01	0.10	4984.10	0	01:05	0.10
992	1328	JUNCTION	0.00	0.00	4989.00	0	00:00	0.00
993	133	JUNCTION	0.03	0.68	4917.68	0	00:49	0.68
994	134	JUNCTION	0.00	0.00	4945.00	0	00:00	0.00
995	1340	JUNCTION	0.35	3.62	4949.62	0	00:58	3.62
996	1347	JUNCTION	0.12	1.64	4950.64	0	00:56	1.64
997	1348	JUNCTION	0.00	0.00	4981.00	0	00:00	0.00
998	1349	JUNCTION	0.21	2.28	4954.28	0	01:00	2.28
999	1351	JUNCTION	0.18	2.20	4981.20	0	00:57	2.20
1000	1352	JUNCTION	0.00	0.00	5019.00	0	00:00	0.00
1001	1353	JUNCTION	0.14	1.98	4986.98	0	00:54	1.98
1002	1354	JUNCTION	0.00	0.00	5028.00	0	00:00	0.00
1003	1355	JUNCTION	0.22	2.28	4973.28	0	00:58	2.28
1004	1356	JUNCTION	0.00	0.00	4989.00	0	00:00	0.00
1005	1357	JUNCTION	0.20	2.26	4983.26	0	00:55	2.26
1006	1358	JUNCTION	0.00	0.00	4993.00	0	00:00	0.00
1007	1361	JUNCTION	0.13	1.78	5025.78	0	00:38	1.77
1008	1362	JUNCTION	0.00	0.00	5035.00	0	00:00	0.00
1009	1363	JUNCTION	0.02	0.60	5038.60	0	00:35	0.60
1010	1364	JUNCTION	0.00	0.00	5058.00	0	00:00	0.00
1011	1367	JUNCTION	0.07	1.19	5034.19	0	00:40	1.19
1012	1368	JUNCTION	0.00	0.00	5059.00	0	00:00	0.00
1013	1371	JUNCTION	0.12	1.64	4972.64	0	00:50	1.64
1014	1372	JUNCTION	0.00	0.00	4988.00	0	00:00	0.00
1015	138	JUNCTION	0.03	0.69	4970.69	0	00:40	0.69
1016	1382	JUNCTION	0.00	0.00	4921.00	0	00:00	0.00
1017	1386	JUNCTION	0.00	0.00	4960.00	0	00:00	0.00
1018	1387	JUNCTION	0.05	1.15	4944.15	0	00:45	1.15
1019	1388	JUNCTION	0.00	0.00	4995.00	0	00:00	0.00
1020	139	JUNCTION	0.17	2.78	4819.78	0	00:51	2.78
1021	1392	JUNCTION	0.00	0.00	4938.00	0	00:00	0.00
1022	1393	JUNCTION	0.12	1.45	4941.45	0	00:55	1.45
1023	1394	JUNCTION	0.00	0.00	4997.00	0	00:00	0.00
1024	1395	JUNCTION	0.08	1.12	4948.12	0	00:55	1.12
1025	1396	JUNCTION	0.00	0.00	4969.00	0	00:00	0.00
1026	1398	JUNCTION	0.00	0.00	4972.00	0	00:00	0.00
1027	141	JUNCTION	0.10	1.74	4828.74	0	00:50	1.74
1028	142	JUNCTION	0.00	0.00	4820.00	0	00:00	0.00
1029	146	JUNCTION	0.02	0.27	4849.27	0	01:05	0.27
1030	149	JUNCTION	0.06	1.13	4870.13	0	00:46	1.13
1031	150	JUNCTION	0.00	0.00	4890.00	0	00:00	0.00
1032	154	JUNCTION	0.03	0.72	4904.72	0	00:40	0.72
1033	210	JUNCTION	0.00	0.00	4770.00	0	00:00	0.00
1034	220	JUNCTION	0.00	0.00	4777.00	0	00:00	0.00
1035	221	JUNCTION	0.24	3.40	4794.00	0	01:02	3.39
1036	223	JUNCTION	0.05	0.83	4793.83	0	00:52	0.83
1037	224	JUNCTION	0.00	0.00	4810.00	0	00:00	0.00
1038	225	JUNCTION	0.05	0.83	4840.83	0	00:48	0.83
1039	226	JUNCTION	0.00	0.00	4850.00	0	00:00	0.00
1040	228	JUNCTION	0.05	0.72	4864.72	0	00:55	0.72
1041	231	JUNCTION	0.09	1.31	4792.11	0	01:04	1.31
1042	232	JUNCTION	0.00	0.00	4810.00	0	00:00	0.00
1043	235	JUNCTION	0.09	1.32	4846.32	0	00:58	1.32
1044	236	JUNCTION	0.00	0.00	4847.00	0	00:00	0.00
1045	237	JUNCTION	0.10	1.53	4847.53	0	00:58	1.53
1046	239	JUNCTION	0.16	2.57	4852.57	0	00:57	2.57
1047	240	JUNCTION	0.00	0.00	4849.00	0	00:00	0.00
1048	241	JUNCTION	0.16	2.57	4864.57	0	00:56	2.57
1049	243	JUNCTION	0.13	2.16	4865.16	0	00:57	2.15
1050	244	JUNCTION	0.00	0.00	4894.00	0	00:00	0.00
1051	245	JUNCTION	0.13	2.17	4982.17	0	00:51	2.16
1052	247	JUNCTION	0.03	0.66	4981.66	0	00:53	0.66
1053	248	JUNCTION	0.00	0.00	4986.00	0	00:00	0.00
1054	250	JUNCTION	0.03	0.68	5015.68	0	00:40	0.68
1055	252	JUNCTION	0.00	0.00	4990.00	0	00:00	0.00
1056	256	JUNCTION	0.00	0.00	4851.00	0	00:00	0.00

1057	259	JUNCTION	0.08	1.15	4864.15	0	00:57	1.15
1058	260	JUNCTION	0.00	0.00	4905.00	0	00:00	0.00
1059	263	JUNCTION	0.08	1.15	4923.15	0	00:52	1.15
1060	264	JUNCTION	0.00	0.00	4991.00	0	00:00	0.00
1061	268	JUNCTION	0.04	0.61	4991.61	0	00:50	0.61
1062	310	JUNCTION	0.00	0.00	4778.00	0	00:00	0.00
1063	314	JUNCTION	0.03	0.64	4839.64	0	00:40	0.64
1064	410	JUNCTION	0.00	0.00	4793.00	0	00:00	0.00
1065	414	JUNCTION	0.00	0.00	4796.00	0	00:00	0.00
1066	418	JUNCTION	0.00	0.00	4802.00	0	00:00	0.00
1067	422	JUNCTION	0.00	0.00	4800.00	0	00:00	0.00
1068	426	JUNCTION	0.00	0.00	4810.00	0	00:00	0.00
1069	510	JUNCTION	0.00	0.00	4856.00	0	00:00	0.00
1070	513	JUNCTION	0.06	0.87	4880.87	0	00:55	0.87
1071	514	JUNCTION	0.00	0.00	4931.00	0	00:00	0.00
1072	518	JUNCTION	0.00	0.00	4940.00	0	00:00	0.00
1073	610	JUNCTION	0.00	0.00	4858.00	0	00:00	0.00
1074	613	JUNCTION	0.05	0.80	4888.80	0	00:54	0.80
1075	614	JUNCTION	0.00	0.00	4899.00	0	00:00	0.00
1076	617	JUNCTION	0.06	0.96	4942.96	0	00:54	0.96
1077	618	JUNCTION	0.00	0.00	4950.00	0	00:00	0.00
1078	620	JUNCTION	0.00	0.00	4920.00	0	00:00	0.00
1079	622	JUNCTION	0.06	0.96	4981.96	0	00:50	0.96
1080	708	JUNCTION	0.04	0.66	4851.66	0	00:51	0.66
1081	709	JUNCTION	0.03	0.57	4866.57	0	00:50	0.57
1082	710	JUNCTION	0.03	0.52	4871.52	0	00:49	0.52
1083	711	JUNCTION	0.05	0.87	4889.87	0	00:48	0.87
1084	712	JUNCTION	0.02	0.40	4915.40	0	00:45	0.40
1085	713	JUNCTION	0.05	0.87	4898.87	0	00:46	0.86
1086	714	JUNCTION	0.00	0.00	4864.00	0	00:00	0.00
1087	804	JUNCTION	0.00	0.00	4882.00	0	00:00	0.00
1088	808	JUNCTION	0.29	5.33	4890.33	0	01:00	5.33
1089	809	JUNCTION	0.29	5.33	4895.33	0	01:00	5.33
1090	810	JUNCTION	0.00	0.00	4925.00	0	00:00	0.00
1091	811	JUNCTION	0.14	2.17	4895.17	0	01:00	2.17
1092	819	JUNCTION	0.14	2.17	4903.17	0	00:58	2.17
1093	820	JUNCTION	0.00	0.00	4945.00	0	00:00	0.00
1094	822	JUNCTION	0.01	0.13	4932.13	0	01:01	0.13
1095	823	JUNCTION	0.07	1.10	4909.10	0	00:57	1.10
1096	824	JUNCTION	0.00	0.09	4961.09	0	00:45	0.09
1097	829	JUNCTION	0.07	1.10	4919.10	0	00:57	1.10
1098	830	JUNCTION	0.00	0.00	4972.00	0	00:00	0.00
1099	831	JUNCTION	0.14	2.24	4930.74	0	01:00	2.24
1100	834	JUNCTION	0.29	4.00	4936.00	0	00:37	4.00
1101	838	JUNCTION	0.28	4.26	4953.26	0	00:55	4.26
1102	839	JUNCTION	0.20	2.64	4967.64	0	00:55	2.64
1103	840	JUNCTION	0.00	0.00	4990.00	0	00:00	0.00
1104	841	JUNCTION	0.20	2.64	4969.64	0	00:55	2.64
1105	842	JUNCTION	0.00	0.00	5000.00	0	00:00	0.00
1106	843	JUNCTION	0.28	4.26	4963.26	0	00:54	4.26
1107	844	JUNCTION	0.00	0.00	4995.00	0	00:00	0.00
1108	850	JUNCTION	0.06	1.19	4991.19	0	00:50	1.19
1109	910	JUNCTION	0.00	0.00	4916.00	0	00:00	0.00
1110	911	JUNCTION	0.23	2.52	4915.52	0	01:02	2.52
1111	912	JUNCTION	0.23	2.52	4922.52	0	01:01	2.52
1112	929	JUNCTION	0.21	2.28	4924.28	0	01:03	2.28
1113	930	JUNCTION	0.00	0.00	4927.00	0	00:00	0.00
1114	931	JUNCTION	0.19	2.30	4956.30	0	00:50	2.30
1115	940	JUNCTION	0.00	0.00	4986.00	0	00:00	0.00
1116	950	JUNCTION	0.00	0.00	4977.00	0	00:00	0.00
1117	960	JUNCTION	0.00	0.00	4970.00	0	00:00	0.00
1118	O_1107	JUNCTION	0.40	5.54	4783.54	0	01:08	5.53
1119	O_1263	JUNCTION	0.00	0.00	4812.00	0	00:00	0.00
1120	O_1307	JUNCTION	0.23	3.48	4868.48	0	01:07	3.47
1121	O_220	JUNCTION	0.24	3.39	4775.39	0	01:06	3.39
1122	O_300	JUNCTION	0.03	0.63	4778.63	0	00:48	0.62

O_500	JUNCTION	0.06	0.86	4826.86	0	01:03	0.86	
O_600	JUNCTION	0.05	0.78	4815.78	0	01:04	0.78	
O_708	JUNCTION	0.04	0.66	4828.66	0	00:51	0.66	
O_803	JUNCTION	0.18	2.78	4867.78	0	01:03	2.78	
O_909	JUNCTION	0.09	1.19	4866.19	0	01:11	1.19	
1323	JUNCTION	0.08	1.27	4967.27	0	00:45	1.27	
CulvertOut_1233	JUNCTION	0.15	2.92	4916.92	0	00:46	2.91	
O_100	OUTFALL	0.00	0.00	4778.00	0	00:00	0.00	
O_1000	OUTFALL	0.00	0.00	4756.00	0	00:00	0.00	
836	DIVIDER	0.29	4.00	4949.00	0	00:36	4.00	

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Node Inflow Summary
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Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
1002	JUNCTION	0.00	9020.19	0 01:22	0	351	0.000
1004	JUNCTION	0.00	8976.45	0 01:19	0	348	0.000
1006_RR	JUNCTION	0.00	7698.12	0 01:20	0	295	0.000
1008	JUNCTION	0.00	7698.91	0 01:19	0	295	0.000
1010	JUNCTION	0.00	7678.06	0 01:19	0	294	0.000
1012	JUNCTION	0.00	7510.40	0 01:17	0	286	-0.000
1014	JUNCTION	0.00	6560.23	0 01:17	0	252	0.000
1016	JUNCTION	0.00	6546.21	0 01:16	0	252	0.000
1018	JUNCTION	0.00	6532.28	0 01:15	0	251	0.000
1020	JUNCTION	0.00	6519.13	0 01:15	0	250	0.000
1022	JUNCTION	0.00	6476.98	0 01:14	0	248	0.000
1024	JUNCTION	0.00	6476.10	0 01:13	0	248	0.000
1026	JUNCTION	0.00	6433.87	0 01:13	0	246	0.000
1028	JUNCTION	0.00	6390.97	0 01:12	0	245	0.000
1030	JUNCTION	0.00	6035.26	0 01:12	0	230	0.000
1032	JUNCTION	21.52	21.52	0 00:35	0.423	0.423	0.000
1034	JUNCTION	0.00	4211.70	0 01:11	0	158	0.000
1036	JUNCTION	0.00	4211.97	0 01:10	0	158	0.000
1038	JUNCTION	0.00	4176.95	0 01:09	0	156	0.000
1040	JUNCTION	0.00	4166.93	0 01:08	0	156	0.000
1042	JUNCTION	0.00	4025.40	0 01:08	0	150	0.000
1044	JUNCTION	0.00	3993.72	0 01:07	0	149	0.000
1046	JUNCTION	0.00	3911.76	0 01:07	0	145	0.000
1048	JUNCTION	0.00	3911.94	0 01:06	0	145	0.000
1050	JUNCTION	0.00	1558.47	0 01:05	0	57.9	0.000
109	JUNCTION	0.00	1048.76	0 01:04	0	39.1	0.000
110	JUNCTION	72.60	72.60	0 01:05	3.55	3.55	0.000
1108	JUNCTION	4.69	4.69	0 00:40	0.106	0.106	0.000
1110	JUNCTION	15.09	15.09	0 00:45	0.491	0.491	0.000
1115	JUNCTION	0.00	1028.55	0 01:08	0	33.8	0.000
1116	JUNCTION	91.01	91.01	0 00:45	2.62	2.62	0.000
1123	JUNCTION	0.00	952.31	0 01:05	0	30.6	0.000
1124	JUNCTION	32.28	32.28	0 00:45	0.995	0.995	0.000
1125	JUNCTION	0.00	91.33	0 00:35	0	1.35	0.000
1126	JUNCTION	91.33	91.33	0 00:35	1.35	1.35	0.000
1127	JUNCTION	0.00	927.22	0 01:04	0	29.6	0.000
113	JUNCTION	0.00	976.17	0 01:03	0	35.5	0.000
1130	JUNCTION	0.00	893.40	0 01:02	0	28.2	0.000
1132	JUNCTION	26.13	26.13	0 00:40	0.611	0.611	0.000
1139	JUNCTION	0.00	876.00	0 01:03	0	27.6	0.000
114	JUNCTION	157.30	157.30	0 00:50	5.4	5.4	0.000
1140	JUNCTION	124.04	124.04	0 00:45	3.05	3.05	0.000
1141	JUNCTION	0.00	817.06	0 00:55	0	24.4	0.000
1142	JUNCTION	34.70	34.70	0 00:40	0.884	0.884	0.000

1189	1144	JUNCTION	121.67	121.67	0	00:40	2.76	2.76	0.000
1190	1147	JUNCTION	0.00	790.43	0	00:53	0	23.5	0.000
1191	1148	JUNCTION	102.56	102.56	0	00:50	3.57	3.57	0.000
1192	115	JUNCTION	0.00	845.69	0	00:56	0	29.8	0.000
1193	1150	JUNCTION	44.33	44.33	0	00:55	2.02	2.02	0.000
1194	1151	JUNCTION	0.00	416.23	0	00:44	0	11.1	-0.000
1195	1152	JUNCTION	35.04	35.04	0	00:45	1.08	1.08	0.000
1196	1153	JUNCTION	0.00	381.41	0	00:44	0	10	0.000
1197	1154	JUNCTION	66.08	66.08	0	00:50	2.66	2.66	0.000
1198	1155	JUNCTION	0.00	660.25	0	00:47	0	17.8	0.000
1199	1156	JUNCTION	141.07	141.07	0	00:40	3.88	3.88	0.000
1200	1163	JUNCTION	0.00	325.33	0	00:40	0	7.33	0.000
1201	1164	JUNCTION	325.33	325.33	0	00:40	7.33	7.33	0.000
1202	117	JUNCTION	0.00	526.85	0	00:58	0	18.9	0.000
1203	1170	JUNCTION	0.00	141.07	0	00:40	0	3.88	0.000
1204	1172	JUNCTION	27.71	27.71	0	00:50	1.22	1.22	0.000
1205	118	JUNCTION	53.02	53.02	0	00:50	1.8	1.8	0.000
1206	1180	JUNCTION	25.37	25.37	0	00:40	0.697	0.697	0.000
1207	119	JUNCTION	0.00	476.64	0	00:56	0	17.1	0.000
1208	1208	JUNCTION	64.99	64.99	0	00:45	1.85	1.85	0.000
1209	1209	JUNCTION	0.00	62.08	0	00:50	0	2.25	0.000
1210	121	JUNCTION	0.00	168.18	0	01:00	0	7.2	0.000
1211	1210	JUNCTION	62.08	62.08	0	00:50	2.25	2.25	0.000
1212	1215	JUNCTION	0.00	1308.95	0	01:17	0	51.3	0.000
1213	1216	JUNCTION	92.28	92.28	0	01:10	5.1	5.1	0.000
1214	1217	JUNCTION	0.00	1313.83	0	01:12	0	51.2	0.000
1215	122	JUNCTION	142.53	142.53	0	01:00	6.11	6.11	0.000
1216	1223	JUNCTION	0.00	1173.06	0	01:06	0	43.8	0.000
1217	1224	JUNCTION	89.48	89.48	0	00:55	3.7	3.7	0.000
1218	1226	JUNCTION	43.70	43.70	0	01:00	2.08	2.08	0.000
1219	1228	JUNCTION	34.80	34.80	0	00:55	1.56	1.56	0.000
1220	1230	JUNCTION	43.71	43.71	0	00:45	1.38	1.38	0.000
1221	1231	JUNCTION	0.00	1062.84	0	00:48	0	34	0.000
1222	1232	JUNCTION	372.78	372.78	0	00:35	7.38	7.38	0.000
1223	1233	JUNCTION	0.00	499.01	0	00:46	0	14.5	0.000
1224	1233_Lake	JUNCTION	0.00	498.88	0	00:47	0	14.5	0.000
1225	1234	JUNCTION	132.74	132.74	0	00:35	2.94	2.94	0.000
1226	1235	JUNCTION	0.00	150.88	0	00:45	0	4.62	0.000
1227	1236	JUNCTION	150.88	150.88	0	00:45	4.62	4.62	0.000
1228	1237	JUNCTION	0.00	169.91	0	00:45	0	4.99	0.000
1229	1238	JUNCTION	169.91	169.91	0	00:45	4.99	4.99	0.000
1230	1239	JUNCTION	0.00	315.61	0	01:03	0	12.1	0.000
1231	1239_Lake	JUNCTION	0.00	315.58	0	01:04	0	12.1	0.000
1232	1240	JUNCTION	39.68	39.68	0	00:45	1.17	1.17	0.000
1233	1247	JUNCTION	0.00	230.22	0	00:45	0	6.89	0.000
1234	1248	JUNCTION	60.65	60.65	0	00:45	1.9	1.9	0.000
1235	1249	JUNCTION	0.00	169.71	0	00:46	0	4.99	0.000
1236	1255	JUNCTION	0.00	261.00	0	00:58	0	10	0.000
1237	1256	JUNCTION	125.58	125.58	0	00:40	3.58	3.58	0.000
1238	1257	JUNCTION	0.00	158.37	0	00:58	0	6.4	0.000
1239	1258	JUNCTION	89.11	89.11	0	00:45	3.01	3.01	0.000
1240	1259	JUNCTION	0.00	77.64	0	00:55	0	3.36	0.000
1241	126	JUNCTION	31.01	31.01	0	00:45	1.02	1.02	0.000
1242	1260	JUNCTION	77.64	77.64	0	00:55	3.36	3.36	0.000
1243	1264	JUNCTION	43.81	43.81	0	00:50	1.44	1.44	0.000
1244	1272	JUNCTION	13.50	13.50	0	00:50	0.515	0.515	0.000
1245	1273	JUNCTION	0.00	282.57	0	01:00	0	11	0.000
1246	1274	JUNCTION	22.38	22.38	0	00:50	0.954	0.954	0.000
1247	129	JUNCTION	0.00	311.41	0	00:55	0	9.89	0.000
1248	130	JUNCTION	62.66	62.66	0	00:50	2.38	2.38	0.000
1249	1308	JUNCTION	63.45	63.45	0	00:55	2.64	2.64	0.000
1250	1310	JUNCTION	43.18	43.18	0	00:50	1.7	1.7	0.000
1251	1315	JUNCTION	0.00	2302.15	0	01:04	0	84.4	0.000
1252	1316	JUNCTION	133.46	1659.13	0	01:01	4.74	59.7	0.000
1253	1318	JUNCTION	38.25	38.25	0	00:50	1.52	1.52	0.000
1254	1319	JUNCTION	0.00	121.76	0	00:40	0	2.57	0.000

1255	1320	JUNCTION	121.76	121.76	0	00:40	2.57	2.57	0.000
1256	1321	JUNCTION	0.00	106.13	0	00:50	0	3.6	-0.000
1257	1322	JUNCTION	106.13	106.13	0	00:50	3.6	3.6	0.000
1258	1341	JUNCTION	0.00	76.20	0	00:51	0	2.39	0.000
1259	1324	JUNCTION	76.35	76.35	0	00:45	2.39	2.39	0.000
1260	1327	JUNCTION	0.00	7.46	0	01:05	0	0.431	0.000
1261	1328	JUNCTION	7.46	7.46	0	01:05	0.431	0.431	0.000
1262	133	JUNCTION	0.00	254.86	0	00:48	0	7.44	0.000
1263	134	JUNCTION	83.61	83.61	0	00:45	2.77	2.77	0.000
1264	1340	JUNCTION	280.17	1339.48	0	00:58	7.14	48.7	0.000
1265	1347	JUNCTION	0.00	268.68	0	00:53	0	9.57	0.000
1266	1348	JUNCTION	105.35	105.35	0	00:50	3.55	3.55	0.000
1267	1349	JUNCTION	50.65	746.55	0	01:02	1.75	27.6	0.000
1268	1351	JUNCTION	0.00	295.90	0	00:57	0	10.9	0.000
1269	1352	JUNCTION	148.16	148.16	0	00:55	5.82	5.82	0.000
1270	1353	JUNCTION	0.00	150.07	0	00:54	0	5.09	0.000
1271	1354	JUNCTION	90.28	90.28	0	00:50	3.23	3.23	0.000
1272	1355	JUNCTION	0.00	404.57	0	00:58	0	14.5	0.000
1273	1356	JUNCTION	138.07	138.07	0	00:50	4.82	4.82	0.000
1274	1357	JUNCTION	0.00	274.40	0	00:55	0	9.63	0.000
1275	1358	JUNCTION	135.83	135.83	0	00:55	5.47	5.47	0.000
1276	1361	JUNCTION	0.00	162.32	0	00:38	0	4.01	0.000
1277	1362	JUNCTION	18.07	18.07	0	01:05	0.969	0.969	0.000
1278	1363	JUNCTION	0.00	151.18	0	00:35	0	3.03	0.000
1279	1364	JUNCTION	151.18	151.18	0	00:35	3.03	3.03	0.000
1280	1367	JUNCTION	0.00	66.85	0	00:40	0	1.82	0.000
1281	1368	JUNCTION	66.85	66.85	0	00:40	1.82	1.82	0.000
1282	1371	JUNCTION	0.00	166.98	0	00:50	0	6.01	0.000
1283	1372	JUNCTION	166.98	166.98	0	00:50	6.01	6.01	0.000
1284	138	JUNCTION	177.32	177.32	0	00:40	4.63	4.63	0.000
1285	1382	JUNCTION	82.60	82.60	0	01:05	4.14	4.14	0.000
1286	1386	JUNCTION	39.20	39.20	0	01:00	1.93	1.93	0.000
1287	1387	JUNCTION	0.00	204.06	0	00:45	0	5.83	0.000
1288	1388	JUNCTION	204.06	204.06	0	00:45	5.83	5.83	0.000
1289	139	JUNCTION	0.00	326.34	0	00:51	0	10.9	0.000
1290	1392	JUNCTION	118.12	118.12	0	00:50	3.78	3.78	0.000
1291	1393	JUNCTION	0.00	125.71	0	00:55	0	5.05	0.000
1292	1394	JUNCTION	125.71	125.71	0	00:55	5.05	5.05	0.000
1293	1395	JUNCTION	0.00	165.72	0	00:55	0	6.63	0.000
1294	1396	JUNCTION	93.51	93.51	0	00:55	3.85	3.85	0.000
1295	1398	JUNCTION	73.71	73.71	0	00:50	2.78	2.78	0.000
1296	141	JUNCTION	0.00	303.25	0	00:50	0	9.9	0.000
1297	142	JUNCTION	23.12	23.12	0	00:50	1.01	1.01	0.000
1298	146	JUNCTION	37.96	37.96	0	01:05	2	2	0.000
1299	149	JUNCTION	0.00	268.59	0	00:46	0	7.89	0.000
1300	150	JUNCTION	89.67	89.67	0	00:50	3	3	0.000
1301	154	JUNCTION	180.83	180.83	0	00:40	4.87	4.87	0.000
1302	210	JUNCTION	90.08	90.08	0	00:45	2.43	2.43	0.000
1303	220	JUNCTION	134.29	134.29	0	00:50	4.78	4.78	0.000
1304	221	JUNCTION	0.00	1282.21	0	01:02	0	48.3	0.000
1305	223	JUNCTION	0.00	302.42	0	00:50	0	9.98	0.000
1306	224	JUNCTION	101.78	101.78	0	00:45	3.14	3.14	0.000
1307	225	JUNCTION	0.00	202.47	0	00:48	0	6.82	0.000
1308	226	JUNCTION	124.28	124.28	0	00:45	3.58	3.58	0.000
1309	228	JUNCTION	84.23	84.23	0	00:55	3.24	3.24	0.000
1310	231	JUNCTION	0.00	1001.53	0	01:03	0	38.3	0.000
1311	232	JUNCTION	138.01	138.01	0	00:55	5.21	5.21	0.000
1312	235	JUNCTION	0.00	877.25	0	00:58	0	32.9	0.000
1313	236	JUNCTION	75.10	75.10	0	00:55	2.94	2.94	0.000
1314	237	JUNCTION	0.00	803.17	0	00:58	0	30	0.000
1315	239	JUNCTION	0.00	772.44	0	00:58	0	28.9	0.000
1316	240	JUNCTION	33.30	33.30	0	00:45	1.04	1.04	0.000
1317	241	JUNCTION	0.00	676.59	0	00:56	0	24.7	0.000
1318	243	JUNCTION	0.00	414.38	0	00:56	0	14.7	0.000
1319	244	JUNCTION	116.13	116.13	0	00:55	4.53	4.53	0.000
1320	245	JUNCTION	0.00	301.70	0	00:51	0	10.1	0.000

1321	247	JUNCTION	0.00	231.90	0	00:50	0	6.99	0.000
1322	248	JUNCTION	152.34	152.34	0	00:50	4.8	4.8	0.000
1323	250	JUNCTION	86.52	86.52	0	00:40	2.13	2.13	0.000
1324	252	JUNCTION	71.49	71.49	0	00:55	3.15	3.15	0.000
1325	256	JUNCTION	96.68	96.68	0	01:00	4.16	4.16	0.000
1326	259	JUNCTION	0.00	262.56	0	00:54	0	10	0.000
1327	260	JUNCTION	95.28	95.28	0	00:50	3.17	3.17	0.000
1328	263	JUNCTION	0.00	171.26	0	00:52	0	6.83	0.000
1329	264	JUNCTION	90.05	90.05	0	00:50	3.68	3.68	0.000
1330	268	JUNCTION	81.63	81.63	0	00:50	3.15	3.15	0.000
1331	310	JUNCTION	110.61	110.61	0	00:50	3.8	3.8	0.000
1332	314	JUNCTION	154.92	154.92	0	00:40	3.78	3.78	0.000
1333	410	JUNCTION	19.09	19.09	0	00:45	0.65	0.65	0.000
1334	414	JUNCTION	19.85	19.85	0	00:45	0.579	0.579	0.000
1335	418	JUNCTION	53.63	53.63	0	00:50	1.96	1.96	0.000
1336	422	JUNCTION	2.88	2.88	0	00:40	0.0777	0.0777	0.000
1337	426	JUNCTION	52.54	52.54	0	00:50	1.97	1.97	0.000
1338	510	JUNCTION	174.30	174.30	0	00:50	6.53	6.53	0.000
1339	513	JUNCTION	0.00	214.39	0	00:55	0	8.31	0.000
1340	514	JUNCTION	101.25	101.25	0	01:00	4.35	4.35	0.000
1341	518	JUNCTION	116.79	116.79	0	00:50	3.96	3.96	0.000
1342	610	JUNCTION	134.55	134.55	0	00:55	5.28	5.28	0.000
1343	613	JUNCTION	0.00	403.70	0	00:54	0	13.3	0.000
1344	614	JUNCTION	182.18	182.18	0	00:45	5.38	5.38	0.000
1345	617	JUNCTION	0.00	237.48	0	00:52	0	7.88	-0.000
1346	618	JUNCTION	94.68	94.68	0	00:45	2.73	2.73	0.000
1347	620	JUNCTION	37.14	37.14	0	01:00	1.89	1.89	0.000
1348	622	JUNCTION	149.22	149.22	0	00:50	5.13	5.13	0.000
1349	708	JUNCTION	0.00	159.55	0	00:51	0	5.15	0.000
1350	709	JUNCTION	0.00	159.63	0	00:50	0	5.14	0.000
1351	710	JUNCTION	0.00	159.65	0	00:49	0	5.14	0.000
1352	711	JUNCTION	0.00	159.87	0	00:48	0	5.13	-0.000
1353	712	JUNCTION	160.60	160.60	0	00:45	5.13	5.13	0.000
1354	713	JUNCTION	0.00	160.08	0	00:46	0	5.13	0.000
1355	714	JUNCTION	49.78	49.78	0	00:40	1.13	1.13	0.000
1356	804	JUNCTION	25.41	25.41	0	00:40	0.601	0.601	0.000
1357	808	JUNCTION	0.00	1024.14	0	01:00	0	35.8	0.000
1358	809	JUNCTION	0.00	1024.14	0	01:00	0	35.8	0.000
1359	810	JUNCTION	101.00	101.00	0	00:50	3.69	3.69	0.000
1360	811	JUNCTION	0.00	927.66	0	01:00	0	32.1	0.000
1361	819	JUNCTION	0.00	929.04	0	00:58	0	32	0.000
1362	820	JUNCTION	292.36	292.36	0	00:35	5.29	5.29	0.000
1363	822	JUNCTION	0.00	65.62	0	01:01	0	2.36	0.000
1364	823	JUNCTION	0.00	710.94	0	00:57	0	24.3	0.000
1365	824	JUNCTION	70.15	70.15	0	00:45	2.29	2.29	0.000
1366	829	JUNCTION	0.00	710.98	0	00:57	0	24.3	0.000
1367	830	JUNCTION	258.62	258.62	0	00:35	4.54	4.54	0.000
1368	831	JUNCTION	0.00	575.62	0	01:00	0	19.8	0.000
1369	834	JUNCTION	0.00	577.37	0	00:56	0	19.7	0.000
1370	838	JUNCTION	0.00	577.56	0	00:55	0	19.7	0.000
1371	839	JUNCTION	0.00	372.05	0	00:55	0	13.3	0.000
1372	840	JUNCTION	82.38	82.38	0	00:50	3.26	3.26	0.000
1373	841	JUNCTION	0.00	290.04	0	00:55	0	9.99	0.000
1374	842	JUNCTION	151.52	151.52	0	00:50	5.49	5.49	0.000
1375	843	JUNCTION	0.00	577.57	0	00:54	0	19.7	0.000
1376	844	JUNCTION	221.05	221.05	0	00:45	6.44	6.44	0.000
1377	850	JUNCTION	141.80	141.80	0	00:50	4.46	4.46	0.000
1378	910	JUNCTION	107.08	107.08	0	00:55	4.16	4.16	0.000
1379	911	JUNCTION	0.00	433.70	0	01:02	0	17.2	0.000
1380	912	JUNCTION	0.00	433.81	0	01:01	0	17.2	0.000
1381	929	JUNCTION	0.00	433.81	0	01:01	0	17.2	0.000
1382	930	JUNCTION	130.52	130.52	0	00:55	4.98	4.98	0.000
1383	931	JUNCTION	0.00	315.29	0	00:50	0	12.1	0.000
1384	940	JUNCTION	118.80	118.80	0	00:55	4.49	4.49	0.000
1385	950	JUNCTION	126.20	126.20	0	01:00	5.48	5.48	0.000
1386	960	JUNCTION	83.71	83.71	0	00:40	2.1	2.1	0.000

O_1107	JUNCTION	0.00	1031.12	0	01:08	0	33.9	0.000
O_1263	JUNCTION	0.00	1340.38	0	01:16	0	52.7	0.000
O_1307	JUNCTION	0.00	2356.18	0	01:07	0	87.2	0.000
O_220	JUNCTION	0.00	1401.32	0	01:06	0	53.2	0.000
O_300	JUNCTION	0.00	258.40	0	00:50	0	7.63	0.000
O_500	JUNCTION	0.00	378.11	0	00:59	0	15	0.000
O_600	JUNCTION	0.00	520.53	0	01:03	0	18.8	0.000
O_708	JUNCTION	0.00	159.54	0	00:51	0	5.15	0.000
O_803	JUNCTION	0.00	1039.12	0	01:03	0	36.4	0.000
O_909	JUNCTION	0.00	527.11	0	01:09	0	21.5	0.000
1323	JUNCTION	0.00	76.35	0	00:45	0	2.39	-0.000
CulvertOut_1233	JUNCTION	0.00	499.01	0	00:46	0	14.5	0.000
O_100	OUTFALL	0.00	1048.76	0	01:04	0	39.1	0.000
O_1000	OUTFALL	0.00	9020.19	0	01:22	0	351	0.000
836	DIVIDER	0.00	577.47	0	00:56	0	19.7	0.000

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Node Flooding Summary
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No nodes were flooded.

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Outfall Loading Summary
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Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
O_100	56.15	86.19	1048.76	39.093
O_1000	99.70	436.23	9020.19	351.358
System	77.93	522.42	9938.30	390.452

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Link Flow Summary
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Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days	hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
Dummy_1032	DUMMY	21.52	0	00:35			
Dummy_1050	DUMMY	1558.47	0	01:05			
Dummy_109	DUMMY	1048.76	0	01:04			
Dummy_110	DUMMY	72.60	0	01:05			
Dummy_1107	DUMMY	1031.12	0	01:08			
Dummy_1108	DUMMY	4.69	0	00:40			
Dummy_1110	DUMMY	15.09	0	00:45			
Dummy_1116	DUMMY	91.01	0	00:45			
Dummy_1124	DUMMY	32.28	0	00:45			
Dummy_1126	DUMMY	91.33	0	00:35			
Dummy_1132	DUMMY	26.13	0	00:40			
Dummy_1139	DUMMY	876.00	0	01:03			
Dummy_114	DUMMY	157.30	0	00:50			
Dummy_1140	DUMMY	124.04	0	00:45			
Dummy_1142	DUMMY	34.70	0	00:40			
Dummy_1144	DUMMY	121.67	0	00:40			
Dummy_1148	DUMMY	102.56	0	00:50			
Dummy_1150	DUMMY	44.33	0	00:55			

1453	Dummy_1152	DUMMY	35.04	0	00:45
1454	Dummy_1153	DUMMY	381.41	0	00:44
1455	Dummy_1154	DUMMY	66.08	0	00:50
1456	Dummy_1156	DUMMY	141.07	0	00:40
1457	Dummy_1164	DUMMY	325.33	0	00:40
1458	Dummy_1172	DUMMY	27.71	0	00:50
1459	Dummy_118	DUMMY	53.02	0	00:50
1460	Dummy_1180	DUMMY	25.37	0	00:40
1461	Dummy_1208	DUMMY	64.99	0	00:45
1462	Dummy_121	DUMMY	168.18	0	01:00
1463	Dummy_1210	DUMMY	62.08	0	00:50
1464	Dummy_1216	DUMMY	92.28	0	01:10
1465	Dummy_122	DUMMY	142.53	0	01:00
1466	Dummy_1224	DUMMY	89.48	0	00:55
1467	Dummy_1226	DUMMY	43.70	0	01:00
1468	Dummy_1228	DUMMY	34.80	0	00:55
1469	Dummy_1230	DUMMY	43.71	0	00:45
1470	Dummy_1232	DUMMY	372.78	0	00:35
1471	Dummy_1233_Lake	DUMMY	498.88	0	00:47
1472	Dummy_1234	DUMMY	132.74	0	00:35
1473	Dummy_1236	DUMMY	150.88	0	00:45
1474	Dummy_1238	DUMMY	169.91	0	00:45
1475	Dummy_1239	DUMMY	315.58	0	01:04
1476	Dummy_1240	DUMMY	39.68	0	00:45
1477	Dummy_1248	DUMMY	60.65	0	00:45
1478	Dummy_1249	DUMMY	169.71	0	00:46
1479	Dummy_1256	DUMMY	125.58	0	00:40
1480	Dummy_1258	DUMMY	89.11	0	00:45
1481	Dummy_1260	DUMMY	77.64	0	00:55
1482	Dummy_1263	DUMMY	1340.38	0	01:16
1483	Dummy_1264	DUMMY	43.81	0	00:50
1484	Dummy_1272	DUMMY	13.50	0	00:50
1485	Dummy_1274	DUMMY	22.38	0	00:50
1486	Dummy_129	DUMMY	311.41	0	00:55
1487	Dummy_130	DUMMY	62.66	0	00:50
1488	Dummy_1307	DUMMY	2356.18	0	01:07
1489	Dummy_1308	DUMMY	63.45	0	00:55
1490	Dummy_1310	DUMMY	43.18	0	00:50
1491	Dummy_1318	DUMMY	38.25	0	00:50
1492	Dummy_1320	DUMMY	121.76	0	00:40
1493	Dummy_1322	DUMMY	106.13	0	00:50
1494	Dummy_1341	DUMMY	76.20	0	00:51
1495	Dummy_1328	DUMMY	7.46	0	01:05
1496	Dummy_1337	DUMMY	268.68	0	00:53
1497	Dummy_134	DUMMY	83.61	0	00:45
1498	Dummy_1348	DUMMY	105.35	0	00:50
1499	Dummy_1349	DUMMY	746.55	0	01:02
1500	Dummy_1352	DUMMY	148.16	0	00:55
1501	Dummy_1354	DUMMY	90.28	0	00:50
1502	Dummy_1356	DUMMY	138.07	0	00:50
1503	Dummy_1358	DUMMY	135.83	0	00:55
1504	Dummy_1362	DUMMY	18.07	0	01:05
1505	Dummy_1364	DUMMY	151.18	0	00:35
1506	Dummy_1368	DUMMY	66.85	0	00:40
1507	Dummy_1372	DUMMY	166.98	0	00:50
1508	Dummy_1382	DUMMY	82.60	0	01:05
1509	Dummy_1386	DUMMY	39.20	0	01:00
1510	Dummy_1388	DUMMY	204.06	0	00:45
1511	Dummy_1392	DUMMY	118.12	0	00:50
1512	Dummy_1394	DUMMY	125.71	0	00:55
1513	Dummy_1396	DUMMY	93.51	0	00:55
1514	Dummy_1398	DUMMY	73.71	0	00:50
1515	Dummy_142	DUMMY	23.12	0	00:50
1516	Dummy_150	DUMMY	89.67	0	00:50
1517	Dummy_210	DUMMY	90.08	0	00:45
1518	Dummy_219	DUMMY	1401.32	0	01:06

1519	Dummy_220	DUMMY	134.29	0	00:50			
1520	Dummy_223	DUMMY	302.42	0	00:50			
1521	Dummy_224	DUMMY	101.78	0	00:45			
1522	Dummy_226	DUMMY	124.28	0	00:45			
1523	Dummy_231	DUMMY	1001.53	0	01:03			
1524	Dummy_232	DUMMY	138.01	0	00:55			
1525	Dummy_236	DUMMY	75.10	0	00:55			
1526	Dummy_237	DUMMY	803.17	0	00:58			
1527	Dummy_240	DUMMY	33.30	0	00:45			
1528	Dummy_243	DUMMY	414.38	0	00:56			
1529	Dummy_244	DUMMY	116.13	0	00:55			
1530	Dummy_247	DUMMY	231.90	0	00:50			
1531	Dummy_248	DUMMY	152.34	0	00:50			
1532	Dummy_252	DUMMY	71.49	0	00:55			
1533	Dummy_256	DUMMY	96.68	0	01:00			
1534	Dummy_259	DUMMY	262.56	0	00:54			
1535	Dummy_260	DUMMY	95.28	0	00:50			
1536	Dummy_264	DUMMY	90.05	0	00:50			
1537	Dummy_300	DUMMY	258.40	0	00:50			
1538	Dummy_310	DUMMY	110.61	0	00:50			
1539	Dummy_410	DUMMY	19.09	0	00:45			
1540	Dummy_414	DUMMY	19.85	0	00:45			
1541	Dummy_418	DUMMY	53.63	0	00:50			
1542	Dummy_422	DUMMY	2.88	0	00:40			
1543	Dummy_426	DUMMY	52.54	0	00:50			
1544	Dummy_500	DUMMY	378.11	0	00:59			
1545	Dummy_510	DUMMY	174.30	0	00:50			
1546	Dummy_514	DUMMY	101.25	0	01:00			
1547	Dummy_518	DUMMY	116.79	0	00:50			
1548	Dummy_600	DUMMY	520.53	0	01:03			
1549	Dummy_610	DUMMY	134.55	0	00:55			
1550	Dummy_614	DUMMY	182.18	0	00:45			
1551	Dummy_618	DUMMY	94.68	0	00:45			
1552	Dummy_620	DUMMY	37.14	0	01:00			
1553	Dummy_708	DUMMY	159.54	0	00:51			
1554	Dummy_714	DUMMY	49.78	0	00:40			
1555	Dummy_803	DUMMY	1039.12	0	01:03			
1556	Dummy_804	DUMMY	25.41	0	00:40			
1557	Dummy_810	DUMMY	101.00	0	00:50			
1558	Dummy_820	DUMMY	292.36	0	00:35			
1559	Dummy_830	DUMMY	258.62	0	00:35			
1560	Dummy_840	DUMMY	82.38	0	00:50			
1561	Dummy_842	DUMMY	151.52	0	00:50			
1562	Dummy_844	DUMMY	221.05	0	00:45			
1563	Dummy_909	DUMMY	527.11	0	01:09			
1564	Dummy_910	DUMMY	107.08	0	00:55			
1565	Dummy_929	DUMMY	433.81	0	01:01			
1566	Dummy_930	DUMMY	130.52	0	00:55			
1567	Dummy_940	DUMMY	118.80	0	00:55			
1568	Dummy_950	DUMMY	126.20	0	01:00			
1569	Dummy_960	DUMMY	83.71	0	00:40			
1570	Dummy_1002	DUMMY	9020.19	0	01:22			
1571	L_1004	CONDUIT	8966.49	0	01:22	7.93	0.49	0.67
1572	L_1006	CONDUIT	7697.44	0	01:21	10.18	0.15	0.40
1573	L_1008	CONDUIT	7698.12	0	01:20	8.77	0.41	0.67
1574	L_1010	CONDUIT	7677.37	0	01:19	7.60	0.50	0.73
1575	L_1012	CONDUIT	7503.66	0	01:19	5.38	0.30	0.59
1576	L_1014	CONDUIT	6557.41	0	01:18	4.31	0.25	0.50
1577	L_1016	CONDUIT	6545.92	0	01:17	7.94	0.24	0.47
1578	L_1018	CONDUIT	6531.59	0	01:16	6.67	0.35	0.58
1579	L_1020	CONDUIT	6518.70	0	01:16	8.98	0.23	0.46
1580	L_1022	CONDUIT	6475.49	0	01:15	8.64	0.34	0.58
1581	L_1024	CONDUIT	6475.33	0	01:14	7.66	0.26	0.50
1582	L_1026	CONDUIT	6433.79	0	01:13	8.49	0.23	0.46
1583	L_1028	CONDUIT	6389.30	0	01:13	10.63	0.30	0.50
1584	L_1030	CONDUIT	6034.98	0	01:12	12.38	0.22	0.42

1585	L_1034	CONDUIT	4211.26	0	01:11	8.00	0.32	0.52
1586	L_1036	CONDUIT	4211.70	0	01:11	9.02	0.27	0.47
1587	L_1038	CONDUIT	4176.17	0	01:10	7.07	0.26	0.52
1588	L_1040	CONDUIT	4165.95	0	01:09	8.48	0.19	0.46
1589	L_1042	CONDUIT	4025.00	0	01:08	10.53	0.15	0.42
1590	L_1044	CONDUIT	3993.40	0	01:08	9.44	0.17	0.45
1591	L_1046	CONDUIT	3911.51	0	01:07	11.15	0.07	0.31
1592	L_1048	CONDUIT	3911.76	0	01:07	9.46	0.09	0.35
1593	L_1115	CONDUIT	1028.43	0	01:08	10.15	0.30	0.55
1594	L_1123	CONDUIT	947.80	0	01:08	5.99	0.06	0.20
1595	L_1125	CONDUIT	91.35	0	00:35	7.74	0.01	0.07
1596	L_1127	CONDUIT	925.89	0	01:05	5.31	0.06	0.18
1597	L_1130	CONDUIT	892.50	0	01:04	4.46	0.07	0.21
1598	L_114	CONDUIT	976.17	0	01:04	10.46	0.04	0.31
1599	L_1141	CONDUIT	785.92	0	01:03	3.14	0.02	0.12
1600	L_1147	CONDUIT	789.38	0	00:55	6.90	0.08	0.29
1601	L_115	CONDUIT	829.83	0	01:04	5.30	0.03	0.15
1602	L_1151	CONDUIT	410.06	0	00:49	7.10	0.07	0.30
1603	L_1156	CONDUIT	646.38	0	00:54	2.23	0.02	0.09
1604	L_1163	CONDUIT	319.82	0	00:43	3.57	0.03	0.12
1605	L_117	CONDUIT	526.84	0	00:58	9.07	0.11	0.34
1606	L_1170	CONDUIT	140.69	0	00:46	2.27	0.00	0.02
1607	L_119	CONDUIT	476.35	0	00:58	8.74	0.10	0.33
1608	L_1209	CONDUIT	61.08	0	00:59	1.86	0.01	0.15
1609	Dummy_1215	DUMMY	1308.95	0	01:17			
1610	L_1217	CONDUIT	1308.95	0	01:17	4.79	0.45	0.68
1611	L_1223	CONDUIT	1167.53	0	01:12	3.83	0.12	0.45
1612	L_1231	CONDUIT	975.30	0	01:08	4.40	0.09	0.40
1613	L_1233	CONDUIT	498.88	0	00:47	5.40	0.08	0.29
1614	L_1235	CONDUIT	150.18	0	00:47	6.03	0.02	0.20
1615	L_1237	CONDUIT	169.71	0	00:46	11.87	0.17	0.24
1616	L_1239	CONDUIT	315.58	0	01:04	8.42	0.04	0.31
1617	L_1247	CONDUIT	228.89	0	00:48	5.98	0.04	0.25
1618	L_1255	CONDUIT	260.82	0	01:00	4.05	0.09	0.40
1619	L_1257	CONDUIT	157.36	0	01:06	3.26	0.12	0.40
1620	L_1259	CONDUIT	76.24	0	01:06	3.58	0.00	0.05
1621	L_126	CONDUIT	27.69	0	01:10	3.37	0.00	0.03
1622	L_1273	CONDUIT	282.03	0	01:04	2.85	0.16	0.50
1623	L_1315	CONDUIT	2296.41	0	01:07	6.60	0.16	0.35
1624	L_1316	CONDUIT	1656.02	0	01:05	4.75	0.14	0.48
1625	L_1319	CONDUIT	115.37	0	00:48	3.39	0.01	0.15
1626	L_1321	CONDUIT	103.90	0	00:56	3.35	0.01	0.14
1627	L_1323	CONDUIT	76.20	0	00:51	3.15	0.00	0.13
1628	L_1327	CONDUIT	7.19	0	01:18	1.82	0.02	0.10
1629	L_133	CONDUIT	249.86	0	00:56	5.15	0.01	0.06
1630	L_1340	CONDUIT	1334.00	0	01:03	6.86	0.07	0.36
1631	L_1351	CONDUIT	292.14	0	01:05	4.11	0.02	0.22
1632	L_1353	CONDUIT	148.95	0	00:59	2.58	0.01	0.20
1633	L_1355	CONDUIT	404.00	0	01:00	5.20	0.02	0.23
1634	L_1357	CONDUIT	272.92	0	00:59	3.60	0.02	0.23
1635	L_1361	CONDUIT	138.71	0	00:56	3.53	0.01	0.17
1636	L_1363	CONDUIT	148.96	0	00:37	6.06	0.01	0.06
1637	L_1367	CONDUIT	61.16	0	00:55	3.60	0.00	0.11
1638	L_1371	CONDUIT	166.78	0	00:56	4.17	0.01	0.16
1639	L_138	CONDUIT	171.65	0	00:49	4.62	0.01	0.07
1640	L_1387	CONDUIT	199.86	0	00:52	4.97	0.01	0.11
1641	L_139	CONDUIT	326.34	0	00:51	4.59	0.09	0.28
1642	L_1393	CONDUIT	124.00	0	01:03	4.03	0.01	0.14
1643	L_1395	CONDUIT	159.29	0	01:11	3.64	0.01	0.11
1644	L_141	CONDUIT	303.23	0	00:51	7.45	0.04	0.17
1645	L_146	CONDUIT	37.95	0	01:05	6.09	0.00	0.03
1646	L_149	CONDUIT	268.05	0	00:49	7.36	0.02	0.11
1647	L_154	CONDUIT	179.28	0	00:46	4.90	0.01	0.07
1648	L_221	CONDUIT	1276.66	0	01:06	7.07	0.12	0.34
1649	L_225	CONDUIT	202.29	0	00:52	5.87	0.01	0.08
1650	L_228	CONDUIT	84.26	0	00:56	5.46	0.01	0.07

1651	L_235	CONDUIT	869.49	0	01:04	6.41	0.03	0.13
1652	L_239	CONDUIT	772.40	0	00:58	6.45	0.04	0.15
1653	L_241	CONDUIT	676.17	0	00:57	7.49	0.09	0.26
1654	L_245	CONDUIT	299.15	0	00:57	9.77	0.04	0.22
1655	L_250	CONDUIT	81.13	0	00:53	2.92	0.00	0.07
1656	L_263	CONDUIT	170.70	0	00:57	6.69	0.02	0.11
1657	L_268	CONDUIT	81.31	0	00:52	6.32	0.01	0.06
1658	L_314	CONDUIT	148.67	0	00:48	4.71	0.01	0.06
1659	L_513	CONDUIT	211.22	0	01:03	4.79	0.01	0.09
1660	L_613	CONDUIT	391.03	0	01:04	4.95	0.01	0.08
1661	L_617	CONDUIT	235.33	0	00:57	4.75	0.01	0.06
1662	L_622	CONDUIT	147.88	0	00:54	5.26	0.01	0.10
1663	L_708	CONDUIT	159.54	0	00:51	10.40	0.01	0.07
1664	L_709	CONDUIT	159.55	0	00:51	5.39	0.01	0.06
1665	L_710	CONDUIT	159.63	0	00:50	4.29	0.01	0.05
1666	L_711	CONDUIT	159.65	0	00:49	4.06	0.01	0.05
1667	L_712	CONDUIT	160.08	0	00:46	3.62	0.00	0.04
1668	L_713	CONDUIT	159.87	0	00:48	2.89	0.01	0.09
1669	L_808	CONDUIT	1022.16	0	01:03	5.02	0.10	0.28
1670	L_809	CONDUIT	1024.14	0	01:00	38.43	0.33	0.36
1671	L_811	CONDUIT	927.57	0	01:00	5.29	0.03	0.15
1672	L_819	CONDUIT	927.66	0	01:00	3.52	0.07	0.22
1673	L_822	CONDUIT	65.48	0	01:05	2.09	0.00	0.01
1674	L_823	CONDUIT	709.15	0	01:00	3.08	0.02	0.10
1675	L_824	CONDUIT	65.62	0	01:01	1.24	0.00	0.01
1676	L_829	CONDUIT	710.94	0	00:57	8.03	0.02	0.11
1677	L_831	CONDUIT	575.60	0	01:00	9.92	0.00	0.06
1678	L_834	CONDUIT	575.62	0	01:00	3.33	0.03	0.15
1679	L_836	CONDUIT	263.50	0	01:48	22.78	1.07	1.00
1680	L_838	CONDUIT	577.47	0	00:56	4.42	0.01	0.15
1681	L_839	CONDUIT	371.61	0	00:57	3.02	0.00	0.07
1682	L_841	CONDUIT	289.99	0	00:55	4.16	0.03	0.26
1683	L_843	CONDUIT	577.56	0	00:55	13.99	0.18	0.28
1684	L_850	CONDUIT	138.64	0	00:56	3.48	0.01	0.12
1685	L_911	CONDUIT	429.64	0	01:11	4.05	0.02	0.12
1686	L_912	CONDUIT	433.70	0	01:02	4.56	0.03	0.25
1687	L_931	CONDUIT	308.60	0	01:03	4.06	0.02	0.23
1688	Overflow_836	CONDUIT	330.97	0	00:56	6.15	0.00	0.07
1689	Dummy_1324	DUMMY	76.35	0	00:45			
1690	Dummy_1233	DUMMY	499.01	0	00:46			
1691								
1692								
1693	************************							
1694	Conduit Surcharge Summary							
1695	************************							
1696								
1697	----------							
1698						Hours	Hours	
1699		--------- Hours Full --------				Above Full	Capacity	
1700	Conduit	Both Ends	Upstream	Dnstream		Normal Flow	Limited	
1701	----------							
1702	L_836	1.24	1.24	1.24		1.24	1.24	
1703								
1704								
1705	Analysis begun on: Thu Jul 10 10:27:27 2025							
1706	Analysis ended on: Thu Jul 10 10:27:27 2025							
1707	Total elapsed time: < 1 sec							

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EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)
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City of Greeley
Comprehensive Draingae Plan Oklahoma Basins
Baseline Hydrology
WARNING 04: minimum elevation drop used for Conduit Dummy_310

*************
Element Count
*************
Number of rain gages ...... 0
Number of subcatchments ... 0
Number of nodes ........... 257
Number of links ........... 256
Number of pollutants ...... 0
Number of land uses ....... 0


************
Node Summary
************
                                    Invert      Max.    Ponded    External
Name                 Type            Elev.     Depth      Area    Inflow
--------------------------------------------------------------------------
1002                 JUNCTION      4757.00     20.00       0.0
1004                 JUNCTION      4768.00     30.00       0.0
1006_RR              JUNCTION      4772.00     30.00       0.0
1008                 JUNCTION      4774.00     20.00       0.0
1010                 JUNCTION      4774.90     30.00       0.0
1012                 JUNCTION      4777.90     30.00       0.0
1014                 JUNCTION      4779.00     30.00       0.0
1016                 JUNCTION      4781.00     20.00       0.0
1018                 JUNCTION      4782.00     20.00       0.0
1020                 JUNCTION      4784.00     20.00       0.0
1022                 JUNCTION      4789.00     20.00       0.0
1024                 JUNCTION      4792.00     20.00       0.0
1026                 JUNCTION      4793.00     20.00       0.0
1028                 JUNCTION      4803.90     20.00       0.0
1030                 JUNCTION      4811.90     20.00       0.0
1032                 JUNCTION      4770.00      0.00       0.0
1034                 JUNCTION      4814.90     20.00       0.0
1036                 JUNCTION      4818.00     20.00       0.0
1038                 JUNCTION      4821.00     20.00       0.0
1040                 JUNCTION      4827.90     20.00       0.0
1042                 JUNCTION      4838.00     20.00       0.0
1044                 JUNCTION      4844.00     20.00       0.0
1046                 JUNCTION      4851.00     20.00       0.0
1048                 JUNCTION      4855.00     20.00       0.0
1050                 JUNCTION      4864.00      0.00       0.0
109                  JUNCTION      4779.00     10.00       0.0
110                  JUNCTION      4794.00      0.00       0.0
1108                 JUNCTION      4816.00      0.00       0.0
1110                 JUNCTION      4855.00      0.00       0.0
1115                 JUNCTION      4790.00     10.00       0.0
1116                 JUNCTION      4850.00      0.00       0.0
1123                 JUNCTION      4825.00     10.00       0.0
1124                 JUNCTION      4864.00      0.00       0.0
1125                 JUNCTION      4852.00     10.00       0.0
1126                 JUNCTION      4864.00      0.00       0.0
1127                 JUNCTION      4841.00     10.00       0.0
113                  JUNCTION      4784.00     10.00       0.0
1130                 JUNCTION      4854.00     10.00       0.0
1132                 JUNCTION      4874.00      0.00       0.0
1139                 JUNCTION      4857.00     10.00       0.0
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67	114	JUNCTION	4798.00	0.00	0.0
68	1140	JUNCTION	4879.00	0.00	0.0
69	1141	JUNCTION	4878.00	10.00	0.0
70	1142	JUNCTION	4902.00	0.00	0.0
71	1144	JUNCTION	4925.00	0.00	0.0
72	1147	JUNCTION	4893.00	10.00	0.0
73	1148	JUNCTION	4946.00	10.00	0.0
74	115	JUNCTION	4816.70	10.00	0.0
75	1150	JUNCTION	4955.00	0.00	0.0
76	1151	JUNCTION	4941.00	10.00	0.0
77	1152	JUNCTION	4966.00	0.00	0.0
78	1153	JUNCTION	4943.00	10.00	0.0
79	1154	JUNCTION	4976.00	0.00	0.0
80	1155	JUNCTION	4898.00	10.00	0.0
81	1156	JUNCTION	4935.00	0.00	0.0
82	1163	JUNCTION	4953.00	10.00	0.0
83	1164	JUNCTION	4958.00	0.00	0.0
84	117	JUNCTION	4818.00	10.00	0.0
85	1170	JUNCTION	4909.00	10.00	0.0
86	1172	JUNCTION	4832.00	0.00	0.0
87	118	JUNCTION	4830.00	0.00	0.0
88	1180	JUNCTION	4838.00	0.00	0.0
89	119	JUNCTION	4834.00	10.00	0.0
90	1208	JUNCTION	4868.00	10.00	0.0
91	1209	JUNCTION	4877.00	10.00	0.0
92	121	JUNCTION	4835.00	10.00	0.0
93	1210	JUNCTION	4889.00	0.00	0.0
94	1215	JUNCTION	4868.00	10.00	0.0
95	1216	JUNCTION	4882.00	0.00	0.0
96	1217	JUNCTION	4873.00	10.00	0.0
97	122	JUNCTION	4983.00	10.00	0.0
98	1223	JUNCTION	4880.00	10.00	0.0
99	1224	JUNCTION	4890.00	0.00	0.0
100	1226	JUNCTION	4895.00	10.00	0.0
101	1228	JUNCTION	4903.00	0.00	0.0
102	1230	JUNCTION	4883.00	0.00	0.0
103	1231	JUNCTION	4908.00	10.00	0.0
104	1232	JUNCTION	4955.00	0.00	0.0
105	1233	JUNCTION	4917.00	10.00	0.0
106	1233_Lake	JUNCTION	4911.00	10.00	0.0
107	1234	JUNCTION	4960.00	0.00	0.0
108	1235	JUNCTION	4941.00	10.00	0.0
109	1236	JUNCTION	4998.00	0.00	0.0
110	1237	JUNCTION	4973.00	10.00	0.0
111	1238	JUNCTION	5005.00	0.00	0.0
112	1239	JUNCTION	4954.00	10.00	0.0
113	1239_Lake	JUNCTION	4941.00	10.00	0.0
114	1240	JUNCTION	4981.00	0.00	0.0
115	1247	JUNCTION	4946.00	11.00	0.0
116	1248	JUNCTION	4967.00	0.00	0.0
117	1249	JUNCTION	4957.00	10.00	0.0
118	1255	JUNCTION	4965.00	10.00	0.0
119	1256	JUNCTION	4993.00	0.00	0.0
120	1257	JUNCTION	4970.00	10.00	0.0
121	1258	JUNCTION	4989.00	0.00	0.0
122	1259	JUNCTION	4990.00	10.00	0.0
123	126	JUNCTION	4999.00	10.00	0.0
124	1260	JUNCTION	5019.00	0.00	0.0
125	1264	JUNCTION	4876.00	0.00	0.0
126	1272	JUNCTION	4880.00	0.00	0.0
127	1273	JUNCTION	4959.00	10.00	0.0
128	1274	JUNCTION	4978.00	0.00	0.0
129	129	JUNCTION	4835.00	10.00	0.0
130	130	JUNCTION	4910.00	0.00	0.0
131	1308	JUNCTION	4891.00	0.00	0.0
132	1310	JUNCTION	4912.00	0.00	0.0

133	1315	JUNCTION	4893.00	10.00	0.0
134	1316	JUNCTION	4904.00	10.00	0.0
135	1318	JUNCTION	4923.00	0.00	0.0
136	1319	JUNCTION	4929.00	10.00	0.0
137	1320	JUNCTION	4970.00	0.00	0.0
138	1321	JUNCTION	4931.00	10.00	0.0
139	1322	JUNCTION	4975.00	0.00	0.0
140	1341	JUNCTION	4957.00	10.00	0.0
141	1324	JUNCTION	4975.00	0.00	0.0
142	1327	JUNCTION	4984.00	1.00	0.0
143	1328	JUNCTION	4989.00	0.00	0.0
144	133	JUNCTION	4917.00	10.00	0.0
145	134	JUNCTION	4945.00	0.00	0.0
146	1340	JUNCTION	4946.00	10.00	0.0
147	1347	JUNCTION	4949.00	10.00	0.0
148	1348	JUNCTION	4981.00	0.00	0.0
149	1349	JUNCTION	4952.00	10.00	0.0
150	1351	JUNCTION	4979.00	10.00	0.0
151	1352	JUNCTION	5019.00	0.00	0.0
152	1353	JUNCTION	4985.00	10.00	0.0
153	1354	JUNCTION	5028.00	0.00	0.0
154	1355	JUNCTION	4971.00	10.00	0.0
155	1356	JUNCTION	4989.00	0.00	0.0
156	1357	JUNCTION	4981.00	10.00	0.0
157	1358	JUNCTION	4993.00	0.00	0.0
158	1361	JUNCTION	5024.00	10.00	0.0
159	1362	JUNCTION	5035.00	0.00	0.0
160	1363	JUNCTION	5038.00	10.00	0.0
161	1364	JUNCTION	5058.00	0.00	0.0
162	1367	JUNCTION	5033.00	10.00	0.0
163	1368	JUNCTION	5059.00	0.00	0.0
164	1371	JUNCTION	4971.00	10.00	0.0
165	1372	JUNCTION	4988.00	0.00	0.0
166	138	JUNCTION	4970.00	10.00	0.0
167	1382	JUNCTION	4921.00	0.00	0.0
168	1386	JUNCTION	4960.00	0.00	0.0
169	1387	JUNCTION	4943.00	10.00	0.0
170	1388	JUNCTION	4995.00	0.00	0.0
171	139	JUNCTION	4817.00	10.00	0.0
172	1392	JUNCTION	4938.00	0.00	0.0
173	1393	JUNCTION	4940.00	10.00	0.0
174	1394	JUNCTION	4997.00	0.00	0.0
175	1395	JUNCTION	4947.00	10.00	0.0
176	1396	JUNCTION	4969.00	0.00	0.0
177	1398	JUNCTION	4972.00	0.00	0.0
178	141	JUNCTION	4827.00	10.00	0.0
179	142	JUNCTION	4820.00	0.00	0.0
180	146	JUNCTION	4849.00	10.00	0.0
181	149	JUNCTION	4869.00	10.00	0.0
182	150	JUNCTION	4890.00	0.00	0.0
183	154	JUNCTION	4904.00	10.00	0.0
184	210	JUNCTION	4770.00	0.00	0.0
185	220	JUNCTION	4777.00	0.00	0.0
186	221	JUNCTION	4790.60	10.00	0.0
187	223	JUNCTION	4793.00	10.00	0.0
188	224	JUNCTION	4810.00	0.00	0.0
189	225	JUNCTION	4840.00	10.00	0.0
190	226	JUNCTION	4850.00	0.00	0.0
191	228	JUNCTION	4864.00	10.00	0.0
192	231	JUNCTION	4790.80	10.00	0.0
193	232	JUNCTION	4810.00	0.00	0.0
194	235	JUNCTION	4845.00	10.00	0.0
195	236	JUNCTION	4847.00	0.00	0.0
196	237	JUNCTION	4846.00	10.00	0.0
197	239	JUNCTION	4850.00	10.00	0.0
198	240	JUNCTION	4849.00	0.00	0.0

199	241	JUNCTION	4862.00	10.00	0.0
200	243	JUNCTION	4863.00	10.00	0.0
201	244	JUNCTION	4894.00	0.00	0.0
202	245	JUNCTION	4980.00	10.00	0.0
203	247	JUNCTION	4981.00	10.00	0.0
204	248	JUNCTION	4986.00	0.00	0.0
205	250	JUNCTION	5015.00	10.00	0.0
206	252	JUNCTION	4990.00	0.00	0.0
207	256	JUNCTION	4851.00	0.00	0.0
208	259	JUNCTION	4863.00	10.00	0.0
209	260	JUNCTION	4905.00	0.00	0.0
210	263	JUNCTION	4922.00	10.00	0.0
211	264	JUNCTION	4991.00	0.00	0.0
212	268	JUNCTION	4991.00	10.00	0.0
213	310	JUNCTION	4778.00	0.00	0.0
214	314	JUNCTION	4839.00	10.00	0.0
215	410	JUNCTION	4793.00	0.00	0.0
216	414	JUNCTION	4796.00	0.00	0.0
217	418	JUNCTION	4802.00	0.00	0.0
218	422	JUNCTION	4800.00	0.00	0.0
219	426	JUNCTION	4810.00	0.00	0.0
220	510	JUNCTION	4856.00	0.00	0.0
221	513	JUNCTION	4880.00	10.00	0.0
222	514	JUNCTION	4931.00	0.00	0.0
223	518	JUNCTION	4940.00	0.00	0.0
224	610	JUNCTION	4858.00	0.00	0.0
225	613	JUNCTION	4888.00	10.00	0.0
226	614	JUNCTION	4899.00	0.00	0.0
227	617	JUNCTION	4942.00	10.00	0.0
228	618	JUNCTION	4950.00	0.00	0.0
229	620	JUNCTION	4920.00	0.00	0.0
230	622	JUNCTION	4981.00	10.00	0.0
231	708	JUNCTION	4851.00	10.00	0.0
232	709	JUNCTION	4866.00	10.00	0.0
233	710	JUNCTION	4871.00	10.00	0.0
234	711	JUNCTION	4889.00	10.00	0.0
235	712	JUNCTION	4915.00	10.00	0.0
236	713	JUNCTION	4898.00	10.00	0.0
237	714	JUNCTION	4864.00	0.00	0.0
238	804	JUNCTION	4882.00	0.00	0.0
239	808	JUNCTION	4885.00	15.00	0.0
240	809	JUNCTION	4890.00	15.00	0.0
241	810	JUNCTION	4925.00	0.00	0.0
242	811	JUNCTION	4893.00	10.00	0.0
243	819	JUNCTION	4901.00	10.00	0.0
244	820	JUNCTION	4945.00	0.00	0.0
245	822	JUNCTION	4932.00	10.00	0.0
246	823	JUNCTION	4908.00	10.00	0.0
247	824	JUNCTION	4961.00	10.00	0.0
248	829	JUNCTION	4918.00	15.00	0.0
249	830	JUNCTION	4972.00	0.00	0.0
250	831	JUNCTION	4928.50	15.00	0.0
251	834	JUNCTION	4932.00	15.00	0.0
252	838	JUNCTION	4949.00	15.00	0.0
253	839	JUNCTION	4965.00	15.00	0.0
254	840	JUNCTION	4990.00	0.00	0.0
255	841	JUNCTION	4967.00	10.00	0.0
256	842	JUNCTION	5000.00	0.00	0.0
257	843	JUNCTION	4959.00	15.00	0.0
258	844	JUNCTION	4995.00	0.00	0.0
259	850	JUNCTION	4990.00	10.00	0.0
260	910	JUNCTION	4916.00	0.00	0.0
261	911	JUNCTION	4913.00	10.00	0.0
262	912	JUNCTION	4920.00	10.00	0.0
263	929	JUNCTION	4922.00	10.00	0.0
264	930	JUNCTION	4927.00	0.00	0.0

931	JUNCTION	4954.00	10.00	0.0	
940	JUNCTION	4986.00	0.00	0.0	
950	JUNCTION	4977.00	0.00	0.0	
960	JUNCTION	4970.00	0.00	0.0	
O_1107	JUNCTION	4778.00	10.00	0.0	
O_1263	JUNCTION	4812.00	0.00	0.0	
O_1307	JUNCTION	4865.00	10.00	0.0	
O_220	JUNCTION	4772.00	10.00	0.0	
O_300	JUNCTION	4778.00	10.00	0.0	
O_500	JUNCTION	4826.00	10.00	0.0	
O_600	JUNCTION	4815.00	10.00	0.0	
O_708	JUNCTION	4828.00	10.00	0.0	
O_803	JUNCTION	4865.00	10.00	0.0	
O_909	JUNCTION	4865.00	10.00	0.0	
1323	JUNCTION	4966.00	10.00	0.0	
CulvertOut_1233	JUNCTION	4914.00	10.00	0.0	
O_100	OUTFALL	4778.00	0.00	0.0	
O_1000	OUTFALL	4756.00	0.00	0.0	
836	DIVIDER	4945.00	15.00	0.0	

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Link Summary
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Name	From Node	To Node	Type	Length	%Slope	Roughness
Dummy_1032	1032	1002	CONDUIT	400.0	3.2517	0.0350
Dummy_1050	1050	1048	CONDUIT	381.0	2.3629	0.0350
Dummy_109	109	O_100	CONDUIT	400.0	0.2500	0.0100
Dummy_110	110	109	CONDUIT	400.0	3.7526	0.0100
Dummy_1107	O_1107	1012	CONDUIT	400.0	0.0250	0.0100
Dummy_1108	1108	O_1107	CONDUIT	400.0	9.5432	0.0350
Dummy_1110	1110	1115	CONDUIT	400.0	16.4689	0.0350
Dummy_1116	1116	1115	CONDUIT	400.0	15.1717	0.0350
Dummy_1124	1124	1123	CONDUIT	400.0	9.7967	0.0350
Dummy_1126	1126	1125	CONDUIT	400.0	3.0014	0.0350
Dummy_1132	1132	1130	CONDUIT	400.0	5.0063	0.0350
Dummy_1139	1139	1130	CONDUIT	300.0	1.0001	0.0130
Dummy_114	114	113	CONDUIT	400.0	3.5021	0.0100
Dummy_1140	1140	1139	CONDUIT	400.0	5.5083	0.0350
Dummy_1142	1142	1141	CONDUIT	400.0	6.0108	0.0350
Dummy_1144	1144	1155	CONDUIT	400.0	6.7654	0.0350
Dummy_1148	1148	1147	CONDUIT	400.0	13.3679	0.0350
Dummy_1150	1150	1147	CONDUIT	400.0	15.6896	0.0350
Dummy_1152	1152	1151	CONDUIT	400.0	6.2622	0.0100
Dummy_1153	1153	1151	CONDUIT	400.0	0.5000	0.0350
Dummy_1154	1154	1153	CONDUIT	400.0	8.2782	0.0350
Dummy_1156	1156	1170	CONDUIT	400.0	6.5138	0.0350
Dummy_1164	1164	1163	CONDUIT	400.0	1.2501	0.0350
Dummy_1172	1172	1008	CONDUIT	400.0	14.6549	0.0350
Dummy_118	118	117	CONDUIT	400.0	3.0014	0.0100
Dummy_1180	1180	1016	CONDUIT	400.0	14.3969	0.0350
Dummy_1208	1208	1024	CONDUIT	400.0	19.3525	0.0350
Dummy_121	121	119	CONDUIT	400.0	0.2500	0.0100
Dummy_1210	1210	1209	CONDUIT	400.0	3.0014	0.0350
Dummy_1216	1216	1217	CONDUIT	400.0	2.2506	0.0350
Dummy_122	122	121	CONDUIT	400.0	39.8264	0.0100
Dummy_1224	1224	1223	CONDUIT	400.0	2.5008	0.0350
Dummy_1226	1226	1223	CONDUIT	400.0	3.7526	0.0350
Dummy_1228	1228	1223	CONDUIT	400.0	5.7595	0.0350
Dummy_1230	1230	1223	CONDUIT	400.0	0.7500	0.0350
Dummy_1232	1232	1231	CONDUIT	400.0	11.8320	0.0350
Dummy_1233_Lake	1233_Lake	1231	CONDUIT	400.0	0.7500	0.0100
Dummy_1234	1234	1233	CONDUIT	400.0	10.8127	0.0100
Dummy_1236	1236	1235	CONDUIT	400.0	14.3969	0.0100
Dummy_1238	1238	1237	CONDUIT	400.0	8.0257	0.0100

331	Dummy_1239	1239_Lake	1231	CONDUIT	400.0	8.2782	0.0100
332	Dummy_1240	1240	1239	CONDUIT	400.0	6.7654	0.0100
333	Dummy_1248	1248	1247	CONDUIT	400.0	5.2573	0.0100
334	Dummy_1249	1249	1247	CONDUIT	400.0	2.7510	0.0100
335	Dummy_1256	1256	1255	CONDUIT	400.0	7.0172	0.0100
336	Dummy_1258	1258	1257	CONDUIT	400.0	4.7554	0.0100
337	Dummy_1260	1260	1259	CONDUIT	400.0	7.2691	0.0100
338	Dummy_1263	O_1263	1030	CONDUIT	400.0	0.0250	0.0100
339	Dummy_1264	1264	O_1263	CONDUIT	400.0	16.2088	0.0350
340	Dummy_1272	1272	1038	CONDUIT	400.0	14.9131	0.0350
341	Dummy_1274	1274	1273	CONDUIT	400.0	4.7554	0.0100
342	Dummy_129	129	119	CONDUIT	400.0	0.2500	0.0100
343	Dummy_130	130	129	CONDUIT	400.0	19.0885	0.0100
344	Dummy_1307	O_1307	1048	CONDUIT	400.0	2.5008	0.0100
345	Dummy_1308	1308	O_1307	CONDUIT	400.0	6.5138	0.0100
346	Dummy_1310	1310	1315	CONDUIT	400.0	4.7554	0.0100
347	Dummy_1318	1318	1315	CONDUIT	400.0	7.5212	0.0100
348	Dummy_1320	1320	1319	CONDUIT	400.0	10.3043	0.0100
349	Dummy_1322	1322	1321	CONDUIT	400.0	11.0672	0.0100
350	Dummy_1341	1341	1340	CONDUIT	400.0	2.7510	0.0100
351	Dummy_1328	1328	1327	CONDUIT	400.0	1.2501	0.0100
352	Dummy_1337	1347	1340	CONDUIT	400.0	0.7500	0.0100
353	Dummy_134	134	133	CONDUIT	400.0	7.0172	0.0100
354	Dummy_1348	1348	1347	CONDUIT	400.0	8.0257	0.0100
355	Dummy_1349	1349	1340	CONDUIT	400.0	1.5002	0.0100
356	Dummy_1352	1352	1351	CONDUIT	400.0	10.0504	0.0100
357	Dummy_1354	1354	1353	CONDUIT	400.0	10.8127	0.0100
358	Dummy_1356	1356	1355	CONDUIT	400.0	4.5046	0.0100
359	Dummy_1358	1358	1357	CONDUIT	400.0	3.0014	0.0100
360	Dummy_1362	1362	1361	CONDUIT	400.0	2.7510	0.0100
361	Dummy_1364	1364	1363	CONDUIT	400.0	5.0063	0.0100
362	Dummy_1368	1368	1367	CONDUIT	400.0	6.5138	0.0100
363	Dummy_1372	1372	1371	CONDUIT	400.0	4.2538	0.0100
364	Dummy_1382	1382	1044	CONDUIT	400.0	19.6169	0.0100
365	Dummy_1386	1386	1340	CONDUIT	400.0	3.5021	0.0100
366	Dummy_1388	1388	1387	CONDUIT	400.0	13.1113	0.0100
367	Dummy_1392	1392	1315	CONDUIT	400.0	11.3219	0.0100
368	Dummy_1394	1394	1393	CONDUIT	400.0	14.3969	0.0100
369	Dummy_1396	1396	1395	CONDUIT	400.0	5.5083	0.0100
370	Dummy_1398	1398	1395	CONDUIT	400.0	6.2622	0.0100
371	Dummy_142	142	139	CONDUIT	400.0	0.7500	0.0100
372	Dummy_150	150	149	CONDUIT	400.0	5.2573	0.0100
373	Dummy_210	210	1002	CONDUIT	400.0	3.2517	0.0350
374	Dummy_219	O_220	1004	CONDUIT	400.0	1.0001	0.0350
375	Dummy_220	220	O_220	CONDUIT	400.0	1.2501	0.0100
376	Dummy_223	223	221	CONDUIT	400.0	0.6000	0.0100
377	Dummy_224	224	223	CONDUIT	400.0	4.2538	0.0100
378	Dummy_226	226	225	CONDUIT	400.0	2.5008	0.0100
379	Dummy_231	231	221	CONDUIT	400.0	0.0500	0.0100
380	Dummy_232	232	231	CONDUIT	400.0	4.8055	0.0100
381	Dummy_236	236	235	CONDUIT	400.0	0.5000	0.0100
382	Dummy_237	237	235	CONDUIT	400.0	0.2500	0.0100
383	Dummy_240	240	237	CONDUIT	400.0	0.7500	0.0100
384	Dummy_243	243	241	CONDUIT	400.0	0.2500	0.0100
385	Dummy_244	244	243	CONDUIT	400.0	7.7734	0.0100
386	Dummy_247	247	245	CONDUIT	400.0	0.2500	0.0100
387	Dummy_248	248	247	CONDUIT	400.0	1.2501	0.0100
388	Dummy_252	252	245	CONDUIT	400.0	2.5008	0.0100
389	Dummy_256	256	239	CONDUIT	400.0	0.2500	0.0100
390	Dummy_259	259	241	CONDUIT	400.0	0.2500	0.0100
391	Dummy_260	260	259	CONDUIT	400.0	10.5584	0.0100
392	Dummy_264	264	263	CONDUIT	400.0	17.5125	0.0100
393	Dummy_300	O_300	1010	CONDUIT	400.0	0.7750	0.0100
394	Dummy_310	310	O_300	CONDUIT	400.0	0.0003	0.0350
395	Dummy_410	410	1014	CONDUIT	400.0	3.5021	0.0100
396	Dummy_414	414	1018	CONDUIT	400.0	3.5021	0.0100

397	Dummy_418	418	1020	CONDUIT	400.0	4.5046	0.0100
398	Dummy_422	422	1022	CONDUIT	400.0	2.7510	0.0100
399	Dummy_426	426	1026	CONDUIT	400.0	4.2538	0.0100
400	Dummy_500	O_500	1028	CONDUIT	400.0	5.5335	0.0100
401	Dummy_510	510	O_500	CONDUIT	400.0	7.5212	0.0100
402	Dummy_514	514	513	CONDUIT	400.0	12.8549	0.0100
403	Dummy_518	518	513	CONDUIT	400.0	15.1717	0.0100
404	Dummy_600	O_600	1030	CONDUIT	400.0	0.7750	0.0100
405	Dummy_610	610	O_600	CONDUIT	400.0	10.8127	0.0100
406	Dummy_614	614	613	CONDUIT	400.0	2.7510	0.0100
407	Dummy_618	618	617	CONDUIT	400.0	2.0004	0.0100
408	Dummy_620	620	1036	CONDUIT	400.0	26.3718	0.0100
409	Dummy_708	O_708	1040	CONDUIT	400.0	0.0250	0.0100
410	Dummy_714	714	1042	CONDUIT	400.0	6.5138	0.0100
411	Dummy_803	O_803	1050	CONDUIT	400.0	0.2500	0.0100
412	Dummy_804	804	O_803	CONDUIT	400.0	4.2538	0.0100
413	Dummy_810	810	809	CONDUIT	400.0	8.7837	0.0100
414	Dummy_820	820	819	CONDUIT	400.0	11.0672	0.0100
415	Dummy_830	830	829	CONDUIT	400.0	13.6247	0.0100
416	Dummy_840	840	839	CONDUIT	400.0	6.2622	0.0100
417	Dummy_842	842	841	CONDUIT	400.0	8.2782	0.0100
418	Dummy_844	844	843	CONDUIT	400.0	9.0367	0.0100
419	Dummy_909	O_909	1050	CONDUIT	400.0	0.2500	0.0100
420	Dummy_910	910	O_909	CONDUIT	400.0	12.8549	0.0350
421	Dummy_929	929	912	CONDUIT	75.0	2.6676	0.0130
422	Dummy_930	930	929	CONDUIT	400.0	1.2501	0.0100
423	Dummy_940	940	931	CONDUIT	400.0	8.0257	0.0350
424	Dummy_950	950	931	CONDUIT	400.0	5.7595	0.0350
425	Dummy_960	960	931	CONDUIT	400.0	4.0032	0.0350
426	Dummy_1002	1002	O_1000	CONDUIT	400.0	0.2500	0.0440
427	L_1004	1004	1002	CONDUIT	1497.0	0.7348	0.0750
428	L_1006	1006_RR	1004	CONDUIT	461.0	0.8677	0.0550
429	L_1008	1008	1006_RR	CONDUIT	473.0	0.4228	0.0440
430	L_1010	1010	1008	CONDUIT	378.0	0.2381	0.0400
431	L_1012	1012	1010	CONDUIT	896.0	0.3348	0.0750
432	L_1014	1014	1012	CONDUIT	536.0	0.2052	0.0750
433	L_1016	1016	1014	CONDUIT	319.0	0.6270	0.0550
434	L_1018	1018	1016	CONDUIT	433.0	0.2309	0.0440
435	L_1020	1020	1018	CONDUIT	373.0	0.5362	0.0440
436	L_1022	1022	1020	CONDUIT	784.0	0.6378	0.0550
437	L_1024	1024	1022	CONDUIT	543.0	0.5525	0.0550
438	L_1026	1026	1024	CONDUIT	134.0	0.7463	0.0550
439	L_1028	1028	1026	CONDUIT	1068.0	1.0207	0.0550
440	L_1030	1030	1028	CONDUIT	474.0	1.6880	0.0550
441	L_1034	1034	1030	CONDUIT	510.0	0.5882	0.0550
442	L_1036	1036	1034	CONDUIT	372.0	0.8334	0.0550
443	L_1038	1038	1036	CONDUIT	567.0	0.5291	0.0550
444	L_1040	1040	1038	CONDUIT	743.0	0.9287	0.0550
445	L_1042	1042	1040	CONDUIT	601.0	1.6808	0.0550
446	L_1044	1044	1042	CONDUIT	477.0	1.2580	0.0550
447	L_1046	1046	1044	CONDUIT	402.0	1.7416	0.0440
448	L_1048	1048	1046	CONDUIT	359.0	1.1143	0.0440
449	L_1115	1115	O_1107	CONDUIT	432.0	2.7789	0.0550
450	L_1123	1123	1115	CONDUIT	1593.0	2.1976	0.0550
451	L_1125	1125	1127	CONDUIT	105.0	10.5342	0.0440
452	L_1127	1127	1123	CONDUIT	873.0	1.8331	0.0550
453	L_1130	1130	1127	CONDUIT	640.0	2.0317	0.0750
454	L_114	113	109	CONDUIT	144.0	3.4743	0.0350
455	L_1141	1141	1139	CONDUIT	1900.0	1.1053	0.0550
456	L_1147	1147	1141	CONDUIT	973.0	1.5418	0.0440
457	L_115	115	113	CONDUIT	3260.0	1.0031	0.0350
458	L_1151	1151	1155	CONDUIT	2508.0	1.7148	0.0440
459	L_1156	1155	1147	CONDUIT	1050.0	0.4762	0.0440
460	L_1163	1163	1153	CONDUIT	1100.0	0.9091	0.0440
461	L_117	117	115	CONDUIT	86.0	1.5118	0.0350
462	L_1170	1170	1155	CONDUIT	600.0	1.8336	0.0350

463	L_119	119	117	CONDUIT	1087.0	1.4721	0.0350
464	L_1209	1209	1217	CONDUIT	930.0	0.4301	0.0440
465	Dummy_1215	1215	O_1263	CONDUIT	1937.8	2.8911	0.0100
466	L_1217	1217	1215	CONDUIT	1800.0	0.2778	0.0440
467	L_1223	1223	1217	CONDUIT	1649.0	0.4245	0.0440
468	L_1231	1231	1223	CONDUIT	4880.0	0.5738	0.0440
469	L_1233	CulvertOut_1233	1233_Lake	CONDUIT	315.0	0.9524	0.0440
470	L_1235	1235	1233	CONDUIT	960.0	2.5008	0.0440
471	L_1237	1237	1249	CONDUIT	920.0	1.7394	0.0200
472	L_1239	1239	1239_Lake	CONDUIT	560.0	2.3221	0.0350
473	L_1247	1247	1233	CONDUIT	1640.0	1.8296	0.0440
474	L_1255	1255	1273	CONDUIT	650.0	0.9231	0.0550
475	L_1257	1257	1255	CONDUIT	1580.0	0.3165	0.0440
476	L_1259	1259	1257	CONDUIT	2600.0	0.7693	0.0200
477	L_126	126	121	CONDUIT	5178.0	3.1688	0.0350
478	L_1273	1273	1239	CONDUIT	795.0	0.6289	0.0750
479	L_1315	1315	O_1307	CONDUIT	2154.0	1.3000	0.0550
480	L_1316	1316	1315	CONDUIT	1157.0	0.9508	0.0550
481	L_1319	1319	1316	CONDUIT	1841.0	1.3581	0.0440
482	L_1321	1321	1316	CONDUIT	1813.0	1.4894	0.0440
483	L_1323	1323	1341	CONDUIT	568.0	1.5847	0.0440
484	L_1327	1327	1349	CONDUIT	2582.0	1.2394	0.0200
485	L_133	133	129	CONDUIT	2743.0	2.9908	0.0350
486	L_1340	1340	1316	CONDUIT	2275.0	1.8465	0.0440
487	L_1351	1351	1349	CONDUIT	2109.0	1.2804	0.0440
488	L_1353	1353	1351	CONDUIT	1021.7	0.5873	0.0440
489	L_1355	1355	1349	CONDUIT	957.7	1.9842	0.0440
490	L_1357	1357	1355	CONDUIT	1049.1	0.9532	0.0440
491	L_1361	1361	1357	CONDUIT	3566.0	1.2059	0.0440
492	L_1363	1363	1361	CONDUIT	1016.3	1.3776	0.0200
493	L_1367	1367	1353	CONDUIT	2810.2	1.7083	0.0440
494	L_1371	1371	1347	CONDUIT	1116.4	1.9709	0.0440
495	L_138	138	133	CONDUIT	2426.0	2.1852	0.0350
496	L_1387	1387	1315	CONDUIT	2272.0	2.2012	0.0440
497	L_139	139	115	CONDUIT	73.0	0.4110	0.0350
498	L_1393	1393	1315	CONDUIT	2179.0	2.1575	0.0440
499	L_1395	1395	1315	CONDUIT	3616.0	1.4935	0.0440
500	L_141	141	139	CONDUIT	542.0	1.8453	0.0350
501	L_146	146	141	CONDUIT	165.0	13.4535	0.0350
502	L_149	149	141	CONDUIT	1479.0	2.8409	0.0350
503	L_154	154	149	CONDUIT	1625.0	2.1543	0.0350
504	L_221	221	O_220	CONDUIT	2511.0	0.7408	0.0350
505	L_225	225	223	CONDUIT	1810.0	2.5976	0.0350
506	L_228	228	225	CONDUIT	847.0	2.8347	0.0350
507	L_235	235	231	CONDUIT	3274.0	1.6557	0.0350
508	L_239	239	237	CONDUIT	288.0	1.3890	0.0350
509	L_241	241	239	CONDUIT	1092.0	1.0990	0.0350
510	L_245	245	243	CONDUIT	4101.0	2.8541	0.0350
511	L_250	250	247	CONDUIT	2063.0	1.6483	0.0350
512	L_263	263	259	CONDUIT	2459.0	2.4000	0.0350
513	L_268	268	263	CONDUIT	1464.0	4.7184	0.0350
514	L_314	314	O_300	CONDUIT	2623.0	2.3262	0.0350
515	L_513	513	O_500	CONDUIT	3358.0	1.6083	0.0350
516	L_613	613	O_600	CONDUIT	3854.0	1.8945	0.0350
517	L_617	617	613	CONDUIT	2214.0	2.4398	0.0350
518	L_622	622	617	CONDUIT	1661.0	2.3486	0.0350
519	L_708	708	O_708	CONDUIT	202.0	11.4607	0.0350
520	L_709	709	708	CONDUIT	560.2	2.6786	0.0300
521	L_710	710	709	CONDUIT	154.3	3.2421	0.0400
522	L_711	711	710	CONDUIT	615.3	2.9267	0.0400
523	L_712	712	713	CONDUIT	485.4	3.5044	0.0400
524	L_713	713	711	CONDUIT	338.1	2.6629	0.0700
525	L_808	808	O_803	CONDUIT	1197.0	1.6711	0.0700
526	L_809	809	808	CONDUIT	90.0	5.5641	0.0130
527	L_811	811	809	CONDUIT	183.0	1.6396	0.0450
528	L_819	819	811	CONDUIT	761.0	1.0513	0.0700

L_822	822	819	CONDUIT	671.0	4.6249	0.0400
L_823	823	819	CONDUIT	943.0	0.7423	0.0400
L_824	824	822	CONDUIT	1270.0	2.2841	0.0350
L_829	829	823	CONDUIT	290.0	3.4503	0.0350
L_831	831	829	CONDUIT	105.0	10.0504	0.0400
L_834	834	831	CONDUIT	1040.0	0.3365	0.0400
L_836	836	834	CONDUIT	442.0	2.9424	0.0130
L_838	838	836	CONDUIT	314.9	1.2704	0.0480
L_839	839	843	CONDUIT	541.0	1.1091	0.0480
L_841	841	839	CONDUIT	190.0	1.0527	0.0440
L_843	843	838	CONDUIT	304.0	3.2913	0.0350
L_850	850	841	CONDUIT	1740.0	1.3220	0.0440
L_911	911	O_909	CONDUIT	2561.0	1.8746	0.0550
L_912	912	911	CONDUIT	522.0	1.3411	0.0440
L_931	931	929	CONDUIT	2763.0	1.1582	0.0440
Overflow_836	836	834	CONDUIT	442.0	2.9424	0.0350
Dummy_1324	1324	1323	CONDUIT	400.0	2.2506	0.0100
Dummy_1233	1233	CulvertOut_1233	CONDUIT	400.0	0.7500	0.0350

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Cross Section Summary
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Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
Dummy_1032	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1050	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_109	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_110	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1107	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1108	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1110	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1116	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1124	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1126	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1132	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1139	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_114	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1140	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1142	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1144	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1148	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1150	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1152	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1153	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1154	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1156	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1164	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1172	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_118	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1180	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1208	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_121	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1210	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1216	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_122	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1224	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1226	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1228	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1230	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1232	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1233_Lake	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1234	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1236	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1238	DUMMY	0.00	0.00	0.00	0.00	1	0.00

595	Dummy_1239	DUMMY	0.00	0.00	0.00	0.00	1	0.00
596	Dummy_1240	DUMMY	0.00	0.00	0.00	0.00	1	0.00
597	Dummy_1248	DUMMY	0.00	0.00	0.00	0.00	1	0.00
598	Dummy_1249	DUMMY	0.00	0.00	0.00	0.00	1	0.00
599	Dummy_1256	DUMMY	0.00	0.00	0.00	0.00	1	0.00
600	Dummy_1258	DUMMY	0.00	0.00	0.00	0.00	1	0.00
601	Dummy_1260	DUMMY	0.00	0.00	0.00	0.00	1	0.00
602	Dummy_1263	DUMMY	0.00	0.00	0.00	0.00	1	0.00
603	Dummy_1264	DUMMY	0.00	0.00	0.00	0.00	1	0.00
604	Dummy_1272	DUMMY	0.00	0.00	0.00	0.00	1	0.00
605	Dummy_1274	DUMMY	0.00	0.00	0.00	0.00	1	0.00
606	Dummy_129	DUMMY	0.00	0.00	0.00	0.00	1	0.00
607	Dummy_130	DUMMY	0.00	0.00	0.00	0.00	1	0.00
608	Dummy_1307	DUMMY	0.00	0.00	0.00	0.00	1	0.00
609	Dummy_1308	DUMMY	0.00	0.00	0.00	0.00	1	0.00
610	Dummy_1310	DUMMY	0.00	0.00	0.00	0.00	1	0.00
611	Dummy_1318	DUMMY	0.00	0.00	0.00	0.00	1	0.00
612	Dummy_1320	DUMMY	0.00	0.00	0.00	0.00	1	0.00
613	Dummy_1322	DUMMY	0.00	0.00	0.00	0.00	1	0.00
614	Dummy_1341	DUMMY	0.00	0.00	0.00	0.00	1	0.00
615	Dummy_1328	DUMMY	0.00	0.00	0.00	0.00	1	0.00
616	Dummy_1337	DUMMY	0.00	0.00	0.00	0.00	1	0.00
617	Dummy_134	DUMMY	0.00	0.00	0.00	0.00	1	0.00
618	Dummy_1348	DUMMY	0.00	0.00	0.00	0.00	1	0.00
619	Dummy_1349	DUMMY	0.00	0.00	0.00	0.00	1	0.00
620	Dummy_1352	DUMMY	0.00	0.00	0.00	0.00	1	0.00
621	Dummy_1354	DUMMY	0.00	0.00	0.00	0.00	1	0.00
622	Dummy_1356	DUMMY	0.00	0.00	0.00	0.00	1	0.00
623	Dummy_1358	DUMMY	0.00	0.00	0.00	0.00	1	0.00
624	Dummy_1362	DUMMY	0.00	0.00	0.00	0.00	1	0.00
625	Dummy_1364	DUMMY	0.00	0.00	0.00	0.00	1	0.00
626	Dummy_1368	DUMMY	0.00	0.00	0.00	0.00	1	0.00
627	Dummy_1372	DUMMY	0.00	0.00	0.00	0.00	1	0.00
628	Dummy_1382	DUMMY	0.00	0.00	0.00	0.00	1	0.00
629	Dummy_1386	DUMMY	0.00	0.00	0.00	0.00	1	0.00
630	Dummy_1388	DUMMY	0.00	0.00	0.00	0.00	1	0.00
631	Dummy_1392	DUMMY	0.00	0.00	0.00	0.00	1	0.00
632	Dummy_1394	DUMMY	0.00	0.00	0.00	0.00	1	0.00
633	Dummy_1396	DUMMY	0.00	0.00	0.00	0.00	1	0.00
634	Dummy_1398	DUMMY	0.00	0.00	0.00	0.00	1	0.00
635	Dummy_142	DUMMY	0.00	0.00	0.00	0.00	1	0.00
636	Dummy_150	DUMMY	0.00	0.00	0.00	0.00	1	0.00
637	Dummy_210	DUMMY	0.00	0.00	0.00	0.00	1	0.00
638	Dummy_219	DUMMY	0.00	0.00	0.00	0.00	1	0.00
639	Dummy_220	DUMMY	0.00	0.00	0.00	0.00	1	0.00
640	Dummy_223	DUMMY	0.00	0.00	0.00	0.00	1	0.00
641	Dummy_224	DUMMY	0.00	0.00	0.00	0.00	1	0.00
642	Dummy_226	DUMMY	0.00	0.00	0.00	0.00	1	0.00
643	Dummy_231	DUMMY	0.00	0.00	0.00	0.00	1	0.00
644	Dummy_232	DUMMY	0.00	0.00	0.00	0.00	1	0.00
645	Dummy_236	DUMMY	0.00	0.00	0.00	0.00	1	0.00
646	Dummy_237	DUMMY	0.00	0.00	0.00	0.00	1	0.00
647	Dummy_240	DUMMY	0.00	0.00	0.00	0.00	1	0.00
648	Dummy_243	DUMMY	0.00	0.00	0.00	0.00	1	0.00
649	Dummy_244	DUMMY	0.00	0.00	0.00	0.00	1	0.00
650	Dummy_247	DUMMY	0.00	0.00	0.00	0.00	1	0.00
651	Dummy_248	DUMMY	0.00	0.00	0.00	0.00	1	0.00
652	Dummy_252	DUMMY	0.00	0.00	0.00	0.00	1	0.00
653	Dummy_256	DUMMY	0.00	0.00	0.00	0.00	1	0.00
654	Dummy_259	DUMMY	0.00	0.00	0.00	0.00	1	0.00
655	Dummy_260	DUMMY	0.00	0.00	0.00	0.00	1	0.00
656	Dummy_264	DUMMY	0.00	0.00	0.00	0.00	1	0.00
657	Dummy_300	DUMMY	0.00	0.00	0.00	0.00	1	0.00
658	Dummy_310	DUMMY	0.00	0.00	0.00	0.00	1	0.00
659	Dummy_410	DUMMY	0.00	0.00	0.00	0.00	1	0.00
660	Dummy_414	DUMMY	0.00	0.00	0.00	0.00	1	0.00

661	Dummy_418	DUMMY	0.00	0.00	0.00	0.00	1	0.00
662	Dummy_422	DUMMY	0.00	0.00	0.00	0.00	1	0.00
663	Dummy_426	DUMMY	0.00	0.00	0.00	0.00	1	0.00
664	Dummy_500	DUMMY	0.00	0.00	0.00	0.00	1	0.00
665	Dummy_510	DUMMY	0.00	0.00	0.00	0.00	1	0.00
666	Dummy_514	DUMMY	0.00	0.00	0.00	0.00	1	0.00
667	Dummy_518	DUMMY	0.00	0.00	0.00	0.00	1	0.00
668	Dummy_600	DUMMY	0.00	0.00	0.00	0.00	1	0.00
669	Dummy_610	DUMMY	0.00	0.00	0.00	0.00	1	0.00
670	Dummy_614	DUMMY	0.00	0.00	0.00	0.00	1	0.00
671	Dummy_618	DUMMY	0.00	0.00	0.00	0.00	1	0.00
672	Dummy_620	DUMMY	0.00	0.00	0.00	0.00	1	0.00
673	Dummy_708	DUMMY	0.00	0.00	0.00	0.00	1	0.00
674	Dummy_714	DUMMY	0.00	0.00	0.00	0.00	1	0.00
675	Dummy_803	DUMMY	0.00	0.00	0.00	0.00	1	0.00
676	Dummy_804	DUMMY	0.00	0.00	0.00	0.00	1	0.00
677	Dummy_810	DUMMY	0.00	0.00	0.00	0.00	1	0.00
678	Dummy_820	DUMMY	0.00	0.00	0.00	0.00	1	0.00
679	Dummy_830	DUMMY	0.00	0.00	0.00	0.00	1	0.00
680	Dummy_840	DUMMY	0.00	0.00	0.00	0.00	1	0.00
681	Dummy_842	DUMMY	0.00	0.00	0.00	0.00	1	0.00
682	Dummy_844	DUMMY	0.00	0.00	0.00	0.00	1	0.00
683	Dummy_909	DUMMY	0.00	0.00	0.00	0.00	1	0.00
684	Dummy_910	DUMMY	0.00	0.00	0.00	0.00	1	0.00
685	Dummy_929	DUMMY	0.00	0.00	0.00	0.00	1	0.00
686	Dummy_930	DUMMY	0.00	0.00	0.00	0.00	1	0.00
687	Dummy_940	DUMMY	0.00	0.00	0.00	0.00	1	0.00
688	Dummy_950	DUMMY	0.00	0.00	0.00	0.00	1	0.00
689	Dummy_960	DUMMY	0.00	0.00	0.00	0.00	1	0.00
690	Dummy_1002	DUMMY	0.00	0.00	0.00	0.00	1	0.00
691	L_1004	TRAPEZOIDAL	20.00	1880.00	13.81	124.00	1	18381.59
692	L_1006	TRAPEZOIDAL	30.00	3000.00	17.23	160.00	1	50358.59
693	L_1008	TRAPEZOIDAL	20.00	1700.00	11.22	145.00	1	18712.97
694	L_1010	TRAPEZOIDAL	20.00	1700.00	11.22	145.00	1	15446.32
695	L_1012	TRAPEZOIDAL	30.00	3450.00	16.07	205.00	1	25184.10
696	L_1014	TRAPEZOIDAL	30.00	4200.00	18.54	215.00	1	26406.15
697	L_1016	TRAPEZOIDAL	20.00	2300.00	13.32	165.00	1	27645.60
698	L_1018	TRAPEZOIDAL	20.00	2100.00	12.91	155.00	1	18753.86
699	L_1020	TRAPEZOIDAL	20.00	2100.00	12.91	155.00	1	28575.76
700	L_1022	TRAPEZOIDAL	20.00	1640.00	12.48	122.00	1	19035.73
701	L_1024	TRAPEZOIDAL	20.00	2200.00	13.12	160.00	1	24575.19
702	L_1026	TRAPEZOIDAL	20.00	2200.00	13.12	160.00	1	28561.86
703	L_1028	TRAPEZOIDAL	20.00	1400.00	13.14	90.00	1	21275.96
704	L_1030	TRAPEZOIDAL	20.00	1400.00	13.14	90.00	1	27361.31
705	L_1034	TRAPEZOIDAL	20.00	1200.00	12.43	80.00	1	13340.75
706	L_1036	TRAPEZOIDAL	20.00	1200.00	12.43	80.00	1	15878.81
707	L_1038	TRAPEZOIDAL	20.00	1600.00	11.62	130.00	1	16131.15
708	L_1040	TRAPEZOIDAL	20.00	1700.00	11.22	145.00	1	22186.34
709	L_1042	TRAPEZOIDAL	20.00	1600.00	10.92	140.00	1	27589.00
710	L_1044	TRAPEZOIDAL	20.00	1600.00	10.92	140.00	1	23867.97
711	L_1046	TRAPEZOIDAL	20.00	2500.00	10.92	225.00	1	54839.61
712	L_1048	TRAPEZOIDAL	20.00	2500.00	10.92	225.00	1	43865.36
713	L_1115	TRAPEZOIDAL	10.00	250.00	5.43	40.00	1	3477.77
714	L_1123	TRAPEZOIDAL	10.00	1050.00	7.60	135.00	1	16249.85
715	L_1125	TRAPEZOIDAL	10.00	500.00	5.69	85.00	1	17477.64
716	L_1127	TRAPEZOIDAL	10.00	1150.00	7.99	140.00	1	16818.94
717	L_1130	TRAPEZOIDAL	10.00	1150.00	7.99	140.00	1	12984.86
718	L_114	TRIANGULAR	10.00	1000.00	4.98	200.00	1	23063.49
719	L_1141	TRAPEZOIDAL	10.00	3000.00	7.48	400.00	1	32596.92
720	L_1147	TRAPEZOIDAL	10.00	750.00	5.91	125.00	1	10276.82
721	L_115	TRAPEZOIDAL	10.00	1500.00	7.43	200.00	1	24279.48
722	L_1151	TRAPEZOIDAL	10.00	400.00	5.46	70.00	1	5485.90
723	L_1156	TRAPEZOIDAL	10.00	4000.00	7.98	500.00	1	37239.33
724	L_1163	TRAPEZOIDAL	10.00	1000.00	7.50	130.00	1	12343.65
725	L_117	TRAPEZOIDAL	10.00	300.00	5.48	50.00	1	4869.25
726	L_1170	TRAPEZOIDAL	10.00	3250.00	8.10	400.00	1	75349.61

727	L_119	TRAPEZOIDAL	10.00	300.00	5.48	50.00	1	4804.89
728	L_1209	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	9700.40
729	Dummy_1215	DUMMY	0.00	0.00	0.00	0.00	1	0.00
730	L_1217	TRAPEZOIDAL	10.00	500.00	6.01	80.00	1	2940.75
731	L_1223	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	9636.96
732	L_1231	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	11203.97
733	L_1233	TRAPEZOIDAL	10.00	600.00	5.86	100.00	1	6424.77
734	L_1235	TRAPEZOIDAL	10.00	440.00	5.09	84.00	1	6952.50
735	L_1237	TRAPEZOIDAL	10.00	60.00	2.31	6.00	1	1026.73
736	L_1239	TRAPEZOIDAL	10.00	400.01	4.85	80.00	1	7415.92
737	L_1247	TRAPEZOIDAL	10.00	450.00	5.15	85.00	1	6126.54
738	L_1255	TRAPEZOIDAL	10.00	400.01	4.85	80.00	1	2975.52
739	L_1257	TRAPEZOIDAL	10.00	240.00	4.93	44.00	1	1320.07
740	L_1259	TRAPEZOIDAL	10.00	1900.00	5.58	340.00	1	38939.80
741	L_126	TRAPEZOIDAL	10.00	500.00	6.69	70.00	1	13419.02
742	L_1273	TRAPEZOIDAL	10.00	400.01	4.85	80.00	1	1801.12
743	L_1315	TRAPEZOIDAL	10.00	1200.00	7.83	150.00	1	14577.20
744	L_1316	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	11537.95
745	L_1319	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	17237.03
746	L_1321	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	18051.21
747	L_1323	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	18619.74
748	L_1327	TRAPEZOIDAL	1.00	42.00	0.94	44.00	1	334.42
749	L_133	TRAPEZOIDAL	10.00	1550.00	6.56	235.00	1	39885.90
750	L_1340	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	20098.81
751	L_1351	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	16736.47
752	L_1353	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	11334.83
753	L_1355	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	20835.18
754	L_1357	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	14440.98
755	L_1361	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	16242.72
756	L_1363	TRAPEZOIDAL	10.00	600.00	7.08	80.00	1	19296.64
757	L_1367	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	19332.24
758	L_1371	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	20765.15
759	L_138	TRAPEZOIDAL	10.00	1300.00	6.15	210.00	1	27399.52
760	L_1387	TRAPEZOIDAL	10.00	800.00	6.06	130.00	1	13326.31
761	L_139	TRAPEZOIDAL	10.00	400.00	6.18	60.00	1	3666.51
762	L_1393	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	21725.52
763	L_1395	TRAPEZOIDAL	10.00	1750.00	5.37	325.00	1	22159.24
764	L_141	TRAPEZOIDAL	10.00	400.00	6.18	60.00	1	7769.44
765	L_146	TRAPEZOIDAL	10.00	1200.00	5.43	220.00	1	57731.32
766	L_149	TRAPEZOIDAL	10.00	500.00	6.69	70.00	1	12705.71
767	L_154	TRAPEZOIDAL	10.00	700.00	7.39	90.00	1	16550.33
768	L_221	TRAPEZOIDAL	10.00	800.00	6.53	120.00	1	10215.79
769	L_225	TRAPEZOIDAL	10.00	600.00	7.08	80.00	1	15141.09
770	L_228	TRAPEZOIDAL	10.00	400.00	6.18	60.00	1	9629.49
771	L_235	TRAPEZOIDAL	10.00	1300.00	7.96	160.00	1	28321.67
772	L_239	TRAPEZOIDAL	10.00	950.00	7.94	115.00	1	18911.69
773	L_241	TRAPEZOIDAL	10.00	500.00	6.69	70.00	1	7902.48
774	L_245	TRAPEZOIDAL	10.00	300.00	5.48	50.00	1	6690.39
775	L_250	TRAPEZOIDAL	10.00	5100.00	5.05	1010.00	1	81811.71
776	L_263	TRAPEZOIDAL	10.00	400.00	6.18	60.00	1	8860.57
777	L_268	TRAPEZOIDAL	10.00	400.00	6.18	60.00	1	12423.61
778	L_314	TRAPEZOIDAL	10.00	700.00	7.39	90.00	1	17197.82
779	L_513	TRAPEZOIDAL	10.00	700.00	7.39	90.00	1	14299.92
780	L_613	TRAPEZOIDAL	10.00	1300.00	7.96	160.00	1	30295.16
781	L_617	TRAPEZOIDAL	10.00	1000.00	8.02	120.00	1	26566.21
782	L_622	TRAPEZOIDAL	10.00	1200.00	5.43	220.00	1	24121.37
783	L_708	TRAPEZOIDAL	10.00	420.00	6.29	62.00	1	20580.76
784	L_709	TRAPEZOIDAL	10.00	900.00	6.79	130.00	1	26173.35
785	L_710	TRAPEZOIDAL	10.00	900.00	7.85	110.00	1	23769.29
786	L_711	TRAPEZOIDAL	10.00	1130.00	7.27	153.00	1	26947.94
787	L_712	TRAPEZOIDAL	10.00	2560.00	6.30	406.00	1	60698.05
788	L_713	TRAPEZOIDAL	10.00	1550.00	6.05	255.00	1	17837.15
789	L_808	TRAPEZOIDAL	10.00	950.00	7.41	125.00	1	9906.73
790	L_809	RECT_CLOSED	15.00	75.00	1.88	5.00	1	3074.94
791	L_811	TRAPEZOIDAL	10.00	1670.00	7.30	227.00	1	26581.36
792	L_819	TRAPEZOIDAL	10.00	1450.00	8.13	175.00	1	12765.94

L_822	TRAPEZOIDAL	10.00	2850.00	8.46	335.00	1	94518.19
L_823	TRAPEZOIDAL	10.00	2850.00	8.46	335.00	1	37867.18
L_824	TRAPEZOIDAL	10.00	9570.00	7.61	1257.00	1	237606.05
L_829	TRAPEZOIDAL	10.00	1250.00	7.06	175.00	1	36264.24
L_831	TRAPEZOIDAL	15.00	2325.00	9.39	245.00	1	121915.29
L_834	TRAPEZOIDAL	15.00	2310.00	9.37	244.00	1	22129.56
L_836	CIRCULAR	4.00	12.57	1.00	4.00	1	246.40
L_838	TRAPEZOIDAL	15.00	3735.00	7.86	474.00	1	51535.74
L_839	TRAPEZOIDAL	15.00	5662.50	8.63	655.00	1	77684.49
L_841	TRIANGULAR	10.00	1000.00	4.98	200.00	1	10098.48
L_843	CIRCULAR	15.00	176.71	3.75	15.00	1	3285.42
L_850	TRAPEZOIDAL	10.00	1400.00	5.37	260.00	1	16665.33
L_911	TRAPEZOIDAL	10.00	1250.00	7.46	165.00	1	17661.02
L_912	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	17129.02
L_931	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	15918.36
Overflow_836	TRAPEZOIDAL	15.00	3975.00	8.10	490.00	1	116720.41
Dummy_1324	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1233	DUMMY	0.00	0.00	0.00	0.00	1	0.00

```
****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ NO
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Flow Routing Method ...... KINWAVE
Starting Date ............ 01/01/2024 00:00:00
Ending Date .............. 01/02/2024 06:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:05:00
Routing Time Step ........ 20.00 sec
```

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	1369.325	446.215
External Outflow	1385.126	451.364
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.042	0.014
Continuity Error (%)	-1.157	

```
******************************
Highest Flow Instability Indexes
******************************
All links are stable.

************************
Routing Time Step Summary
************************
```

```
  Minimum Time Step           :    20.00 sec
  Average Time Step           :    20.00 sec
  Maximum Time Step           :    20.00 sec
  % of Time in Steady State   :     0.00
  Average Iterations per Step :     1.00
  % of Steps Not Converging   :     0.00


  ******************
  Node Depth Summary
  ******************

  --------------------------------------------------------------------------------
                               Average  Maximum  Maximum  Time of Max    Reported
                                 Depth    Depth      HGL   Occurrence   Max Depth
  Node                 Type       Feet     Feet     Feet  days hr:min        Feet
  --------------------------------------------------------------------------------
  1002                 JUNCTION   1.09    15.65  4772.65     0  01:13       15.62
  1004                 JUNCTION   1.08    15.66  4783.66     0  01:11       15.66
  1006_RR              JUNCTION   1.19    15.08  4787.08     0  01:11       15.06
  1008                 JUNCTION   1.31    16.42  4790.42     0  01:11       16.41
  1010                 JUNCTION   1.62    19.92  4794.82     0  01:10       19.92
  1012                 JUNCTION   1.61    19.93  4797.83     0  01:08       19.92
  1014                 JUNCTION   1.18    16.85  4795.85     0  01:08       16.84
  1016                 JUNCTION   0.92    13.18  4794.18     0  01:08       13.17
  1018                 JUNCTION   0.92    13.18  4795.18     0  01:07       13.15
  1020                 JUNCTION   0.90    13.04  4797.04     0  01:07       13.02
  1022                 JUNCTION   0.90    13.05  4802.05     0  01:06       13.04
  1024                 JUNCTION   0.77    11.32  4803.32     0  01:05       11.32
  1026                 JUNCTION   0.75    11.50  4804.50     0  01:05       11.50
  1028                 JUNCTION   0.74    11.50  4815.40     0  01:04       11.49
  1030                 JUNCTION   0.76    12.25  4824.15     0  01:02       12.21
  1032                 JUNCTION   0.00     0.00  4770.00     0  00:00        0.00
  1034                 JUNCTION   0.75    12.25  4827.15     0  01:02       12.22
  1036                 JUNCTION   0.80    12.05  4830.05     0  01:01       12.03
  1038                 JUNCTION   0.79    12.05  4833.05     0  01:00       12.04
  1040                 JUNCTION   0.71    10.62  4838.52     0  00:59       10.62
  1042                 JUNCTION   0.70    10.27  4848.27     0  00:59       10.27
  1044                 JUNCTION   0.70    10.27  4854.27     0  00:58       10.26
  1046                 JUNCTION   0.54     7.92  4858.92     0  00:58        7.91
  1048                 JUNCTION   0.54     7.92  4862.92     0  00:57        7.90
  1050                 JUNCTION   0.00     0.00  4864.00     0  00:00        0.00
  109                  JUNCTION   0.30     3.49  4782.49     0  00:54        3.48
  110                  JUNCTION   0.00     0.00  4794.00     0  00:00        0.00
  1108                 JUNCTION   0.00     0.00  4816.00     0  00:00        0.00
  1110                 JUNCTION   0.00     0.00  4855.00     0  00:00        0.00
  1115                 JUNCTION   0.43     6.70  4796.70     0  01:01        6.69
  1116                 JUNCTION   0.00     0.00  4850.00     0  00:00        0.00
  1123                 JUNCTION   0.14     2.47  4827.47     0  00:59        2.46
  1124                 JUNCTION   0.00     0.00  4864.00     0  00:00        0.00
  1125                 JUNCTION   0.03     1.16  4853.16     0  00:30        1.14
  1126                 JUNCTION   0.00     0.00  4864.00     0  00:00        0.00
  1127                 JUNCTION   0.15     2.62  4843.62     0  00:58        2.61
  113                  JUNCTION   0.31     3.49  4787.49     0  00:54        3.48
  1130                 JUNCTION   0.14     2.62  4856.62     0  00:56        2.61
  1132                 JUNCTION   0.00     0.00  4874.00     0  00:00        0.00
  1139                 JUNCTION   0.08     1.44  4858.44     0  00:58        1.44
  114                  JUNCTION   0.00     0.00  4798.00     0  00:00        0.00
  1140                 JUNCTION   0.00     0.00  4879.00     0  00:00        0.00
  1141                 JUNCTION   0.18     3.40  4881.40     0  00:51        3.39
  1142                 JUNCTION   0.00     0.00  4902.00     0  00:00        0.00
  1144                 JUNCTION   0.00     0.00  4925.00     0  00:00        0.00
  1147                 JUNCTION   0.17     3.40  4896.40     0  00:49        3.40
  1148                 JUNCTION   0.00     0.00  4946.00     0  00:00        0.00
  115                  JUNCTION   0.23     4.31  4821.01     0  00:47        4.29
  1150                 JUNCTION   0.00     0.00  4955.00     0  00:00        0.00
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925	1151	JUNCTION	0.16	3.53	4944.53	0	00:41	3.51
926	1152	JUNCTION	0.00	0.00	4966.00	0	00:00	0.00
927	1153	JUNCTION	0.05	1.23	4944.23	0	00:43	1.22
928	1154	JUNCTION	0.00	0.00	4976.00	0	00:00	0.00
929	1155	JUNCTION	0.16	3.50	4901.50	0	00:46	3.49
930	1156	JUNCTION	0.00	0.00	4935.00	0	00:00	0.00
931	1163	JUNCTION	0.05	1.24	4954.24	0	00:40	1.24
932	1164	JUNCTION	0.00	0.00	4958.00	0	00:00	0.00
933	117	JUNCTION	0.23	4.31	4822.31	0	00:47	4.29
934	1170	JUNCTION	0.01	0.26	4909.26	0	00:40	0.25
935	1172	JUNCTION	0.00	0.00	4832.00	0	00:00	0.00
936	118	JUNCTION	0.00	0.00	4830.00	0	00:00	0.00
937	1180	JUNCTION	0.00	0.00	4838.00	0	00:00	0.00
938	119	JUNCTION	0.22	4.20	4838.20	0	00:45	4.20
939	1208	JUNCTION	0.00	0.00	4868.00	0	00:00	0.00
940	1209	JUNCTION	0.13	1.60	4878.60	0	00:50	1.60
941	121	JUNCTION	0.02	0.28	4835.28	0	01:10	0.28
942	1210	JUNCTION	0.00	0.00	4889.00	0	00:00	0.00
943	1215	JUNCTION	0.55	6.99	4874.99	0	01:15	6.99
944	1216	JUNCTION	0.00	0.00	4882.00	0	00:00	0.00
945	1217	JUNCTION	0.60	7.00	4880.00	0	01:11	7.00
946	122	JUNCTION	0.00	0.00	4983.00	0	00:00	0.00
947	1223	JUNCTION	0.46	4.61	4884.61	0	01:05	4.61
948	1224	JUNCTION	0.00	0.00	4890.00	0	00:00	0.00
949	1226	JUNCTION	0.00	0.00	4895.00	0	00:00	0.00
950	1228	JUNCTION	0.00	0.00	4903.00	0	00:00	0.00
951	1230	JUNCTION	0.00	0.00	4883.00	0	00:00	0.00
952	1231	JUNCTION	0.34	4.18	4912.18	0	00:47	4.18
953	1232	JUNCTION	0.00	0.00	4955.00	0	00:00	0.00
954	1233	JUNCTION	0.15	2.55	4919.55	0	00:48	2.55
955	1233_Lake	JUNCTION	0.15	2.93	4913.93	0	00:47	2.92
956	1234	JUNCTION	0.00	0.00	4960.00	0	00:00	0.00
957	1235	JUNCTION	0.12	2.06	4943.06	0	00:45	2.06
958	1236	JUNCTION	0.00	0.00	4998.00	0	00:00	0.00
959	1237	JUNCTION	0.11	2.39	4975.39	0	00:45	2.39
960	1238	JUNCTION	0.00	0.00	5005.00	0	00:00	0.00
961	1239	JUNCTION	0.50	5.05	4959.05	0	01:03	5.05
962	1239_Lake	JUNCTION	0.30	3.10	4944.10	0	01:03	3.10
963	1240	JUNCTION	0.00	0.00	4981.00	0	00:00	0.00
964	1247	JUNCTION	1.14	3.56	4949.56	0	00:45	3.56
965	1248	JUNCTION	0.00	0.00	4967.00	0	00:00	0.00
966	1249	JUNCTION	0.11	2.39	4959.39	0	00:46	2.38
967	1255	JUNCTION	0.40	4.06	4969.06	0	00:58	4.06
968	1256	JUNCTION	0.00	0.00	4993.00	0	00:00	0.00
969	1257	JUNCTION	0.32	4.06	4974.06	0	00:58	4.05
970	1258	JUNCTION	0.00	0.00	4989.00	0	00:00	0.00
971	1259	JUNCTION	0.03	0.47	4990.47	0	00:55	0.47
972	126	JUNCTION	0.02	0.30	4999.30	0	00:45	0.30
973	1260	JUNCTION	0.00	0.00	5019.00	0	00:00	0.00
974	1264	JUNCTION	0.00	0.00	4876.00	0	00:00	0.00
975	1272	JUNCTION	0.00	0.00	4880.00	0	00:00	0.00
976	1273	JUNCTION	0.49	5.06	4964.06	0	00:59	5.06
977	1274	JUNCTION	0.00	0.00	4978.00	0	00:00	0.00
978	129	JUNCTION	0.03	0.88	4835.88	0	00:45	0.88
979	130	JUNCTION	0.00	0.00	4910.00	0	00:00	0.00
980	1308	JUNCTION	0.00	0.00	4891.00	0	00:00	0.00
981	1310	JUNCTION	0.00	0.00	4912.00	0	00:00	0.00
982	1315	JUNCTION	0.44	4.94	4897.94	0	01:03	4.93
983	1316	JUNCTION	0.44	4.94	4908.94	0	01:00	4.94
984	1318	JUNCTION	0.00	0.00	4923.00	0	00:00	0.00
985	1319	JUNCTION	0.07	1.58	4930.58	0	00:40	1.58
986	1320	JUNCTION	0.00	0.00	4970.00	0	00:00	0.00
987	1321	JUNCTION	0.10	1.47	4932.47	0	00:50	1.47
988	1322	JUNCTION	0.00	0.00	4975.00	0	00:00	0.00
989	1341	JUNCTION	0.08	1.30	4958.30	0	00:47	1.30
990	1324	JUNCTION	0.00	0.00	4975.00	0	00:00	0.00

991	1327	JUNCTION	0.01	0.10	4984.10	0	01:05	0.10
992	1328	JUNCTION	0.00	0.00	4989.00	0	00:00	0.00
993	133	JUNCTION	0.03	0.97	4917.97	0	00:40	0.97
994	134	JUNCTION	0.00	0.00	4945.00	0	00:00	0.00
995	1340	JUNCTION	0.35	3.71	4949.71	0	00:57	3.71
996	1347	JUNCTION	0.13	1.67	4950.67	0	00:54	1.67
997	1348	JUNCTION	0.00	0.00	4981.00	0	00:00	0.00
998	1349	JUNCTION	0.21	2.34	4954.34	0	00:59	2.34
999	1351	JUNCTION	0.18	2.29	4981.29	0	00:55	2.29
1000	1352	JUNCTION	0.00	0.00	5019.00	0	00:00	0.00
1001	1353	JUNCTION	0.15	2.10	4987.10	0	00:50	2.10
1002	1354	JUNCTION	0.00	0.00	5028.00	0	00:00	0.00
1003	1355	JUNCTION	0.22	2.34	4973.34	0	00:56	2.34
1004	1356	JUNCTION	0.00	0.00	4989.00	0	00:00	0.00
1005	1357	JUNCTION	0.21	2.33	4983.33	0	00:54	2.33
1006	1358	JUNCTION	0.00	0.00	4993.00	0	00:00	0.00
1007	1361	JUNCTION	0.13	1.86	5025.86	0	00:37	1.84
1008	1362	JUNCTION	0.00	0.00	5035.00	0	00:00	0.00
1009	1363	JUNCTION	0.02	0.65	5038.65	0	00:35	0.65
1010	1364	JUNCTION	0.00	0.00	5058.00	0	00:00	0.00
1011	1367	JUNCTION	0.07	1.34	5034.34	0	00:35	1.34
1012	1368	JUNCTION	0.00	0.00	5059.00	0	00:00	0.00
1013	1371	JUNCTION	0.12	1.67	4972.67	0	00:50	1.67
1014	1372	JUNCTION	0.00	0.00	4988.00	0	00:00	0.00
1015	138	JUNCTION	0.03	1.00	4971.00	0	00:35	1.00
1016	1382	JUNCTION	0.00	0.00	4921.00	0	00:00	0.00
1017	1386	JUNCTION	0.00	0.00	4960.00	0	00:00	0.00
1018	1387	JUNCTION	0.06	1.19	4944.19	0	00:45	1.19
1019	1388	JUNCTION	0.00	0.00	4995.00	0	00:00	0.00
1020	139	JUNCTION	0.17	3.39	4820.39	0	00:43	3.38
1021	1392	JUNCTION	0.00	0.00	4938.00	0	00:00	0.00
1022	1393	JUNCTION	0.12	1.55	4941.55	0	00:50	1.55
1023	1394	JUNCTION	0.00	0.00	4997.00	0	00:00	0.00
1024	1395	JUNCTION	0.08	1.75	4948.75	0	00:40	1.75
1025	1396	JUNCTION	0.00	0.00	4969.00	0	00:00	0.00
1026	1398	JUNCTION	0.00	0.00	4972.00	0	00:00	0.00
1027	141	JUNCTION	0.10	2.16	4829.16	0	00:42	2.15
1028	142	JUNCTION	0.00	0.00	4820.00	0	00:00	0.00
1029	146	JUNCTION	0.02	0.32	4849.32	0	00:55	0.32
1030	149	JUNCTION	0.06	1.43	4870.43	0	00:40	1.43
1031	150	JUNCTION	0.00	0.00	4890.00	0	00:00	0.00
1032	154	JUNCTION	0.03	1.00	4905.00	0	00:35	1.00
1033	210	JUNCTION	0.00	0.00	4770.00	0	00:00	0.00
1034	220	JUNCTION	0.00	0.00	4777.00	0	00:00	0.00
1035	221	JUNCTION	0.23	4.51	4795.11	0	00:50	4.51
1036	223	JUNCTION	0.05	1.04	4794.04	0	00:45	1.04
1037	224	JUNCTION	0.00	0.00	4810.00	0	00:00	0.00
1038	225	JUNCTION	0.05	1.04	4841.04	0	00:41	1.04
1039	226	JUNCTION	0.00	0.00	4850.00	0	00:00	0.00
1040	228	JUNCTION	0.05	0.99	4864.99	0	00:40	0.98
1041	231	JUNCTION	0.09	1.91	4792.71	0	00:50	1.91
1042	232	JUNCTION	0.00	0.00	4810.00	0	00:00	0.00
1043	235	JUNCTION	0.09	1.93	4846.93	0	00:45	1.93
1044	236	JUNCTION	0.00	0.00	4847.00	0	00:00	0.00
1045	237	JUNCTION	0.10	2.30	4848.30	0	00:45	2.30
1046	239	JUNCTION	0.17	3.81	4853.81	0	00:45	3.81
1047	240	JUNCTION	0.00	0.00	4849.00	0	00:00	0.00
1048	241	JUNCTION	0.17	3.81	4865.81	0	00:43	3.81
1049	243	JUNCTION	0.14	3.30	4866.30	0	00:43	3.29
1050	244	JUNCTION	0.00	0.00	4894.00	0	00:00	0.00
1051	245	JUNCTION	0.13	3.33	4983.33	0	00:40	3.33
1052	247	JUNCTION	0.04	0.89	4981.89	0	00:42	0.88
1053	248	JUNCTION	0.00	0.00	4986.00	0	00:00	0.00
1054	250	JUNCTION	0.03	0.93	5015.93	0	00:35	0.93
1055	252	JUNCTION	0.00	0.00	4990.00	0	00:00	0.00
1056	256	JUNCTION	0.00	0.00	4851.00	0	00:00	0.00

1057	259	JUNCTION	0.08	1.74	4864.74	0	00:44	1.74
1058	260	JUNCTION	0.00	0.00	4905.00	0	00:00	0.00
1059	263	JUNCTION	0.07	1.75	4923.75	0	00:41	1.74
1060	264	JUNCTION	0.00	0.00	4991.00	0	00:00	0.00
1061	268	JUNCTION	0.04	0.90	4991.90	0	00:40	0.90
1062	310	JUNCTION	0.00	0.00	4778.00	0	00:00	0.00
1063	314	JUNCTION	0.03	0.67	4839.67	0	00:40	0.67
1064	410	JUNCTION	0.00	0.00	4793.00	0	00:00	0.00
1065	414	JUNCTION	0.00	0.00	4796.00	0	00:00	0.00
1066	418	JUNCTION	0.00	0.00	4802.00	0	00:00	0.00
1067	422	JUNCTION	0.00	0.00	4800.00	0	00:00	0.00
1068	426	JUNCTION	0.00	0.00	4810.00	0	00:00	0.00
1069	510	JUNCTION	0.00	0.00	4856.00	0	00:00	0.00
1070	513	JUNCTION	0.06	1.36	4881.36	0	00:40	1.36
1071	514	JUNCTION	0.00	0.00	4931.00	0	00:00	0.00
1072	518	JUNCTION	0.00	0.00	4940.00	0	00:00	0.00
1073	610	JUNCTION	0.00	0.00	4858.00	0	00:00	0.00
1074	613	JUNCTION	0.05	1.24	4889.24	0	00:41	1.24
1075	614	JUNCTION	0.00	0.00	4899.00	0	00:00	0.00
1076	617	JUNCTION	0.06	1.50	4943.50	0	00:41	1.50
1077	618	JUNCTION	0.00	0.00	4950.00	0	00:00	0.00
1078	620	JUNCTION	0.00	0.00	4920.00	0	00:00	0.00
1079	622	JUNCTION	0.06	1.52	4982.52	0	00:35	1.50
1080	708	JUNCTION	0.04	0.69	4851.69	0	00:50	0.69
1081	709	JUNCTION	0.03	0.59	4866.59	0	00:49	0.59
1082	710	JUNCTION	0.03	0.55	4871.55	0	00:49	0.55
1083	711	JUNCTION	0.05	0.91	4889.91	0	00:47	0.90
1084	712	JUNCTION	0.02	0.41	4915.41	0	00:45	0.41
1085	713	JUNCTION	0.05	0.91	4898.91	0	00:46	0.90
1086	714	JUNCTION	0.00	0.00	4864.00	0	00:00	0.00
1087	804	JUNCTION	0.00	0.00	4882.00	0	00:00	0.00
1088	808	JUNCTION	0.33	9.66	4894.66	0	00:48	9.60
1089	809	JUNCTION	0.33	9.66	4899.66	0	00:48	9.60
1090	810	JUNCTION	0.00	0.00	4925.00	0	00:00	0.00
1091	811	JUNCTION	0.14	3.30	4896.30	0	00:48	3.29
1092	819	JUNCTION	0.14	3.31	4904.31	0	00:46	3.30
1093	820	JUNCTION	0.00	0.00	4945.00	0	00:00	0.00
1094	822	JUNCTION	0.01	0.22	4932.22	0	00:45	0.22
1095	823	JUNCTION	0.07	1.71	4909.71	0	00:44	1.71
1096	824	JUNCTION	0.00	0.14	4961.14	0	00:35	0.14
1097	829	JUNCTION	0.07	1.71	4919.71	0	00:44	1.71
1098	830	JUNCTION	0.00	0.00	4972.00	0	00:00	0.00
1099	831	JUNCTION	0.14	3.53	4932.03	0	00:45	3.53
1100	834	JUNCTION	0.25	4.00	4936.00	0	00:26	4.00
1101	838	JUNCTION	0.28	6.56	4955.56	0	00:41	6.55
1102	839	JUNCTION	0.19	3.57	4968.57	0	00:42	3.55
1103	840	JUNCTION	0.00	0.00	4990.00	0	00:00	0.00
1104	841	JUNCTION	0.19	3.57	4970.57	0	00:41	3.56
1105	842	JUNCTION	0.00	0.00	5000.00	0	00:00	0.00
1106	843	JUNCTION	0.28	6.56	4965.56	0	00:41	6.55
1107	844	JUNCTION	0.00	0.00	4995.00	0	00:00	0.00
1108	850	JUNCTION	0.07	1.78	4991.78	0	00:35	1.77
1109	910	JUNCTION	0.00	0.00	4916.00	0	00:00	0.00
1110	911	JUNCTION	0.24	2.85	4915.85	0	00:53	2.85
1111	912	JUNCTION	0.24	2.85	4922.85	0	00:52	2.84
1112	929	JUNCTION	0.21	2.39	4924.39	0	00:59	2.39
1113	930	JUNCTION	0.00	0.00	4927.00	0	00:00	0.00
1114	931	JUNCTION	0.19	2.41	4956.41	0	00:50	2.41
1115	940	JUNCTION	0.00	0.00	4986.00	0	00:00	0.00
1116	950	JUNCTION	0.00	0.00	4977.00	0	00:00	0.00
1117	960	JUNCTION	0.00	0.00	4970.00	0	00:00	0.00
1118	O_1107	JUNCTION	0.43	6.70	4784.70	0	01:01	6.68
1119	O_1263	JUNCTION	0.00	0.00	4812.00	0	00:00	0.00
1120	O_1307	JUNCTION	0.24	3.77	4868.77	0	01:03	3.76
1121	O_220	JUNCTION	0.24	4.49	4776.49	0	00:54	4.49
1122	O_300	JUNCTION	0.03	0.66	4778.66	0	00:47	0.65

O_500	JUNCTION	0.06	1.33	4827.33	0	00:47	1.32	
O_600	JUNCTION	0.05	1.20	4816.20	0	00:49	1.20	
O_708	JUNCTION	0.04	0.69	4828.69	0	00:50	0.69	
O_803	JUNCTION	0.18	4.16	4869.16	0	00:50	4.16	
O_909	JUNCTION	0.09	1.45	4866.45	0	00:59	1.45	
1323	JUNCTION	0.08	1.30	4967.30	0	00:45	1.30	
CulvertOut_1233	JUNCTION	0.15	2.93	4916.93	0	00:46	2.93	
O_100	OUTFALL	0.00	0.00	4778.00	0	00:00	0.00	
O_1000	OUTFALL	0.00	0.00	4756.00	0	00:00	0.00	
836	DIVIDER	0.25	4.00	4949.00	0	00:25	4.00	

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Node Inflow Summary
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Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
1002	JUNCTION	0.00	11827.16	0 01:13	0	407	0.000
1004	JUNCTION	0.00	11771.67	0 01:11	0	404	0.000
1006_RR	JUNCTION	0.00	9915.70	0 01:11	0	340	0.000
1008	JUNCTION	0.00	9916.98	0 01:11	0	340	0.000
1010	JUNCTION	0.00	9893.47	0 01:10	0	339	0.000
1012	JUNCTION	0.00	9692.75	0 01:08	0	331	0.000
1014	JUNCTION	0.00	8297.64	0 01:08	0	287	0.000
1016	JUNCTION	0.00	8281.74	0 01:08	0	286	0.000
1018	JUNCTION	0.00	8264.69	0 01:07	0	285	0.000
1020	JUNCTION	0.00	8249.22	0 01:07	0	285	0.000
1022	JUNCTION	0.00	8202.51	0 01:06	0	283	0.000
1024	JUNCTION	0.00	8201.97	0 01:05	0	283	0.000
1026	JUNCTION	0.00	8129.20	0 01:05	0	280	0.000
1028	JUNCTION	0.00	8082.29	0 01:04	0	278	0.000
1030	JUNCTION	0.00	7567.13	0 01:04	0	260	0.000
1032	JUNCTION	22.60	22.60	0 00:35	0.436	0.436	0.000
1034	JUNCTION	0.00	5553.94	0 01:02	0	181	0.000
1036	JUNCTION	0.00	5554.30	0 01:01	0	181	0.000
1038	JUNCTION	0.00	5518.62	0 01:00	0	179	0.000
1040	JUNCTION	0.00	5505.76	0 00:59	0	179	0.000
1042	JUNCTION	0.00	5343.97	0 00:59	0	174	0.000
1044	JUNCTION	0.00	5305.15	0 00:58	0	172	0.000
1046	JUNCTION	0.00	5219.57	0 00:58	0	168	0.000
1048	JUNCTION	0.00	5220.06	0 00:57	0	168	0.000
1050	JUNCTION	0.00	2751.38	0 00:51	0	73.5	0.000
109	JUNCTION	0.00	1459.58	0 00:54	0	43.9	0.000
110	JUNCTION	72.62	72.62	0 01:05	3.55	3.55	0.000
1108	JUNCTION	7.59	7.59	0 00:35	0.152	0.152	0.000
1110	JUNCTION	28.58	28.58	0 00:40	0.739	0.739	0.000
1115	JUNCTION	0.00	1507.07	0 01:01	0	44.4	0.000
1116	JUNCTION	144.71	144.71	0 00:40	3.21	3.21	0.000
1123	JUNCTION	0.00	1393.99	0 00:59	0	40.4	0.000
1124	JUNCTION	65.92	65.92	0 00:40	1.52	1.52	0.000
1125	JUNCTION	0.00	231.67	0 00:30	0	3.09	0.000
1126	JUNCTION	231.67	231.67	0 00:30	3.09	3.09	0.000
1127	JUNCTION	0.00	1348.41	0 00:57	0	38.9	0.000
113	JUNCTION	0.00	1389.07	0 00:54	0	40.4	0.000
1130	JUNCTION	0.00	1289.35	0 00:56	0	35.8	0.000
1132	JUNCTION	54.44	54.44	0 00:35	1.07	1.07	0.000
1139	JUNCTION	0.00	1254.85	0 00:57	0	34.7	0.000
114	JUNCTION	157.30	157.30	0 00:50	5.4	5.4	0.000
1140	JUNCTION	278.22	278.22	0 00:40	5.63	5.63	0.000
1141	JUNCTION	0.00	1108.83	0 00:51	0	28.8	0.000
1142	JUNCTION	48.51	48.51	0 00:35	1.11	1.11	0.000

1189	1144	JUNCTION	203.80	203.80	0	00:35	3.74	3.74	0.000
1190	1147	JUNCTION	0.00	1071.12	0	00:49	0	27.7	0.000
1191	1148	JUNCTION	194.50	194.50	0	00:40	5.12	5.12	0.000
1192	115	JUNCTION	0.00	1277.69	0	00:46	0	34.5	0.000
1193	1150	JUNCTION	44.33	44.33	0	00:55	2.02	2.02	0.000
1194	1151	JUNCTION	0.00	550.92	0	00:41	0	12.7	0.000
1195	1152	JUNCTION	77.44	77.44	0	00:35	1.46	1.46	0.000
1196	1153	JUNCTION	0.00	482.10	0	00:42	0	11.3	0.000
1197	1154	JUNCTION	164.54	164.54	0	00:40	3.9	3.9	0.000
1198	1155	JUNCTION	0.00	861.26	0	00:44	0	20.5	0.000
1199	1156	JUNCTION	148.41	148.41	0	00:40	3.98	3.98	0.000
1200	1163	JUNCTION	0.00	327.56	0	00:40	0	7.34	-0.000
1201	1164	JUNCTION	327.56	327.56	0	00:40	7.34	7.34	0.000
1202	117	JUNCTION	0.00	820.58	0	00:47	0	22.2	0.000
1203	1170	JUNCTION	0.00	148.41	0	00:40	0	3.98	0.000
1204	1172	JUNCTION	28.40	28.40	0	00:50	1.25	1.25	0.000
1205	118	JUNCTION	53.02	53.02	0	00:50	1.8	1.8	0.000
1206	1180	JUNCTION	25.72	25.72	0	00:40	0.701	0.701	0.000
1207	119	JUNCTION	0.00	769.18	0	00:45	0	20.4	-0.000
1208	1208	JUNCTION	109.25	109.25	0	00:40	2.63	2.63	0.000
1209	1209	JUNCTION	0.00	73.20	0	00:50	0	2.71	0.000
1210	121	JUNCTION	0.00	250.65	0	00:50	0	8.55	0.000
1211	1210	JUNCTION	73.20	73.20	0	00:50	2.71	2.71	0.000
1212	1215	JUNCTION	0.00	1379.66	0	01:15	0	53.7	0.000
1213	1216	JUNCTION	100.68	100.68	0	01:10	5.58	5.58	0.000
1214	1217	JUNCTION	0.00	1384.38	0	01:11	0	53.6	0.000
1215	122	JUNCTION	235.38	235.38	0	00:45	7.46	7.46	0.000
1216	1223	JUNCTION	0.00	1224.81	0	01:05	0	45.2	0.000
1217	1224	JUNCTION	97.13	97.13	0	00:55	4	4	0.000
1218	1226	JUNCTION	60.04	60.04	0	00:50	2.49	2.49	0.000
1219	1228	JUNCTION	37.67	37.67	0	00:55	1.68	1.68	0.000
1220	1230	JUNCTION	46.76	46.76	0	00:45	1.48	1.48	0.000
1221	1231	JUNCTION	0.00	1097.43	0	00:47	0	34.5	-0.000
1222	1232	JUNCTION	401.77	401.77	0	00:35	7.57	7.57	0.000
1223	1233	JUNCTION	0.00	503.57	0	00:46	0	14.5	0.000
1224	1233_Lake	JUNCTION	0.00	503.44	0	00:47	0	14.5	0.000
1225	1234	JUNCTION	132.99	132.99	0	00:35	2.94	2.94	0.000
1226	1235	JUNCTION	0.00	152.61	0	00:45	0	4.64	0.000
1227	1236	JUNCTION	152.61	152.61	0	00:45	4.64	4.64	0.000
1228	1237	JUNCTION	0.00	169.91	0	00:45	0	4.99	0.000
1229	1238	JUNCTION	169.91	169.91	0	00:45	4.99	4.99	0.000
1230	1239	JUNCTION	0.00	327.01	0	01:02	0	12.4	0.000
1231	1239_Lake	JUNCTION	0.00	326.98	0	01:03	0	12.4	0.000
1232	1240	JUNCTION	41.19	41.19	0	00:45	1.21	1.21	0.000
1233	1247	JUNCTION	0.00	232.62	0	00:45	0	6.92	0.000
1234	1248	JUNCTION	63.07	63.07	0	00:45	1.92	1.92	0.000
1235	1249	JUNCTION	0.00	169.71	0	00:46	0	4.99	0.000
1236	1255	JUNCTION	0.00	269.03	0	00:58	0	10.2	0.000
1237	1256	JUNCTION	141.99	141.99	0	00:40	3.75	3.75	0.000
1238	1257	JUNCTION	0.00	158.77	0	00:58	0	6.41	0.000
1239	1258	JUNCTION	89.11	89.11	0	00:45	3.01	3.01	0.000
1240	1259	JUNCTION	0.00	77.98	0	00:55	0	3.37	0.000
1241	126	JUNCTION	31.01	31.01	0	00:45	1.02	1.02	0.000
1242	1260	JUNCTION	77.98	77.98	0	00:55	3.37	3.37	0.000
1243	1264	JUNCTION	47.68	47.68	0	00:45	1.58	1.58	0.000
1244	1272	JUNCTION	15.89	15.89	0	00:50	0.624	0.624	0.000
1245	1273	JUNCTION	0.00	292.49	0	00:59	0	11.2	0.000
1246	1274	JUNCTION	24.44	24.44	0	00:50	1.02	1.02	0.000
1247	129	JUNCTION	0.00	522.01	0	00:45	0	11.8	0.000
1248	130	JUNCTION	65.49	65.49	0	00:50	2.47	2.47	0.000
1249	1308	JUNCTION	66.76	66.76	0	00:55	2.78	2.78	0.000
1250	1310	JUNCTION	45.31	45.31	0	00:50	1.77	1.77	0.000
1251	1315	JUNCTION	0.00	2640.29	0	01:00	0	91.5	0.000
1252	1316	JUNCTION	139.78	1761.75	0	01:00	4.95	62.1	0.000
1253	1318	JUNCTION	40.00	40.00	0	00:50	1.58	1.58	0.000
1254	1319	JUNCTION	0.00	125.09	0	00:40	0	2.66	0.000

1255	1320	JUNCTION	125.09	125.09	0	00:40	2.66	2.66	0.000
1256	1321	JUNCTION	0.00	108.62	0	00:50	0	3.68	0.000
1257	1322	JUNCTION	108.62	108.62	0	00:50	3.68	3.68	0.000
1258	1341	JUNCTION	0.00	80.91	0	00:47	0	2.56	0.000
1259	1324	JUNCTION	81.37	81.37	0	00:45	2.56	2.56	0.000
1260	1327	JUNCTION	0.00	7.46	0	01:05	0	0.431	0.000
1261	1328	JUNCTION	7.46	7.46	0	01:05	0.431	0.431	0.000
1262	133	JUNCTION	0.00	474.02	0	00:39	0	9.28	0.000
1263	134	JUNCTION	159.32	159.32	0	00:35	3.48	3.48	0.000
1264	1340	JUNCTION	286.91	1427.84	0	00:57	7.21	50.7	0.000
1265	1347	JUNCTION	0.00	281.44	0	00:52	0	9.99	0.000
1266	1348	JUNCTION	108.46	108.46	0	00:45	3.65	3.65	0.000
1267	1349	JUNCTION	52.09	807.59	0	01:00	1.79	29.1	0.000
1268	1351	JUNCTION	0.00	328.80	0	00:55	0	11.6	0.000
1269	1352	JUNCTION	154.57	154.57	0	00:55	6.1	6.1	0.000
1270	1353	JUNCTION	0.00	176.29	0	00:50	0	5.5	-0.000
1271	1354	JUNCTION	94.66	94.66	0	00:50	3.4	3.4	0.000
1272	1355	JUNCTION	0.00	432.23	0	00:56	0	15.2	0.000
1273	1356	JUNCTION	142.76	142.76	0	00:50	4.97	4.97	0.000
1274	1357	JUNCTION	0.00	296.16	0	00:54	0	10.2	0.000
1275	1358	JUNCTION	143.13	143.13	0	00:55	5.76	5.76	0.000
1276	1361	JUNCTION	0.00	182.74	0	00:37	0	4.27	0.000
1277	1362	JUNCTION	19.06	19.06	0	01:00	1.01	1.01	0.000
1278	1363	JUNCTION	0.00	171.04	0	00:35	0	3.26	0.000
1279	1364	JUNCTION	171.04	171.04	0	00:35	3.26	3.26	0.000
1280	1367	JUNCTION	0.00	91.55	0	00:35	0	2.07	0.000
1281	1368	JUNCTION	91.55	91.55	0	00:35	2.07	2.07	0.000
1282	1371	JUNCTION	0.00	176.16	0	00:50	0	6.33	0.000
1283	1372	JUNCTION	176.16	176.16	0	00:50	6.33	6.33	0.000
1284	138	JUNCTION	336.11	336.11	0	00:35	5.75	5.75	0.000
1285	1382	JUNCTION	86.77	86.77	0	01:05	4.36	4.36	0.000
1286	1386	JUNCTION	39.22	39.22	0	01:00	1.93	1.93	0.000
1287	1387	JUNCTION	0.00	215.50	0	00:45	0	6.18	-0.000
1288	1388	JUNCTION	215.50	215.50	0	00:45	6.18	6.18	0.000
1289	139	JUNCTION	0.00	464.94	0	00:43	0	12.4	0.000
1290	1392	JUNCTION	146.74	146.74	0	00:45	4.4	4.4	0.000
1291	1393	JUNCTION	0.00	150.85	0	00:50	0	5.78	0.000
1292	1394	JUNCTION	150.85	150.85	0	00:50	5.78	5.78	0.000
1293	1395	JUNCTION	0.00	405.87	0	00:40	0	9.44	0.000
1294	1396	JUNCTION	238.22	238.22	0	00:40	5.64	5.64	0.000
1295	1398	JUNCTION	170.85	170.85	0	00:35	3.8	3.8	0.000
1296	141	JUNCTION	0.00	443.51	0	00:42	0	11.4	0.000
1297	142	JUNCTION	23.12	23.12	0	00:50	1.01	1.01	0.000
1298	146	JUNCTION	48.81	48.81	0	00:55	2.28	2.28	0.000
1299	149	JUNCTION	0.00	401.01	0	00:40	0	9.08	0.000
1300	150	JUNCTION	99.87	99.87	0	00:45	3.26	3.26	0.000
1301	154	JUNCTION	316.19	316.19	0	00:35	5.8	5.8	0.000
1302	210	JUNCTION	90.08	90.08	0	00:45	2.43	2.43	0.000
1303	220	JUNCTION	134.31	134.31	0	00:50	4.78	4.78	0.000
1304	221	JUNCTION	0.00	2159.63	0	00:50	0	59.1	0.000
1305	223	JUNCTION	0.00	397.28	0	00:45	0	11	0.000
1306	224	JUNCTION	102.13	102.13	0	00:45	3.15	3.15	0.000
1307	225	JUNCTION	0.00	297.42	0	00:41	0	7.87	0.000
1308	226	JUNCTION	157.08	157.08	0	00:40	3.81	3.81	0.000
1309	228	JUNCTION	142.96	142.96	0	00:40	4.05	4.05	0.000
1310	231	JUNCTION	0.00	1771.84	0	00:50	0	48.1	0.000
1311	232	JUNCTION	138.79	138.79	0	00:55	5.26	5.26	0.000
1312	235	JUNCTION	0.00	1663.11	0	00:45	0	42.5	0.000
1313	236	JUNCTION	105.63	105.63	0	00:45	3.49	3.49	0.000
1314	237	JUNCTION	0.00	1557.59	0	00:45	0	39	0.000
1315	239	JUNCTION	0.00	1524.53	0	00:45	0	38	0.000
1316	240	JUNCTION	33.33	33.33	0	00:45	1.04	1.04	0.000
1317	241	JUNCTION	0.00	1343.38	0	00:43	0	32.4	0.000
1318	243	JUNCTION	0.00	900.77	0	00:43	0	20.4	0.000
1319	244	JUNCTION	237.04	237.04	0	00:40	5.92	5.92	0.000
1320	245	JUNCTION	0.00	680.47	0	00:40	0	14.4	0.000

1321	247	JUNCTION	0.00	509.02	0	00:39	0	9.99	0.000
1322	248	JUNCTION	372.42	372.42	0	00:35	7	7	0.000
1323	250	JUNCTION	181.64	181.64	0	00:35	2.96	2.96	0.000
1324	252	JUNCTION	172.98	172.98	0	00:40	4.43	4.43	0.000
1325	256	JUNCTION	182.91	182.91	0	00:45	5.55	5.55	0.000
1326	259	JUNCTION	0.00	444.89	0	00:45	0	12	0.000
1327	260	JUNCTION	98.74	98.74	0	00:50	3.33	3.33	0.000
1328	263	JUNCTION	0.00	350.78	0	00:41	0	8.68	0.000
1329	264	JUNCTION	195.65	195.65	0	00:40	4.78	4.78	0.000
1330	268	JUNCTION	158.12	158.12	0	00:40	3.89	3.89	0.000
1331	310	JUNCTION	110.61	110.61	0	00:50	3.8	3.8	0.000
1332	314	JUNCTION	168.04	168.04	0	00:40	3.88	3.88	0.000
1333	410	JUNCTION	19.09	19.09	0	00:45	0.65	0.65	0.000
1334	414	JUNCTION	19.85	19.85	0	00:45	0.579	0.579	0.000
1335	418	JUNCTION	53.79	53.79	0	00:50	1.97	1.97	0.000
1336	422	JUNCTION	2.89	2.89	0	00:40	0.0781	0.0781	0.000
1337	426	JUNCTION	52.54	52.54	0	00:50	1.97	1.97	0.000
1338	510	JUNCTION	174.84	174.84	0	00:50	6.55	6.55	0.000
1339	513	JUNCTION	0.00	456.02	0	00:40	0	11.1	0.000
1340	514	JUNCTION	229.26	229.26	0	00:40	6	6	0.000
1341	518	JUNCTION	226.75	226.75	0	00:40	5.15	5.15	0.000
1342	610	JUNCTION	145.90	145.90	0	00:50	5.68	5.68	0.000
1343	613	JUNCTION	0.00	846.72	0	00:41	0	17.8	0.000
1344	614	JUNCTION	321.94	321.94	0	00:35	6.49	6.49	0.000
1345	617	JUNCTION	0.00	550.30	0	00:38	0	11.2	0.000
1346	618	JUNCTION	216.70	216.70	0	00:35	3.84	3.84	0.000
1347	620	JUNCTION	37.16	37.16	0	01:00	1.89	1.89	0.000
1348	622	JUNCTION	359.48	359.48	0	00:35	7.38	7.38	0.000
1349	708	JUNCTION	0.00	172.28	0	00:50	0	5.23	0.000
1350	709	JUNCTION	0.00	172.38	0	00:49	0	5.22	0.000
1351	710	JUNCTION	0.00	172.39	0	00:49	0	5.22	0.000
1352	711	JUNCTION	0.00	172.62	0	00:47	0	5.21	0.000
1353	712	JUNCTION	173.25	173.25	0	00:45	5.21	5.21	0.000
1354	713	JUNCTION	0.00	172.84	0	00:46	0	5.21	0.000
1355	714	JUNCTION	51.50	51.50	0	00:40	1.18	1.18	0.000
1356	804	JUNCTION	25.42	25.42	0	00:40	0.602	0.602	0.000
1357	808	JUNCTION	0.00	2057.59	0	00:48	0	46.8	0.000
1358	809	JUNCTION	0.00	2057.58	0	00:48	0	46.8	0.000
1359	810	JUNCTION	189.76	189.76	0	00:40	4.7	4.7	0.000
1360	811	JUNCTION	0.00	1882.17	0	00:48	0	42.1	0.000
1361	819	JUNCTION	0.00	1887.34	0	00:46	0	42.1	-0.000
1362	820	JUNCTION	331.20	331.20	0	00:35	5.64	5.64	0.000
1363	822	JUNCTION	0.00	146.07	0	00:45	0	3.24	0.000
1364	823	JUNCTION	0.00	1511.25	0	00:44	0	33.1	0.000
1365	824	JUNCTION	164.89	164.89	0	00:35	3.18	3.18	0.000
1366	829	JUNCTION	0.00	1511.40	0	00:44	0	33.1	0.000
1367	830	JUNCTION	293.93	293.93	0	00:35	4.86	4.86	0.000
1368	831	JUNCTION	0.00	1290.07	0	00:45	0	28.3	0.000
1369	834	JUNCTION	0.00	1299.30	0	00:42	0	28.2	0.000
1370	838	JUNCTION	0.00	1300.31	0	00:41	0	28.2	0.000
1371	839	JUNCTION	0.00	845.95	0	00:41	0	19	0.000
1372	840	JUNCTION	199.86	199.86	0	00:40	4.63	4.63	0.000
1373	841	JUNCTION	0.00	649.41	0	00:41	0	14.4	-0.000
1374	842	JUNCTION	353.28	353.28	0	00:40	7.79	7.79	0.000
1375	843	JUNCTION	0.00	1300.42	0	00:41	0	28.2	0.000
1376	844	JUNCTION	523.46	523.46	0	00:35	9.24	9.24	0.000
1377	850	JUNCTION	316.04	316.04	0	00:35	6.53	6.53	0.000
1378	910	JUNCTION	140.59	140.59	0	00:50	5.08	5.08	0.000
1379	911	JUNCTION	0.00	601.74	0	00:53	0	20.9	0.000
1380	912	JUNCTION	0.00	602.04	0	00:52	0	20.9	0.000
1381	929	JUNCTION	0.00	602.04	0	00:52	0	20.9	0.000
1382	930	JUNCTION	334.77	334.77	0	00:40	7.52	7.52	0.000
1383	931	JUNCTION	0.00	359.16	0	00:50	0	13.2	0.000
1384	940	JUNCTION	137.30	137.30	0	00:50	5.01	5.01	0.000
1385	950	JUNCTION	145.62	145.62	0	00:55	6.1	6.1	0.000
1386	960	JUNCTION	85.75	85.75	0	00:40	2.11	2.11	0.000

1387	O_1107	JUNCTION	0.00	1511.21	0	01:01	0	44.6	0.000
1388	O_1263	JUNCTION	0.00	1414.86	0	01:15	0	55.3	0.000
1389	O_1307	JUNCTION	0.00	2696.95	0	01:03	0	94.5	0.000
1390	O_220	JUNCTION	0.00	2273.28	0	00:54	0	64	0.000
1391	O_300	JUNCTION	0.00	269.56	0	00:49	0	7.72	0.000
1392	O_500	JUNCTION	0.00	609.28	0	00:48	0	17.8	0.000
1393	O_600	JUNCTION	0.00	945.45	0	00:49	0	23.7	0.000
1394	O_708	JUNCTION	0.00	172.27	0	00:50	0	5.23	0.000
1395	O_803	JUNCTION	0.00	2071.87	0	00:50	0	47.5	0.000
1396	O_909	JUNCTION	0.00	727.72	0	00:59	0	26.1	0.000
1397	1323	JUNCTION	0.00	81.37	0	00:45	0	2.56	0.000
1398	CulvertOut_1233	JUNCTION	0.00	503.57	0	00:46	0	14.5	0.000
1399	O_100	OUTFALL	0.00	1459.58	0	00:54	0	43.9	0.000
1400	O_1000	OUTFALL	0.00	11827.16	0	01:13	0	407	0.000
1401	836	DIVIDER	0.00	1299.70	0	00:41	0	28.2	0.000
1402									
1403									
1404	**********								
1405	Node Flooding Summary								
1406	**********								
1407									
1408	No nodes were flooded.								
1409									
1410									
1411	**********								
1412	Outfall Loading Summary								
1413	**********								
1414									

1415	---				
1416		Flow	Avg	Max	Total
1417		Freq	Flow	Flow	Volume
1418	Outfall Node	Pcnt	CFS	CFS	10^6 gal
1419	---				
1420	O_100	55.48	98.00	1459.58	43.926
1421	O_1000	99.70	505.81	11827.16	407.405
1422	---				
1423	System	77.59	603.82	12997.95	451.330
1424					
1425					
1426	**********				
1427	Link Flow Summary				
1428	**********				
1429					

1430	---						
1431		Maximum	Time of Max	Maximum	Max/	Max/	
1432		|Flow|	Occurrence	|Veloc|	Full	Full	
1433	Link	Type	CFS	days hr:min	ft/sec	Flow	Depth
1434	---						
1435	Dummy_1032	DUMMY	22.60	0 00:35			
1436	Dummy_1050	DUMMY	2751.38	0 00:51			
1437	Dummy_109	DUMMY	1459.58	0 00:54			
1438	Dummy_110	DUMMY	72.62	0 01:05			
1439	Dummy_1107	DUMMY	1511.21	0 01:01			
1440	Dummy_1108	DUMMY	7.59	0 00:35			
1441	Dummy_1110	DUMMY	28.58	0 00:40			
1442	Dummy_1116	DUMMY	144.71	0 00:40			
1443	Dummy_1124	DUMMY	65.92	0 00:40			
1444	Dummy_1126	DUMMY	231.67	0 00:30			
1445	Dummy_1132	DUMMY	54.44	0 00:35			
1446	Dummy_1139	DUMMY	1254.85	0 00:57			
1447	Dummy_114	DUMMY	157.30	0 00:50			
1448	Dummy_1140	DUMMY	278.22	0 00:40			
1449	Dummy_1142	DUMMY	48.51	0 00:35			
1450	Dummy_1144	DUMMY	203.80	0 00:35			
1451	Dummy_1148	DUMMY	194.50	0 00:40			
1452	Dummy_1150	DUMMY	44.33	0 00:55			

1453	Dummy_1152	DUMMY	77.44	0	00:35
1454	Dummy_1153	DUMMY	482.10	0	00:42
1455	Dummy_1154	DUMMY	164.54	0	00:40
1456	Dummy_1156	DUMMY	148.41	0	00:40
1457	Dummy_1164	DUMMY	327.56	0	00:40
1458	Dummy_1172	DUMMY	28.40	0	00:50
1459	Dummy_118	DUMMY	53.02	0	00:50
1460	Dummy_1180	DUMMY	25.72	0	00:40
1461	Dummy_1208	DUMMY	109.25	0	00:40
1462	Dummy_121	DUMMY	250.65	0	00:50
1463	Dummy_1210	DUMMY	73.20	0	00:50
1464	Dummy_1216	DUMMY	100.68	0	01:10
1465	Dummy_122	DUMMY	235.38	0	00:45
1466	Dummy_1224	DUMMY	97.13	0	00:55
1467	Dummy_1226	DUMMY	60.04	0	00:50
1468	Dummy_1228	DUMMY	37.67	0	00:55
1469	Dummy_1230	DUMMY	46.76	0	00:45
1470	Dummy_1232	DUMMY	401.77	0	00:35
1471	Dummy_1233_Lake	DUMMY	503.44	0	00:47
1472	Dummy_1234	DUMMY	132.99	0	00:35
1473	Dummy_1236	DUMMY	152.61	0	00:45
1474	Dummy_1238	DUMMY	169.91	0	00:45
1475	Dummy_1239	DUMMY	326.98	0	01:03
1476	Dummy_1240	DUMMY	41.19	0	00:45
1477	Dummy_1248	DUMMY	63.07	0	00:45
1478	Dummy_1249	DUMMY	169.71	0	00:46
1479	Dummy_1256	DUMMY	141.99	0	00:40
1480	Dummy_1258	DUMMY	89.11	0	00:45
1481	Dummy_1260	DUMMY	77.98	0	00:55
1482	Dummy_1263	DUMMY	1414.86	0	01:15
1483	Dummy_1264	DUMMY	47.68	0	00:45
1484	Dummy_1272	DUMMY	15.89	0	00:50
1485	Dummy_1274	DUMMY	24.44	0	00:50
1486	Dummy_129	DUMMY	522.01	0	00:45
1487	Dummy_130	DUMMY	65.49	0	00:50
1488	Dummy_1307	DUMMY	2696.95	0	01:03
1489	Dummy_1308	DUMMY	66.76	0	00:55
1490	Dummy_1310	DUMMY	45.31	0	00:50
1491	Dummy_1318	DUMMY	40.00	0	00:50
1492	Dummy_1320	DUMMY	125.09	0	00:40
1493	Dummy_1322	DUMMY	108.62	0	00:50
1494	Dummy_1341	DUMMY	80.91	0	00:47
1495	Dummy_1328	DUMMY	7.46	0	01:05
1496	Dummy_1337	DUMMY	281.44	0	00:52
1497	Dummy_134	DUMMY	159.32	0	00:35
1498	Dummy_1348	DUMMY	108.46	0	00:45
1499	Dummy_1349	DUMMY	807.59	0	01:00
1500	Dummy_1352	DUMMY	154.57	0	00:55
1501	Dummy_1354	DUMMY	94.66	0	00:50
1502	Dummy_1356	DUMMY	142.76	0	00:50
1503	Dummy_1358	DUMMY	143.13	0	00:55
1504	Dummy_1362	DUMMY	19.06	0	01:00
1505	Dummy_1364	DUMMY	171.04	0	00:35
1506	Dummy_1368	DUMMY	91.55	0	00:35
1507	Dummy_1372	DUMMY	176.16	0	00:50
1508	Dummy_1382	DUMMY	86.77	0	01:05
1509	Dummy_1386	DUMMY	39.22	0	01:00
1510	Dummy_1388	DUMMY	215.50	0	00:45
1511	Dummy_1392	DUMMY	146.74	0	00:45
1512	Dummy_1394	DUMMY	150.85	0	00:50
1513	Dummy_1396	DUMMY	238.22	0	00:40
1514	Dummy_1398	DUMMY	170.85	0	00:35
1515	Dummy_142	DUMMY	23.12	0	00:50
1516	Dummy_150	DUMMY	99.87	0	00:45
1517	Dummy_210	DUMMY	90.08	0	00:45
1518	Dummy_219	DUMMY	2273.28	0	00:54

1519	Dummy_220	DUMMY	134.31	0	00:50			
1520	Dummy_223	DUMMY	397.28	0	00:45			
1521	Dummy_224	DUMMY	102.13	0	00:45			
1522	Dummy_226	DUMMY	157.08	0	00:40			
1523	Dummy_231	DUMMY	1771.84	0	00:50			
1524	Dummy_232	DUMMY	138.79	0	00:55			
1525	Dummy_236	DUMMY	105.63	0	00:45			
1526	Dummy_237	DUMMY	1557.59	0	00:45			
1527	Dummy_240	DUMMY	33.33	0	00:45			
1528	Dummy_243	DUMMY	900.77	0	00:43			
1529	Dummy_244	DUMMY	237.04	0	00:40			
1530	Dummy_247	DUMMY	509.02	0	00:39			
1531	Dummy_248	DUMMY	372.42	0	00:35			
1532	Dummy_252	DUMMY	172.98	0	00:40			
1533	Dummy_256	DUMMY	182.91	0	00:45			
1534	Dummy_259	DUMMY	444.89	0	00:45			
1535	Dummy_260	DUMMY	98.74	0	00:50			
1536	Dummy_264	DUMMY	195.65	0	00:40			
1537	Dummy_300	DUMMY	269.56	0	00:49			
1538	Dummy_310	DUMMY	110.61	0	00:50			
1539	Dummy_410	DUMMY	19.09	0	00:45			
1540	Dummy_414	DUMMY	19.85	0	00:45			
1541	Dummy_418	DUMMY	53.79	0	00:50			
1542	Dummy_422	DUMMY	2.89	0	00:40			
1543	Dummy_426	DUMMY	52.54	0	00:50			
1544	Dummy_500	DUMMY	609.28	0	00:48			
1545	Dummy_510	DUMMY	174.84	0	00:50			
1546	Dummy_514	DUMMY	229.26	0	00:40			
1547	Dummy_518	DUMMY	226.75	0	00:40			
1548	Dummy_600	DUMMY	945.45	0	00:49			
1549	Dummy_610	DUMMY	145.90	0	00:50			
1550	Dummy_614	DUMMY	321.94	0	00:35			
1551	Dummy_618	DUMMY	216.70	0	00:35			
1552	Dummy_620	DUMMY	37.16	0	01:00			
1553	Dummy_708	DUMMY	172.27	0	00:50			
1554	Dummy_714	DUMMY	51.50	0	00:40			
1555	Dummy_803	DUMMY	2071.87	0	00:50			
1556	Dummy_804	DUMMY	25.42	0	00:40			
1557	Dummy_810	DUMMY	189.76	0	00:40			
1558	Dummy_820	DUMMY	331.20	0	00:35			
1559	Dummy_830	DUMMY	293.93	0	00:35			
1560	Dummy_840	DUMMY	199.86	0	00:40			
1561	Dummy_842	DUMMY	353.28	0	00:40			
1562	Dummy_844	DUMMY	523.46	0	00:35			
1563	Dummy_909	DUMMY	727.72	0	00:59			
1564	Dummy_910	DUMMY	140.59	0	00:50			
1565	Dummy_929	DUMMY	602.04	0	00:52			
1566	Dummy_930	DUMMY	334.77	0	00:40			
1567	Dummy_940	DUMMY	137.30	0	00:50			
1568	Dummy_950	DUMMY	145.62	0	00:55			
1569	Dummy_960	DUMMY	85.75	0	00:40			
1570	Dummy_1002	DUMMY	11827.16	0	01:13			
1571	L_1004	CONDUIT	11756.97	0	01:13	8.61	0.64	0.78
1572	L_1006	CONDUIT	9914.56	0	01:12	10.92	0.20	0.45
1573	L_1008	CONDUIT	9915.70	0	01:11	9.36	0.53	0.75
1574	L_1010	CONDUIT	9892.44	0	01:11	8.11	0.64	0.82
1575	L_1012	CONDUIT	9682.39	0	01:10	5.75	0.38	0.66
1576	L_1014	CONDUIT	8293.63	0	01:10	4.60	0.31	0.56
1577	L_1016	CONDUIT	8281.29	0	01:08	8.52	0.30	0.53
1578	L_1018	CONDUIT	8263.62	0	01:08	7.13	0.44	0.66
1579	L_1020	CONDUIT	8248.71	0	01:07	9.62	0.29	0.53
1580	L_1022	CONDUIT	8200.27	0	01:07	9.24	0.43	0.65
1581	L_1024	CONDUIT	8200.53	0	01:06	8.21	0.33	0.57
1582	L_1026	CONDUIT	8129.04	0	01:05	9.10	0.28	0.52
1583	L_1028	CONDUIT	8080.16	0	01:05	11.44	0.38	0.57
1584	L_1030	CONDUIT	7566.75	0	01:04	13.31	0.28	0.48

1585	L_1034	CONDUIT	5553.10	0	01:02	8.68	0.42	0.61
1586	L_1036	CONDUIT	5553.94	0	01:02	9.81	0.35	0.55
1587	L_1038	CONDUIT	5517.21	0	01:01	7.62	0.34	0.60
1588	L_1040	CONDUIT	5504.12	0	01:00	9.12	0.25	0.53
1589	L_1042	CONDUIT	5343.23	0	00:59	11.34	0.19	0.48
1590	L_1044	CONDUIT	5304.46	0	00:59	10.17	0.22	0.51
1591	L_1046	CONDUIT	5219.30	0	00:58	12.03	0.10	0.36
1592	L_1048	CONDUIT	5219.57	0	00:58	10.20	0.12	0.40
1593	L_1115	CONDUIT	1506.85	0	01:01	11.22	0.43	0.67
1594	L_1123	CONDUIT	1388.27	0	01:01	6.88	0.09	0.25
1595	L_1125	CONDUIT	232.24	0	00:30	10.54	0.01	0.12
1596	L_1127	CONDUIT	1346.58	0	00:59	6.11	0.08	0.23
1597	L_1130	CONDUIT	1287.99	0	00:58	5.11	0.10	0.26
1598	L_114	CONDUIT	1389.04	0	00:54	11.43	0.06	0.35
1599	L_1141	CONDUIT	1071.53	0	00:58	3.53	0.03	0.14
1600	L_1147	CONDUIT	1069.65	0	00:51	7.52	0.10	0.34
1601	L_115	CONDUIT	1233.28	0	00:54	6.17	0.05	0.19
1602	L_1151	CONDUIT	541.66	0	00:46	7.67	0.10	0.35
1603	L_1156	CONDUIT	845.19	0	00:50	2.47	0.02	0.11
1604	L_1163	CONDUIT	322.16	0	00:43	3.58	0.03	0.12
1605	L_117	CONDUIT	820.56	0	00:47	10.23	0.17	0.43
1606	L_1170	CONDUIT	147.03	0	00:46	2.31	0.00	0.03
1607	L_119	CONDUIT	767.91	0	00:47	9.97	0.16	0.42
1608	L_1209	CONDUIT	72.02	0	00:57	1.93	0.01	0.16
1609	Dummy_1215	DUMMY	1379.66	0	01:15			
1610	L_1217	CONDUIT	1379.66	0	01:15	4.86	0.47	0.70
1611	L_1223	CONDUIT	1219.35	0	01:11	3.88	0.13	0.46
1612	L_1231	CONDUIT	1000.69	0	01:07	4.44	0.09	0.40
1613	L_1233	CONDUIT	503.44	0	00:47	5.42	0.08	0.29
1614	L_1235	CONDUIT	151.94	0	00:46	6.05	0.02	0.21
1615	L_1237	CONDUIT	169.71	0	00:46	11.87	0.17	0.24
1616	L_1239	CONDUIT	326.98	0	01:03	8.50	0.04	0.31
1617	L_1247	CONDUIT	231.38	0	00:48	6.00	0.04	0.26
1618	L_1255	CONDUIT	268.88	0	01:00	4.08	0.09	0.41
1619	L_1257	CONDUIT	157.73	0	01:06	3.27	0.12	0.40
1620	L_1259	CONDUIT	76.57	0	01:06	3.59	0.00	0.05
1621	L_126	CONDUIT	27.69	0	01:10	3.37	0.00	0.03
1622	L_1273	CONDUIT	291.91	0	01:03	2.87	0.16	0.51
1623	L_1315	CONDUIT	2632.60	0	01:03	6.92	0.18	0.38
1624	L_1316	CONDUIT	1758.12	0	01:03	4.82	0.15	0.49
1625	L_1319	CONDUIT	118.97	0	00:48	3.42	0.01	0.15
1626	L_1321	CONDUIT	106.66	0	00:56	3.38	0.01	0.15
1627	L_1323	CONDUIT	80.91	0	00:47	3.20	0.00	0.13
1628	L_1327	CONDUIT	7.19	0	01:18	1.82	0.02	0.10
1629	L_133	CONDUIT	457.65	0	00:45	6.49	0.01	0.09
1630	L_1340	CONDUIT	1421.96	0	01:01	6.96	0.07	0.37
1631	L_1351	CONDUIT	323.33	0	01:02	4.21	0.02	0.23
1632	L_1353	CONDUIT	174.24	0	00:55	2.69	0.02	0.21
1633	L_1355	CONDUIT	431.73	0	00:59	5.29	0.02	0.23
1634	L_1357	CONDUIT	295.27	0	00:57	3.67	0.02	0.23
1635	L_1361	CONDUIT	153.35	0	00:53	3.64	0.01	0.17
1636	L_1363	CONDUIT	168.62	0	00:37	6.37	0.01	0.06
1637	L_1367	CONDUIT	81.68	0	00:51	4.52	0.00	0.13
1638	L_1371	CONDUIT	174.91	0	00:54	4.21	0.01	0.17
1639	L_138	CONDUIT	316.28	0	00:40	5.79	0.01	0.10
1640	L_1387	CONDUIT	211.33	0	00:51	5.07	0.02	0.12
1641	L_139	CONDUIT	464.95	0	00:43	5.12	0.13	0.34
1642	L_1393	CONDUIT	148.46	0	00:58	4.21	0.01	0.15
1643	L_1395	CONDUIT	369.85	0	00:50	4.64	0.02	0.17
1644	L_141	CONDUIT	443.32	0	00:43	8.45	0.06	0.22
1645	L_146	CONDUIT	48.80	0	00:55	6.64	0.00	0.03
1646	L_149	CONDUIT	399.89	0	00:42	8.53	0.03	0.14
1647	L_154	CONDUIT	306.65	0	00:39	6.04	0.02	0.10
1648	L_221	CONDUIT	2139.31	0	00:54	8.30	0.21	0.45
1649	L_225	CONDUIT	295.21	0	00:45	6.78	0.02	0.10
1650	L_228	CONDUIT	142.74	0	00:45	6.61	0.01	0.10

L_235	CONDUIT	1634.24	0	00:50	8.17	0.06	0.19
L_239	CONDUIT	1524.30	0	00:45	8.33	0.08	0.23
L_241	CONDUIT	1341.72	0	00:45	9.38	0.17	0.38
L_245	CONDUIT	668.69	0	00:43	12.41	0.10	0.33
L_250	CONDUIT	162.58	0	00:42	3.61	0.00	0.09
L_263	CONDUIT	346.98	0	00:44	8.56	0.04	0.17
L_268	CONDUIT	156.99	0	00:42	8.06	0.01	0.09
L_314	CONDUIT	161.26	0	00:47	4.86	0.01	0.07
L_513	CONDUIT	437.88	0	00:47	6.34	0.03	0.13
L_613	CONDUIT	800.69	0	00:49	6.60	0.03	0.12
L_617	CONDUIT	541.61	0	00:42	6.62	0.02	0.10
L_622	CONDUIT	352.48	0	00:41	6.80	0.01	0.15
L_708	CONDUIT	172.27	0	00:50	10.70	0.01	0.07
L_709	CONDUIT	172.28	0	00:50	5.55	0.01	0.06
L_710	CONDUIT	172.38	0	00:49	4.42	0.01	0.05
L_711	CONDUIT	172.39	0	00:49	4.18	0.01	0.05
L_712	CONDUIT	172.84	0	00:46	3.73	0.00	0.04
L_713	CONDUIT	172.62	0	00:47	2.97	0.01	0.09
L_808	CONDUIT	2049.42	0	00:50	6.39	0.21	0.42
L_809	CONDUIT	2057.59	0	00:48	42.60	0.67	0.64
L_811	CONDUIT	1881.96	0	00:48	6.82	0.07	0.23
L_819	CONDUIT	1882.17	0	00:48	4.58	0.15	0.33
L_822	CONDUIT	145.35	0	00:48	2.87	0.00	0.02
L_823	CONDUIT	1503.55	0	00:47	4.14	0.04	0.15
L_824	CONDUIT	146.07	0	00:45	1.72	0.00	0.01
L_829	CONDUIT	1511.25	0	00:44	10.56	0.04	0.17
L_831	CONDUIT	1289.92	0	00:45	13.28	0.01	0.09
L_834	CONDUIT	1290.07	0	00:45	4.33	0.06	0.23
L_836	CONDUIT	263.77	0	01:35	22.91	1.07	1.00
L_838	CONDUIT	1299.70	0	00:41	5.46	0.03	0.22
L_839	CONDUIT	843.86	0	00:43	3.95	0.01	0.11
L_841	CONDUIT	649.22	0	00:42	5.09	0.06	0.36
L_843	CONDUIT	1300.31	0	00:41	17.51	0.40	0.44
L_850	CONDUIT	306.07	0	00:43	4.37	0.02	0.17
L_911	CONDUIT	594.45	0	00:59	4.57	0.03	0.14
L_912	CONDUIT	601.74	0	00:53	4.95	0.04	0.28
L_931	CONDUIT	349.34	0	00:59	4.18	0.02	0.24
Overflow_836	CONDUIT	1052.90	0	00:42	8.64	0.01	0.12
Dummy_1324	DUMMY	81.37	0	00:45			
Dummy_1233	DUMMY	503.57	0	00:46			

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
L_836	1.20	1.20	1.20	1.20	1.20

Analysis begun on: Thu Jul 10 10:29:40 2025
Analysis ended on: Thu Jul 10 10:29:40 2025
Total elapsed time: < 1 sec

APPENDIX C – HYDRAULIC ANALYSIS

Existing infrastructure with future flows

Culvert Data: Structure#101

Site Data - Structure#101

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4778.22 ft
Outlet Station: 52.00 ft
Outlet Elevation: 4777.89 ft
Number of Barrels: 2

Culvert Data Summary - Structure#101

Barrel Shape: Circular
Barrel Diameter: 4.00 ft
Barrel Material: Corrugated Steel
Embedment: 0.00 in
Barrel Manning's n: 0.0240
Culvert Type: Straight
Inlet Configuration: Thin Edge Projecting (Ke=0.9)
Inlet Depression: None

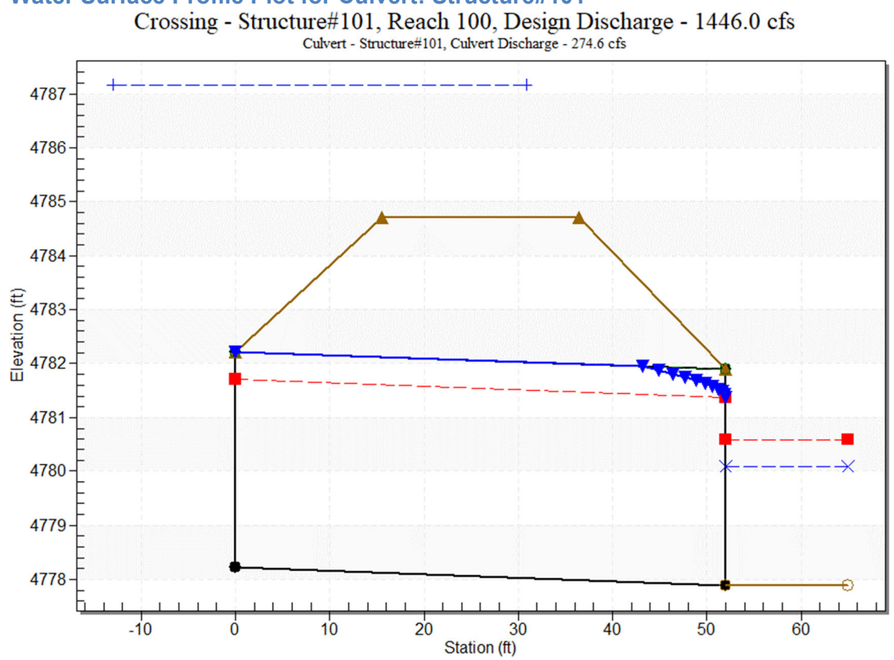
Culvert Summary Table: Structure#101

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	5.18 cfs	5.18 cfs	4778.95	0.67	0.733	2-M2c	0.55	0.46	0.46	0.27	3.19	2.44
100 Year	1446.00 cfs	274.58 cfs	4787.16	8.94	8.585	7-M2c	4.00	3.48	3.48	2.20	11.82	9.99

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4778.22 ft,
Outlet Elevation (invert): 4777.89 ft
Culvert Length: 52.00 ft,
Culvert Slope: 0.0063

Water Surface Profile Plot for Culvert: Structure#101



Tailwater Data for Crossing: Structure#101, Reach 100

Downstream Channel Rating Curve (Crossing: Structure#101, Reach 100)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
5.18	4778.16	0.27	2.44	0.38	1.18
1446.00	4780.09	2.20	9.99	3.15	1.68

Tailwater Channel Data - Structure#101, Reach 100

Tailwater Channel Option: Triangular Channel
Side Slope (H:V): 30.00 (_:1)
Channel Slope: 0.0230
Channel Manning's n: 0.0240
Channel Invert Elevation: 4777.89 ft

Roadway Data for Crossing: Structure#101, Reach 100

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4784.70 ft
Roadway Surface: Paved
Roadway Top Width: 21.00 ft

Culvert Data: Structure#102

Site Data - Structure#102

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4782.03 ft
Outlet Station: 60.00 ft
Outlet Elevation: 4781.65 ft
Number of Barrels: 2

Culvert Data Summary - Structure#102

Barrel Shape: Concrete Box
Barrel Span: 10.00 ft
Barrel Rise: 6.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

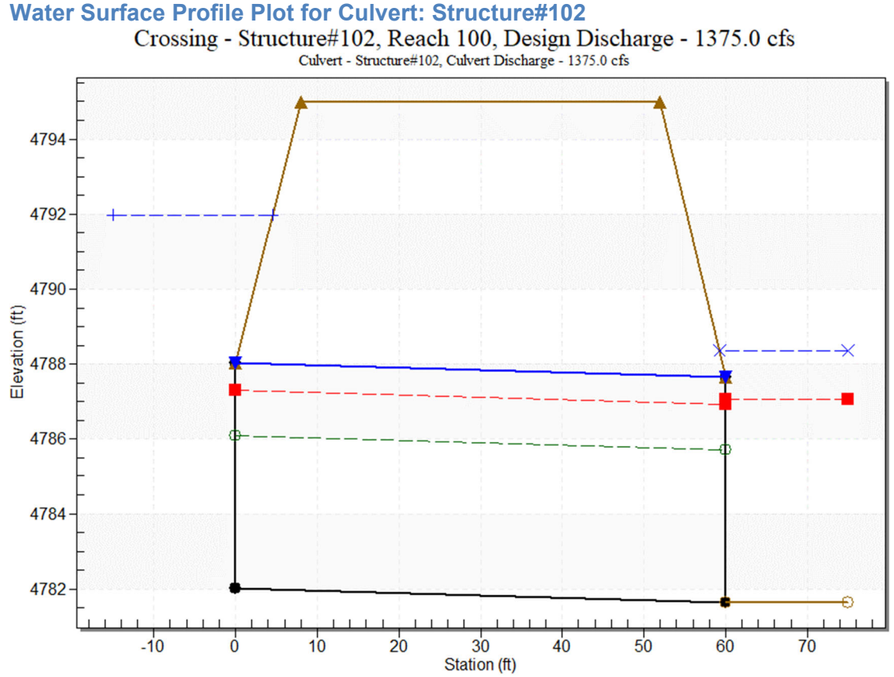
Culvert Summary Table: Structure#102

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	6.28 cfs	6.28 cfs	4782.55	0.25	0.516	1-S1t	0.11	0.15	0.89	0.89	0.35	1.59
100 Year	1375.00 cfs	1375.00 cfs	4791.98	9.95	9.608	4-FFf	4.06	5.28	6.00	6.71	11.46	6.11

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4782.03 ft,
Outlet Elevation (invert): 4781.65 ft
Culvert Length: 60.00 ft,
Culvert Slope: 0.0063

Water Surface Profile Plot for Culvert: Structure#102



Tailwater Data for Crossing: Structure#102, Reach 100

Downstream Channel Rating Curve (Crossing: Structure#102, Reach 100)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
6.28	4782.54	0.89	1.59	0.39	0.42
1375.00	4788.36	6.71	6.11	2.93	0.59

Tailwater Channel Data - Structure#102, Reach 100

Tailwater Channel Option: Triangular Channel
Side Slope (H:V): 5.00 (_:1)
Channel Slope: 0.0070
Channel Manning's n: 0.0450
Channel Invert Elevation: 4781.65 ft

Roadway Data for Crossing: Structure#102, Reach 100

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4794.98 ft
Roadway Surface: Paved
Roadway Top Width: 44.00 ft

Culvert Data: Structure#103

Site Data - Structure#103

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4864.72 ft
Outlet Station: 295.00 ft
Outlet Elevation: 4858.55 ft
Number of Barrels: 1

Culvert Data Summary - Structure#103

Barrel Shape: Circular
Barrel Diameter: 4.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall (Ke=0.5)
Inlet Depression: None

Culvert Summary Table: Structure#103

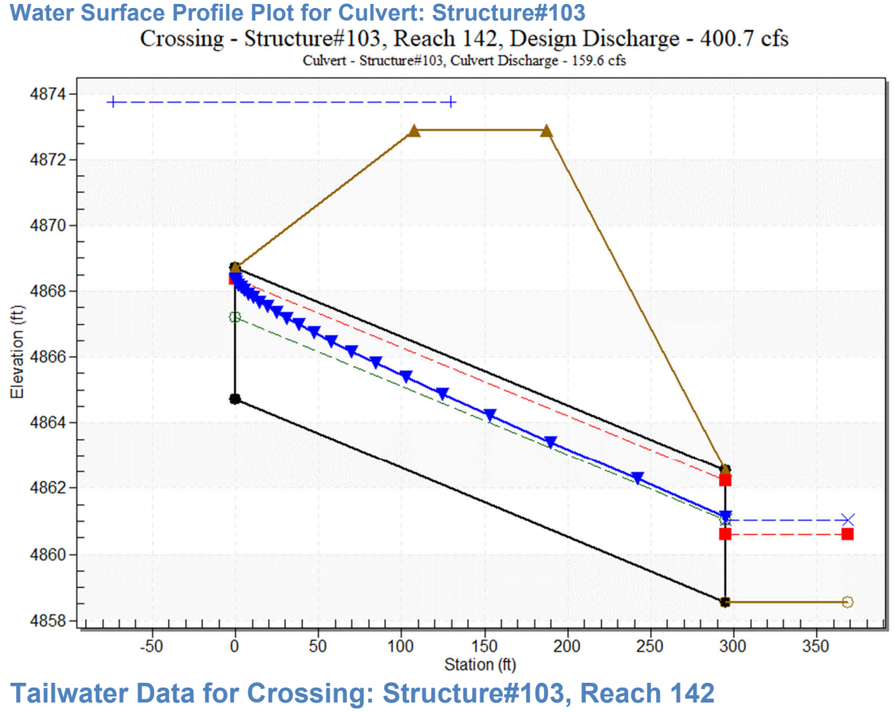
Discharge Names	Total Discharge (cfs)	Culvert Discharge	Headwater Elevation (ft)	Inlet Control Dept h (ft)	Outlet Control Dept h (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	85.77 cfs	85.77 cfs	4869.23	4.51	0.0*	5-S2n	1.71	2.81	1.75	1.18	16.19	3.21
100 Year	400.70 cfs	159.58 cfs	4873.74	9.02	4.504	5-S2n	2.48	3.66	2.58	2.48	18.61	4.86

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4864.72 ft,
Outlet Elevation (invert): 4858.55 ft
Culvert Length: 295.06 ft,
Culvert Slope: 0.0209

Water Surface Profile Plot for Culvert: Structure#103



Tailwater Data for Crossing: Structure#103, Reach 142

Downstream Channel Rating Curve (Crossing: Structure#103, Reach 142)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
85.77	4859.73	1.18	3.21	0.91	0.62
400.70	4861.03	2.48	4.86	1.91	0.69

Tailwater Channel Data - Structure#103, Reach 142

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 12.70 ft
Side Slope (H:V): 8.30 (_:1)
Channel Slope: 0.0123
Channel Manning's n: 0.0450
Channel Invert Elevation: 4858.55 ft

Roadway Data for Crossing: Structure#103, Reach 142

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4872.88 ft
Roadway Surface: Paved
Roadway Top Width: 80.00 ft

Culvert Data: Structure#104

Site Data - Structure#104

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4921.39 ft
Outlet Station: 127.00 ft
Outlet Elevation: 4919.92 ft
Number of Barrels: 1

Culvert Data Summary - Structure#104

Barrel Shape: Circular
Barrel Diameter: 3.00 ft
Barrel Material: Corrugated Steel
Embedment: 0.00 in
Barrel Manning's n: 0.0240
Culvert Type: Straight
Inlet Configuration: Thin Edge Projecting (Ke=0.9)
Inlet Depression: None

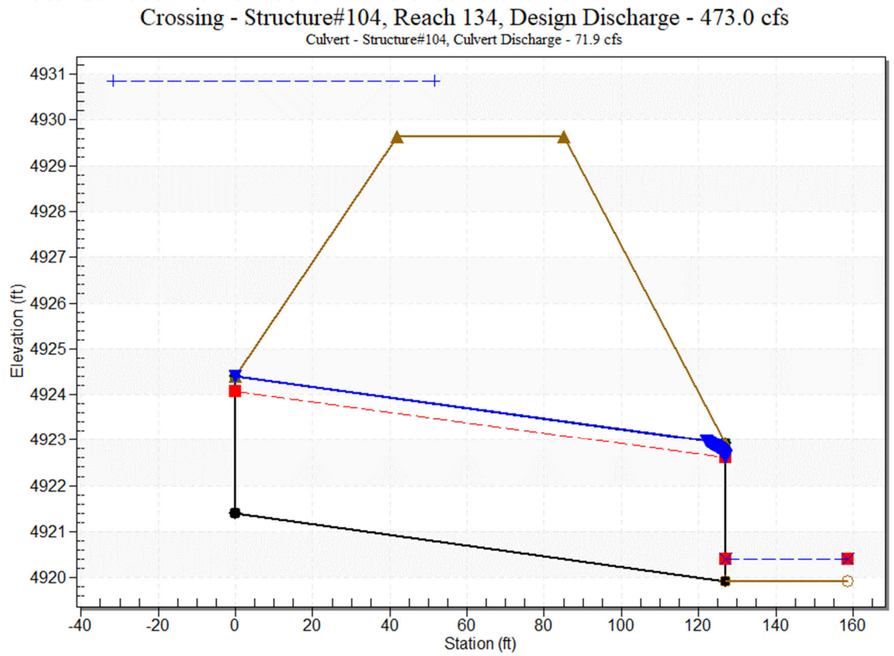
Culvert Summary Table: Structure#104

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	124.36 cfs	68.01 cfs	4929.97	6.86	8.577	7-M2c	3.00	2.63	2.63	0.26	10.35	2.12
100 Year	473.00 cfs	71.94 cfs	4930.84	7.47	9.454	7-M2c	3.00	2.68	2.68	0.47	10.79	3.00

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4921.39 ft,
Outlet Elevation (invert): 4919.92 ft
Culvert Length: 127.01 ft,
Culvert Slope: 0.0116

Water Surface Profile Plot for Culvert: Structure#104



Tailwater Data for Crossing: Structure#104, Reach 134

Downstream Channel Rating Curve (Crossing: Structure#104, Reach 134)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
124.36	4920.18	0.26	2.12	0.74	0.92
473.00	4920.39	0.47	3.00	1.35	1.01

Tailwater Channel Data - Structure#104, Reach 134

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 100.00 ft
Side Slope (H:V): 500.00 (_:1)
Channel Slope: 0.0460
Channel Manning's n: 0.0450
Channel Invert Elevation: 4919.92 ft

Roadway Data for Crossing: Structure#104, Reach 134

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4929.64 ft
Roadway Surface: Paved
Roadway Top Width: 43.00 ft

Culvert Data: Structure#201

Site Data - Structure#201

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4770.52 ft
Outlet Station: 30.46 ft
Outlet Elevation: 4770.40 ft
Number of Barrels: 4

Culvert Data Summary - Structure#201

Barrel Shape: Circular
Barrel Diameter: 2.00 ft
Barrel Material: Corrugated Steel
Embedment: 0.00 in
Barrel Manning's n: 0.0240
Culvert Type: Straight
Inlet Configuration: Thin Edge Projecting (Ke=0.9)
Inlet Depression: None

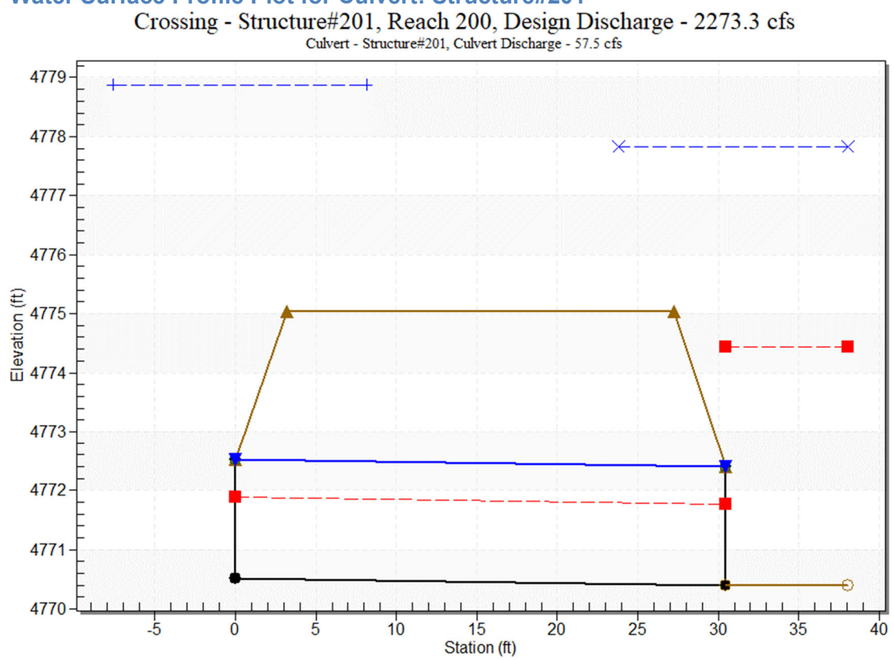
Culvert Summary Table: Structure#201

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	5.00 cfs	5.00 cfs	4771.15	0.57	0.632	2-M2c	0.54	0.39	0.39	0.23	2.94	0.54
100 Year	2273.28 cfs	57.47 cfs	4778.87	2.43	8.347	4-FFf	2.00	1.37	2.00	7.43	4.57	4.39

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4770.52 ft,
Outlet Elevation (invert): 4770.40 ft
Culvert Length: 30.46 ft,
Culvert Slope: 0.0039

Water Surface Profile Plot for Culvert: Structure#201



Tailwater Data for Crossing: Structure#201, Reach 200

Downstream Channel Rating Curve (Crossing: Structure#201, Reach 200)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
5.00	4770.63	0.23	0.54	0.03	0.20
2273.28	4777.83	7.43	4.39	0.93	0.34

Tailwater Channel Data - Structure#201, Reach 200

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 40.00 ft
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.0020
Channel Manning's n: 0.0450
Channel Invert Elevation: 4770.40 ft

Roadway Data for Crossing: Structure#201, Reach 200

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4775.04 ft
Roadway Surface: Gravel
Roadway Top Width: 24.00 ft

Culvert Data: Structure#202

Site Data - Structure#202

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4952.72 ft
Outlet Station: 100.00 ft
Outlet Elevation: 4947.32 ft
Number of Barrels: 1

Culvert Data Summary - Structure#202

Barrel Shape: Circular
Barrel Diameter: 1.00 ft
Barrel Material: Corrugated Steel
Embedment: 0.00 in
Barrel Manning's n: 0.0240
Culvert Type: Straight
Inlet Configuration: Thin Edge Projecting (Ke=0.9)
Inlet Depression: None

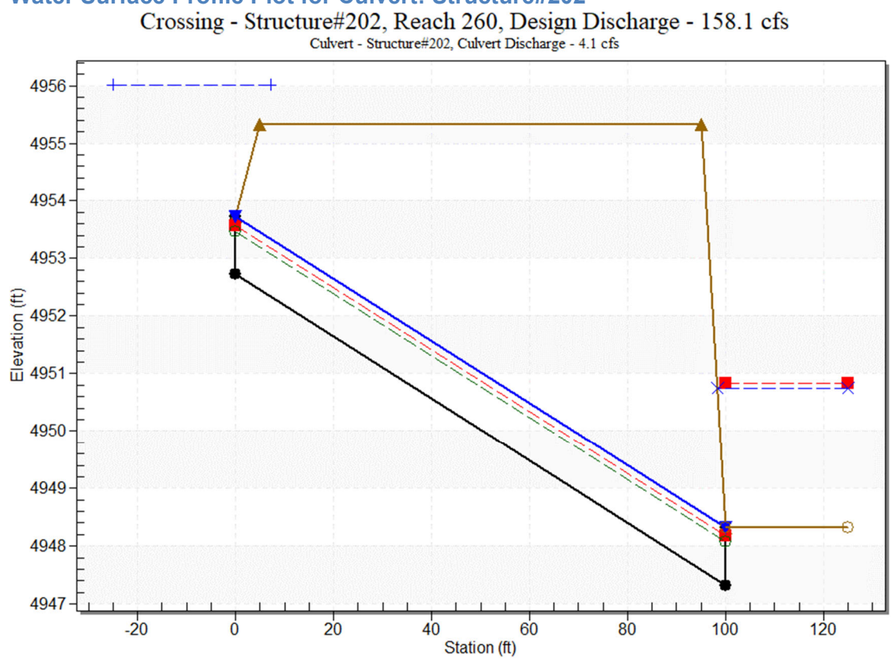
Culvert Summary Table: Structure#202

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5	40.39 cfs	4.35 cfs	4955.59	2.26	2.871	4-FFf	0.79	0.88	1.00	1.31	5.54	5.11
100	158.12 cfs	4.09 cfs	4956.01	2.06	3.286	4-FFf	0.75	0.86	1.00	2.41	5.21	7.64

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4952.72 ft,
Outlet Elevation (invert): 4947.32 ft
Culvert Length: 100.15 ft,
Culvert Slope: 0.0540

Water Surface Profile Plot for Culvert: Structure#202



Tailwater Data for Crossing: Structure#202, Reach 260

Downstream Channel Rating Curve (Crossing: Structure#202, Reach 260)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
40.39	4949.63	1.31	5.11	2.68	0.99
158.12	4950.74	2.41	7.64	4.96	1.08

Tailwater Channel Data - Structure#202, Reach 260

Tailwater Channel Option: Irregular Channel
Channel Slope: Irregular Channel

User Defined Channel Cross-Section

Coord No.	Station (ft)	Elevation (ft)	Manning's n
1	0.00	4962.30	0.0450
2	3.23	4962.09	0.0450
3	6.47	4961.86	0.0450
4	9.70	4961.61	0.0450
5	12.93	4961.41	0.0450
6	16.17	4961.22	0.0450
7	19.40	4960.97	0.0450
8	22.64	4960.70	0.0450

9	25.87	4960.41	0.0450
10	29.10	4960.10	0.0450
11	32.34	4959.84	0.0450
12	35.57	4959.59	0.0450
13	38.80	4959.34	0.0450
14	42.04	4959.06	0.0450
15	45.27	4958.74	0.0450
16	48.50	4958.41	0.0450
17	51.74	4958.07	0.0450
18	54.97	4957.68	0.0450
19	58.20	4957.27	0.0450
20	61.44	4956.89	0.0450
21	64.67	4956.54	0.0450
22	67.91	4956.23	0.0450
23	71.14	4955.85	0.0450
24	74.37	4955.38	0.0450
25	77.61	4954.97	0.0450
26	80.84	4954.70	0.0450
27	84.07	4954.43	0.0450
28	87.31	4954.23	0.0450
29	90.54	4954.07	0.0450
30	93.77	4953.94	0.0450
31	97.01	4953.82	0.0450
32	100.24	4953.72	0.0450
33	103.47	4953.55	0.0450
34	106.71	4953.08	0.0450
35	109.94	4952.92	0.0450
36	113.17	4953.12	0.0450
37	116.41	4951.97	0.0450
38	119.64	4950.01	0.0450
39	122.88	4948.73	0.0450
40	126.11	4948.32	0.0450
41	129.34	4949.03	0.0450
42	132.58	4951.36	0.0450
43	135.81	4953.47	0.0450
44	139.04	4955.07	0.0450
45	142.28	4956.11	0.0450
46	145.51	4956.75	0.0450
47	148.75	4956.69	0.0450
48	151.98	4955.86	0.0450
49	155.21	4954.91	0.0450
50	158.45	4954.71	0.0450
51	161.68	4954.76	0.0450
52	164.91	4954.65	0.0450
53	168.15	4954.77	0.0450
54	171.38	4955.49	0.0450
55	174.61	4956.04	0.0450
56	177.85	4956.47	0.0450
57	181.08	4957.05	0.0450
58	184.31	4957.49	0.0450
59	187.55	4957.86	0.0450
60	190.78	4958.15	0.0450
61	194.01	4958.40	0.0450
62	197.25	4958.70	0.0450
63	200.48	4958.98	0.0450
64	203.72	4959.11	0.0450
65	206.95	4959.15	0.0450
66	210.18	4959.21	0.0450
67	213.42	4959.31	0.0450
68	216.65	4959.39	0.0450
69	219.88	4959.50	0.0450
70	223.12	4959.56	0.0000

Roadway Data for Crossing: Structure#202, Reach 260

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4955.33 ft
Roadway Surface: Gravel
Roadway Top Width: 90.00 ft

Culvert Data: Structure#203

Site Data - Structure#203

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4979.58 ft
Outlet Station: 327.00 ft
Outlet Elevation: 4970.79 ft
Number of Barrels: 1

Culvert Data Summary - Structure#203

Barrel Shape: Circular
Barrel Diameter: 3.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall (Ke=0.5)
Inlet Depression: None

Culvert Summary Table: Structure#203

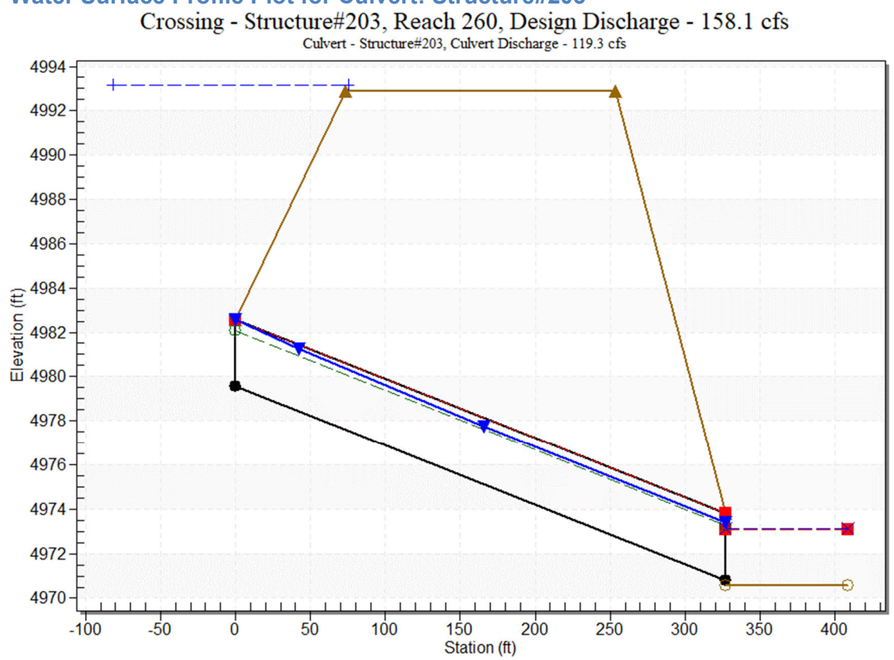
Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5-year	40.39 cfs	40.39 cfs	4982.87	3.29	0.0*	5-S2n	1.21	2.07	1.21	1.52	15.19	4.35
100-year	158.12 cfs	119.28 cfs	4993.15	13.57	9.706	5-S2n	2.47	3.00	2.59	2.54	18.38	6.12

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4979.58 ft,
Outlet Elevation (invert): 4970.79 ft
Culvert Length: 327.12 ft,
Culvert Slope: 0.0269

Water Surface Profile Plot for Culvert: Structure#203



Tailwater Data for Crossing: Structure#203, Reach 260

Downstream Channel Rating Curve (Crossing: Structure#203, Reach 260)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
40.39	4972.10	1.52	4.35	2.47	0.88
158.12	4973.12	2.54	6.12	4.12	0.96

Tailwater Channel Data - Structure#203, Reach 260

Tailwater Channel Option: Triangular Channel
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.0260
Channel Manning's n: 0.0450
Channel Invert Elevation: 4970.58 ft

Roadway Data for Crossing: Structure#203, Reach 260

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4992.89 ft
Roadway Surface: Paved
Roadway Top Width: 180.00 ft

Culvert Data: Structure#301

Site Data - Structure#301

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4786.49 ft
Outlet Station: 35.60 ft
Outlet Elevation: 4786.34 ft
Number of Barrels: 1

Culvert Data Summary - Structure#301

Barrel Shape: Circular
Barrel Diameter: 3.00 ft
Barrel Material: Corrugated Steel
Embedment: 0.00 in
Barrel Manning's n: 0.0240
Culvert Type: Straight
Inlet Configuration: Thin Edge Projecting (Ke=0.9)
Inlet Depression: None

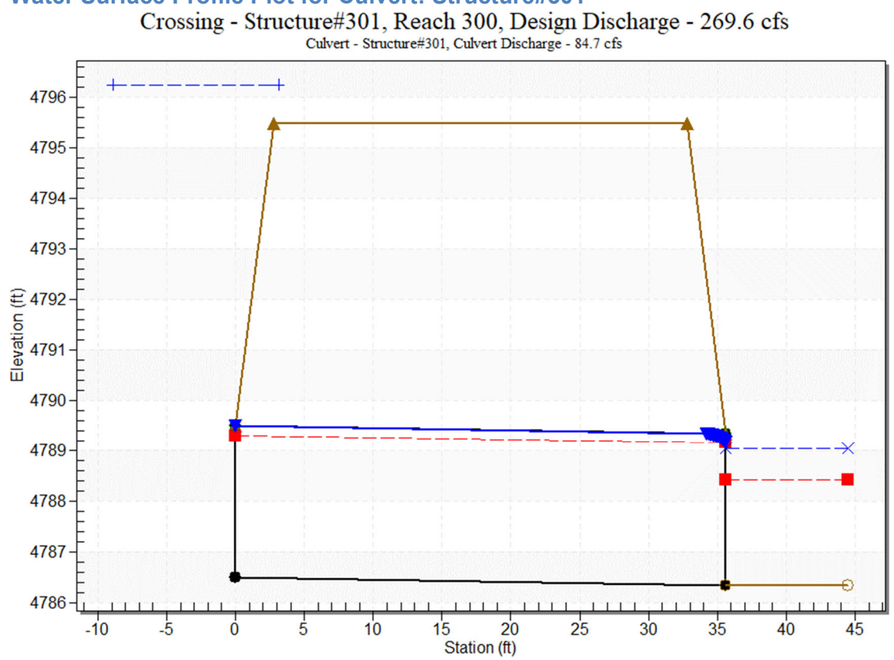
Culvert Summary Table: Structure#301

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	23.55 cfs	23.55 cfs	4789.14	2.47	2.652	2-M2c	2.47	1.56	1.56	0.78	6.32	2.25
100 Year	269.56 cfs	84.65 cfs	4796.23	9.74	8.955	7-M2c	3.00	2.81	2.81	2.71	12.30	4.49

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4786.49 ft,
Outlet Elevation (invert): 4786.34 ft
Culvert Length: 35.60 ft,
Culvert Slope: 0.0042

Water Surface Profile Plot for Culvert: Structure#301



Tailwater Data for Crossing: Structure#301, Reach 300

Downstream Channel Rating Curve (Crossing: Structure#301, Reach 300)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
23.55	4787.12	0.78	2.25	0.44	0.51
269.56	4789.05	2.71	4.49	1.52	0.60

Tailwater Channel Data - Structure#301, Reach 300

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 10.00 ft
Side Slope (H:V): 4.50 (_:1)
Channel Slope: 0.0090
Channel Manning's n: 0.0450
Channel Invert Elevation: 4786.34 ft

Roadway Data for Crossing: Structure#301, Reach 300

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4795.47 ft
Roadway Surface: Gravel
Roadway Top Width: 30.00 ft

Culvert Data: Structure#501

Site Data - Structure#501

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4824.39 ft
Outlet Station: 88.00 ft
Outlet Elevation: 4816.39 ft
Number of Barrels: 1

Culvert Data Summary - Structure#501

Barrel Shape: Concrete Box
Barrel Span: 3.33 ft
Barrel Rise: 3.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

Culvert Summary Table: Structure#501

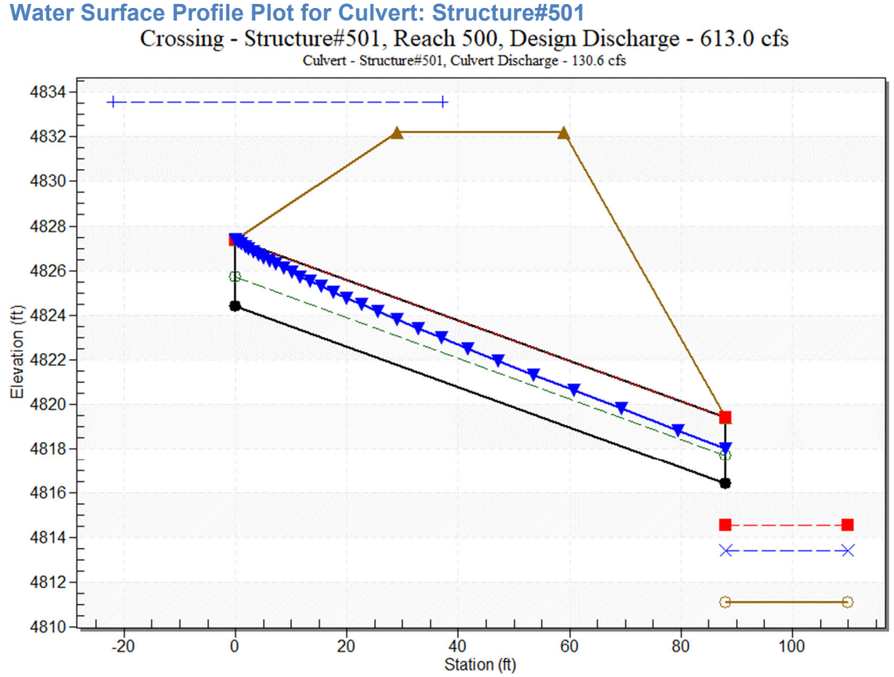
Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	19.99 cfs	19.99 cfs	4826.03	1.64	0.0*	1-S2n	0.36	1.04	0.36	0.64	16.68	7.02
100 Year	613.00 cfs	130.57 cfs	4833.55	9.16	0.321	5-S2n	1.29	3.00	1.61	2.30	24.28	16.51

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4824.39 ft,
Outlet Elevation (invert): 4816.39 ft
Culvert Length: 88.36 ft,
Culvert Slope: 0.0909

Water Surface Profile Plot for Culvert: Structure#501



Tailwater Data for Crossing: Structure#501, Reach 500

Downstream Channel Rating Curve (Crossing: Structure#501, Reach 500)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
19.99	4811.74	0.64	7.02	8.36	2.19
613.00	4813.40	2.30	16.51	30.18	2.71

Tailwater Channel Data - Structure#501, Reach 500

Tailwater Channel Option: Triangular Channel
Side Slope (H:V): 7.00 (_:1)
Channel Slope: 0.2100
Channel Manning's n: 0.0450
Channel Invert Elevation: 4811.10 ft

Roadway Data for Crossing: Structure#501, Reach 500

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4832.19 ft
Roadway Surface: Paved
Roadway Top Width: 30.00 ft

Culvert Data: Structure#601

Site Data - Structure#601

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4827.99 ft
Outlet Station: 120.50 ft
Outlet Elevation: 4825.15 ft
Number of Barrels: 1

Culvert Data Summary - Structure#601

Barrel Shape: Circular
Barrel Diameter: 2.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall (Ke=0.5)
Inlet Depression: None

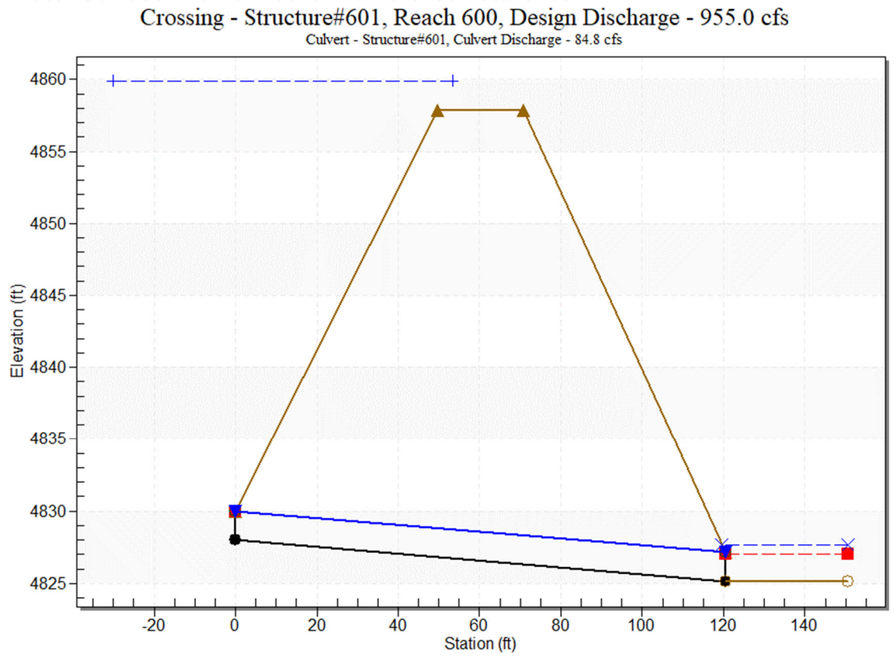
Culvert Summary Table: Structure#601

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	17.62 cfs	17.62 cfs	4830.56	2.57	0.268	5-S2n	0.96	1.51	0.99	0.31	11.31	1.20
100 Year	955.00 cfs	84.77 cfs	4859.86	31.87	30.998	4-FFf	2.00	2.00	2.00	2.54	26.98	3.92

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4827.99 ft,
Outlet Elevation (invert): 4825.15 ft
Culvert Length: 120.53 ft,
Culvert Slope: 0.0236

Water Surface Profile Plot for Culvert: Structure#601



Tailwater Data for Crossing: Structure#601, Reach 600

Downstream Channel Rating Curve (Crossing: Structure#601, Reach 600)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
17.62	4825.46	0.31	1.20	0.15	0.41
955.00	4827.69	2.54	3.92	1.19	0.55

Tailwater Channel Data - Structure#601, Reach 600

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 40.00 ft
Side Slope (H:V): 21.90 (_:1)
Channel Slope: 0.0075
Channel Manning's n: 0.0450
Channel Invert Elevation: 4825.15 ft

Roadway Data for Crossing: Structure#601, Reach 600

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4857.82 ft
Roadway Surface: Gravel
Roadway Top Width: 21.00 ft

Culvert Data: Structure#602

Site Data - Structure#602

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4832.02 ft
Outlet Station: 41.00 ft
Outlet Elevation: 4832.33 ft
Number of Barrels: 1

Culvert Data Summary - Structure#602

Barrel Shape: Pipe Arch
Barrel Span: 42.00 in
Barrel Rise: 29.00 in
Barrel Material: Steel or Aluminum
Embedment: 0.00 in
Barrel Manning's n: 0.0250
Culvert Type: Straight
Inlet Configuration: Projecting (Ke=0.9)
Inlet Depression: None

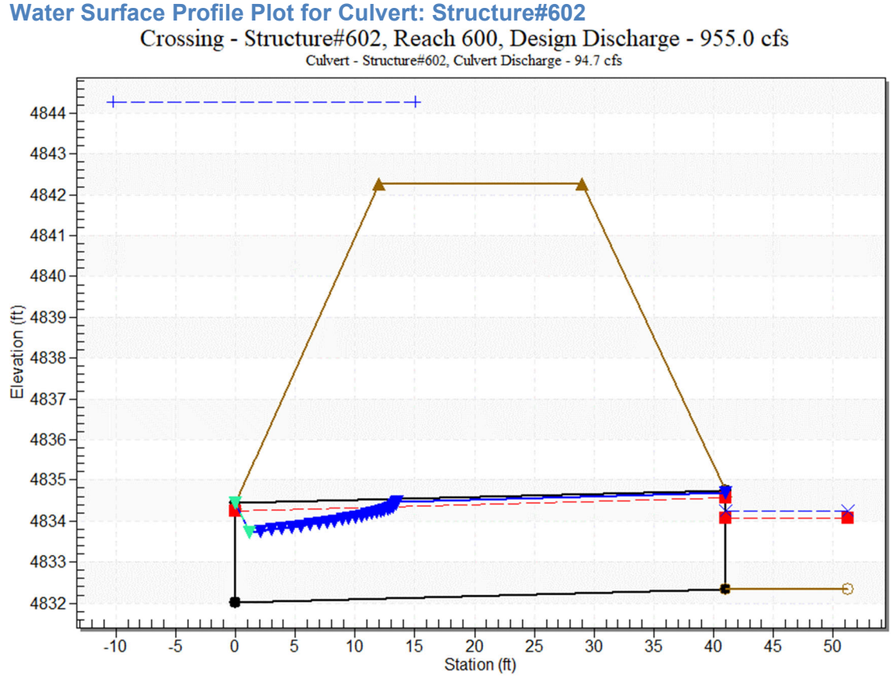
Culvert Summary Table: Structure#602

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	17.62 cfs	17.62 cfs	4834.17	1.76	2.155	7-A2c	-1.00	1.05	1.05	0.21	5.46	1.52
100 Year	955.00 cfs	94.69 cfs	4844.26	12.24	0.000	7-A2t	-1.00	2.22	2.22	1.91	14.45	5.54

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4832.02 ft,
Outlet Elevation (invert): 4832.33 ft
Culvert Length: 41.00 ft,
Culvert Slope: -0.0076

Water Surface Profile Plot for Culvert: Structure#602



Tailwater Data for Crossing: Structure#602, Reach 600

Downstream Channel Rating Curve (Crossing: Structure#602, Reach 600)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
17.62	4832.54	0.21	1.52	0.25	0.61
955.00	4834.24	1.91	5.54	2.27	0.84

Tailwater Channel Data - Structure#602, Reach 600

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 52.00 ft
Side Slope (H:V): 20.00 (_:1)
Channel Slope: 0.0190
Channel Manning's n: 0.0450
Channel Invert Elevation: 4832.33 ft

Roadway Data for Crossing: Structure#602, Reach 600

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4842.26 ft
Roadway Surface: Paved
Roadway Top Width: 17.00 ft

Culvert Data: Structure#603

Site Data - Structure#603

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4918.96 ft
Outlet Station: 234.00 ft
Outlet Elevation: 4917.04 ft
Number of Barrels: 1

Culvert Data Summary - Structure#603

Barrel Shape: Circular
Barrel Diameter: 2.00 ft
Barrel Material: Smooth HDPE
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall (Ke=0.5)
Inlet Depression: None

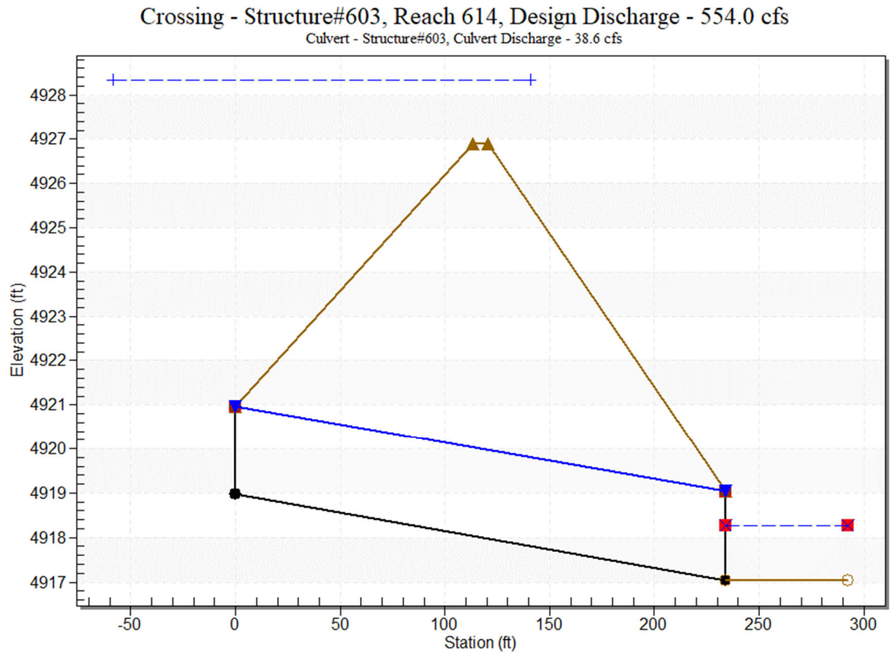
Culvert Summary Table: Structure#603

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	78.44 cfs	36.16 cfs	4927.19	6.64	8.226	7-M2c	2.00	1.78	1.78	0.38	12.22	2.88
100 Year	554.00 cfs	38.60 cfs	4928.33	7.42	9.364	6-FFc	2.00	2.00	2.00	1.24	12.29	6.18

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4918.96 ft,
Outlet Elevation (invert): 4917.04 ft
Culvert Length: 234.01 ft,
Culvert Slope: 0.0082

Water Surface Profile Plot for Culvert: Structure#603



Tailwater Data for Crossing: Structure#603, Reach 614

Downstream Channel Rating Curve (Crossing: Structure#603, Reach 614)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
78.44	4917.42	0.38	2.88	0.67	0.82
554.00	4918.28	1.24	6.18	2.15	0.99

Tailwater Channel Data - Structure#603, Reach 614

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 70.00 ft
Side Slope (H:V): 2.00 (_:1)
Channel Slope: 0.0278
Channel Manning's n: 0.0450
Channel Invert Elevation: 4917.04 ft

Roadway Data for Crossing: Structure#603, Reach 614

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4926.90 ft
Roadway Surface: Gravel
Roadway Top Width: 7.00 ft

Culvert Data: Structure#702

Site Data - Structure#702

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4867.00 ft
Outlet Station: 97.00 ft
Outlet Elevation: 4862.00 ft
Number of Barrels: 1

Culvert Data Summary - Structure#702

Barrel Shape: Circular
Barrel Diameter: 2.00 ft
Barrel Material: Corrugated Steel
Embedment: 0.00 in
Barrel Manning's n: 0.0240
Culvert Type: Straight
Inlet Configuration: Mitered to Conform to Slope (Ke=0.7)
Inlet Depression: None

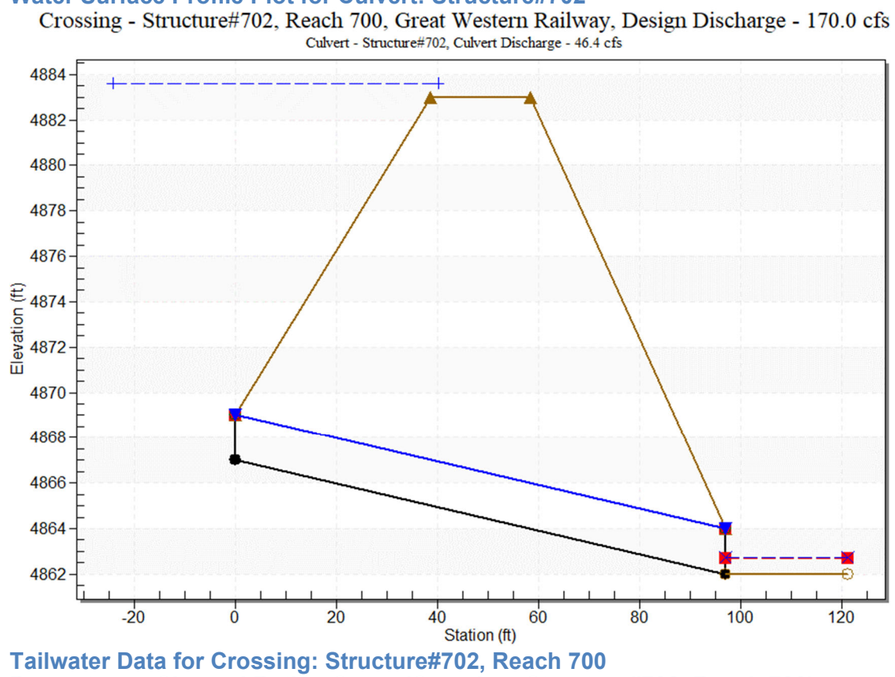
Culvert Summary Table: Structure#702

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	24.91 cfs	24.91 cfs	4871.48	4.48	2.530	5-S2n	1.47	1.76	1.47	0.23	10.03	2.12
100 Year	170.02 cfs	46.38 cfs	4883.59	12.46	16.591	6-FFc	2.00	2.00	2.00	0.72	14.76	4.44

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4867.00 ft,
Outlet Elevation (invert): 4862.00 ft
Culvert Length: 97.13 ft,
Culvert Slope: 0.0515

Water Surface Profile Plot for Culvert: Structure#702



Tailwater Data for Crossing: Structure#702, Reach 700

Downstream Channel Rating Curve (Crossing: Structure#702, Reach 700)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
24.91	4862.23	0.23	2.12	0.43	0.79
172	4862.72	0.72	4.44	1.35	0.94

Tailwater Channel Data - Structure#702, Reach 700

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 50.00 ft
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.0300
Channel Manning's n: 0.0450
Channel Invert Elevation: 4862.00 ft

Roadway Data for Crossing: Structure#702, Reach 700

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4883.00 ft
Roadway Surface: Gravel
Roadway Top Width: 20.00 ft

Culvert Data: Structure#704

Site Data - Structure#704

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4891.00 ft
Outlet Station: 89.00 ft
Outlet Elevation: 4888.00 ft
Number of Barrels: 1

Culvert Data Summary - Structure#704

Barrel Shape: Circular
Barrel Diameter: 2.50 ft
Barrel Material: Corrugated Steel
Embedment: 0.00 in
Barrel Manning's n: 0.0240
Culvert Type: Straight
Inlet Configuration: Thin Edge Projecting (Ke=0.9)
Inlet Depression: None

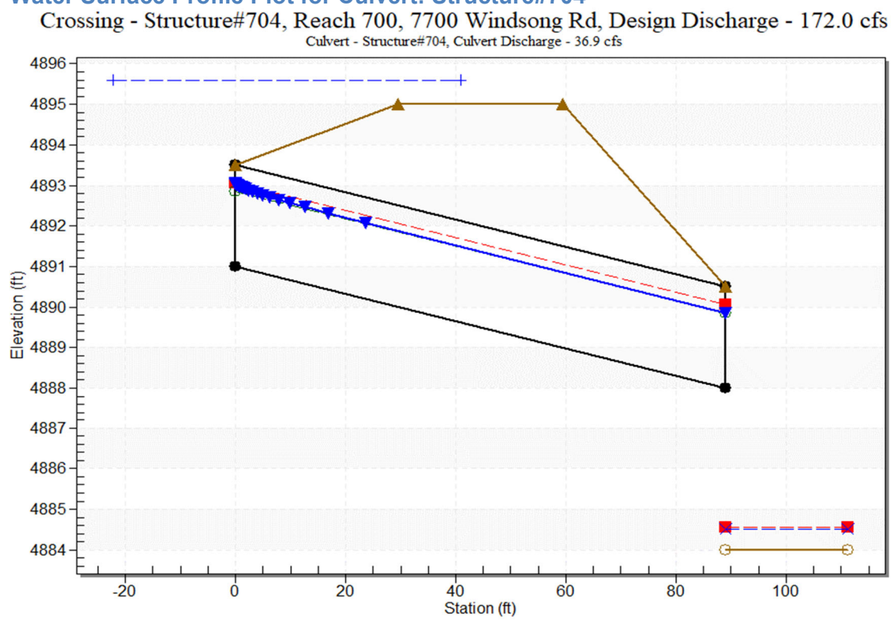
Culvert Summary Table: Structure#704

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	24.91 cfs	24.91 cfs	4893.98	2.98	0.573	5-S2n	1.41	1.70	1.41	0.16	8.73	2.09
100 Year	172.00 cfs	36.92 cfs	4895.58	4.58	3.393	5-S2n	1.86	2.06	1.86	0.51	9.43	4.47

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4891.00 ft,
Outlet Elevation (invert): 4888.00 ft
Culvert Length: 89.05 ft,
Culvert Slope: 0.0337

Water Surface Profile Plot for Culvert: Structure#704



Tailwater Data for Crossing: Structure#704, Reach 700

Downstream Channel Rating Curve (Crossing: Structure#704, Reach 700)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
24.91	4884.16	0.16	2.09	0.28	0.92
172.00	4884.51	0.51	4.47	0.90	1.11

Tailwater Channel Data - Structure#704, Reach 700

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 73.00 ft
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.0280
Channel Manning's n: 0.0350
Channel Invert Elevation: 4884.00 ft

Roadway Data for Crossing: Structure#704, Reach 700

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4895.00 ft
Roadway Surface: Paved
Roadway Top Width: 30.00 ft

Culvert Data: Structure#801

Site Data - Structure#801

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4960.15 ft
Outlet Station: 74.00 ft
Outlet Elevation: 4960.01 ft
Number of Barrels: 1

Culvert Data Summary - Structure#801

Barrel Shape: Circular
Barrel Diameter: 4.00 ft
Barrel Material: Corrugated Steel
Embedment: 0.00 in
Barrel Manning's n: 0.0240
Culvert Type: Straight
Inlet Configuration: Thin Edge Projecting (Ke=0.9)
Inlet Depression: None

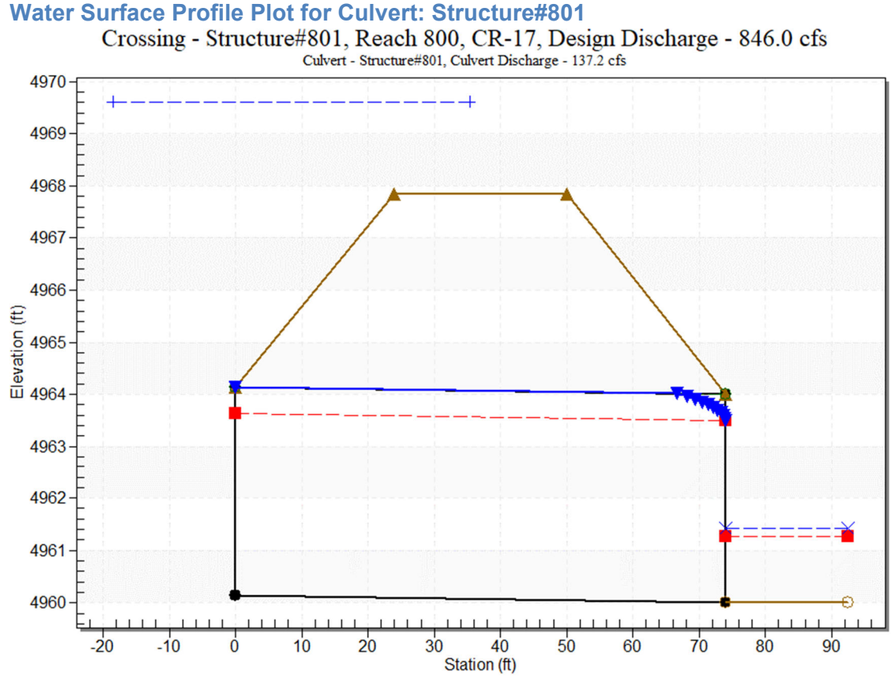
Culvert Summary Table: Structure#801

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	18.94 cfs	18.94 cfs	4962.29	1.90	2.145	2-M2c	2.16	1.28	1.28	0.15	5.47	1.25
100 Year	846.00 cfs	137.19 cfs	4969.60	8.94	9.458	7-M2c	4.00	3.48	3.48	1.42	11.81	5.23

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4960.15 ft,
Outlet Elevation (invert): 4960.01 ft
Culvert Length: 74.00 ft,
Culvert Slope: 0.0018

Water Surface Profile Plot for Culvert: Structure#801



Tailwater Data for Crossing: Structure#802, Reach 800

Downstream Channel Rating Curve (Crossing: Structure#802, Reach 800)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
18.94	4960.16	0.15	1.25	0.17	0.58
846.00	4961.43	1.42	5.23	1.63	0.82

Tailwater Channel Data - Structure#801, Reach 800

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 100.00 ft
Side Slope (H:V): 10.00 (_:1)
Channel Slope: 0.0185
Channel Manning's n: 0.0450
Channel Invert Elevation: 4960.01 ft

Roadway Data for Crossing: Structure#801, Reach 800

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4967.84 ft
Roadway Surface: Paved
Roadway Top Width: 26.00 ft

Culvert Data: Structure#804

Site Data - Structure#804

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4889.00 ft
Outlet Station: 90.00 ft
Outlet Elevation: 4881.00 ft
Number of Barrels: 1

Culvert Data Summary - Structure#804

Barrel Shape: Concrete Box
Barrel Span: 5.00 ft
Barrel Rise: 6.33 ft
Barrel Material: Concrete
Embedment: 60.00 in
Barrel Manning's n: 0.0130 (top and sides)
Manning's n: 0.0130 (bottom)
Culvert Type: Straight
Inlet Configuration: Square Edge (30-75º flare) Wingwall (Ke=0.4)
Inlet Depression: None

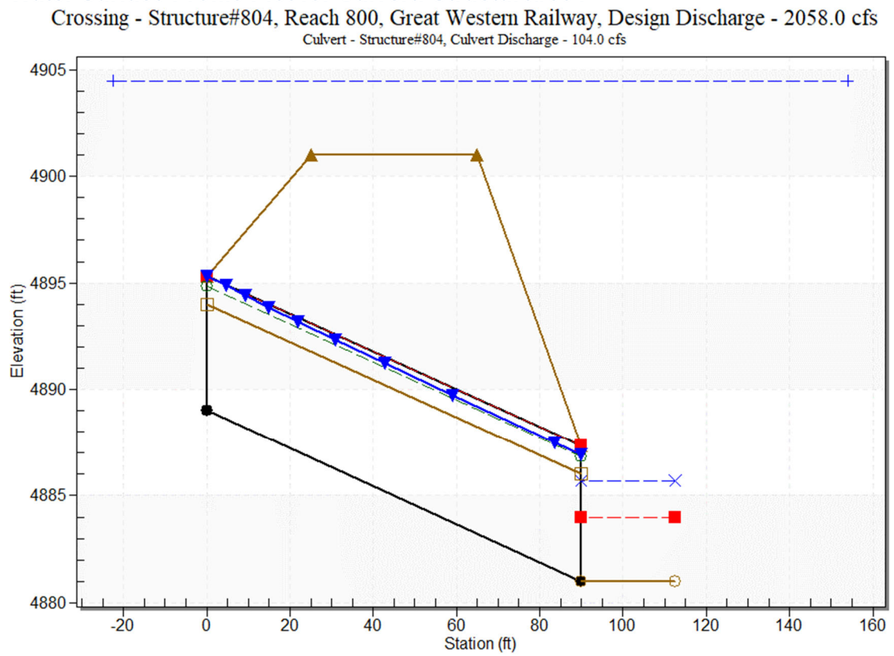
Culvert Summary Table: Structure#804

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	126.99 cfs	85.50 cfs	4901.29	7.29	0.0*	5-S2n	0.73	1.33	0.81	0.92	21.16	2.04
100 Year	2058.00 cfs	103.95 cfs	4904.46	10.46	2.606	5-S2n	0.83	1.33	0.92	4.70	22.52	5.54

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4894.00 ft,
Outlet Elevation (invert): 4886.00 ft
Culvert Length: 90.35 ft,
Culvert Slope: 0.0889

Water Surface Profile Plot for Culvert: Structure#804



Tailwater Data for Crossing: Structure#804, Reach 800

Downstream Channel Rating Curve (Crossing: Structure#804, Reach 800)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
126.99	4881.92	0.92	2.04	0.63	0.38
2058.00	4885.70	4.70	5.54	3.22	0.49

Tailwater Channel Data - Structure#804, Reach 800

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 65.00 ft
Side Slope (H:V): 3.00 (_:1)
Channel Slope: 0.0110
Channel Manning's n: 0.0700
Channel Invert Elevation: 4881.00 ft

Roadway Data for Crossing: Structure#804, Reach 800

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4901.00 ft
Roadway Surface: Gravel
Roadway Top Width: 40.00 ft

Culvert Data: Structure#805

Site Data - Structure#805

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4893.00 ft
Outlet Station: 62.00 ft
Outlet Elevation: 4892.00 ft
Number of Barrels: 1

Culvert Data Summary - Structure#805

Barrel Shape: Circular
Barrel Diameter: 2.00 ft
Barrel Material: Corrugated Steel
Embedment: 0.00 in
Barrel Manning's n: 0.0240
Culvert Type: Straight
Inlet Configuration: Thin Edge Projecting (Ke=0.9)
Inlet Depression: None

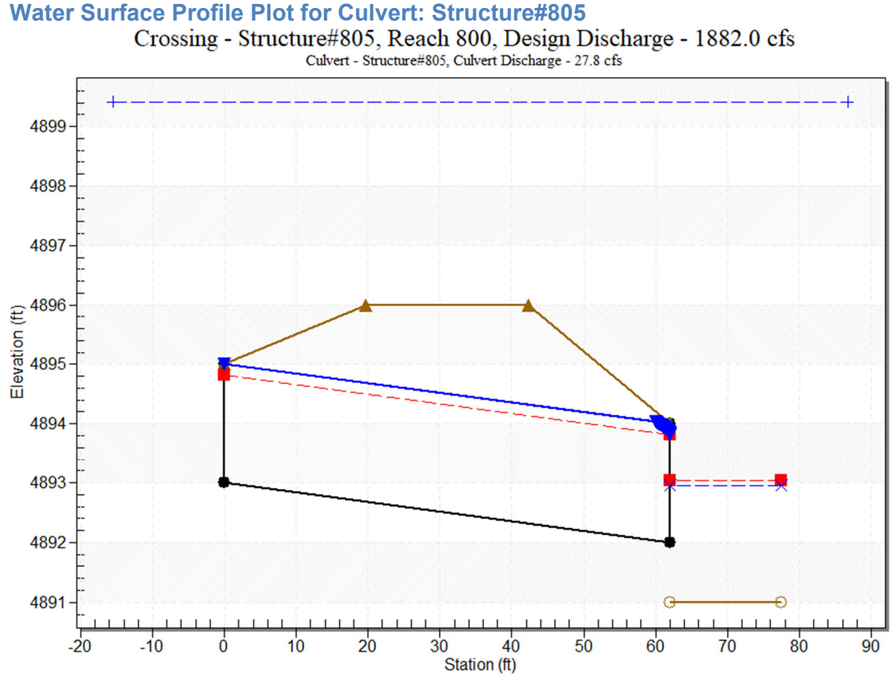
Culvert Summary Table: Structure#805

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	126.99 cfs	19.78 cfs	4896.54	3.39	3.538	7-M2c	2.00	1.60	1.60	0.40	7.35	2.93
100 Year	1882.00 cfs	27.78 cfs	4899.41	5.49	6.405	7-M2c	2.00	1.82	1.82	1.96	9.24	8.10

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4893.00 ft,
Outlet Elevation (invert): 4892.00 ft
Culvert Length: 62.01 ft,
Culvert Slope: 0.0161

Water Surface Profile Plot for Culvert: Structure#805



Tailwater Data for Crossing: Structure#805, Reach 800

Downstream Channel Rating Curve (Crossing: Structure#805, Reach 800)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
126.99	4891.40	0.40	2.93	0.69	0.83
1882.00	4892.96	1.96	8.10	3.42	1.07

Tailwater Channel Data - Structure#805, Reach 800

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 107.00 ft
Side Slope (H:V): 6.00 (_:1)
Channel Slope: 0.0280
Channel Manning's n: 0.0450
Channel Invert Elevation: 4891.00 ft

Roadway Data for Crossing: Structure#805, Reach 800

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4896.00 ft
Roadway Surface: Gravel
Roadway Top Width: 22.60 ft

Culvert Data: Structure#807

Site Data - Structure#807

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4917.00 ft
Outlet Station: 80.00 ft
Outlet Elevation: 4916.00 ft
Number of Barrels: 2

Culvert Data Summary - Structure#807

Barrel Shape: Concrete Box
Barrel Span: 12.00 ft
Barrel Rise: 5.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (30-75º flare) Wingwall (Ke=0.4)
Inlet Depression: None

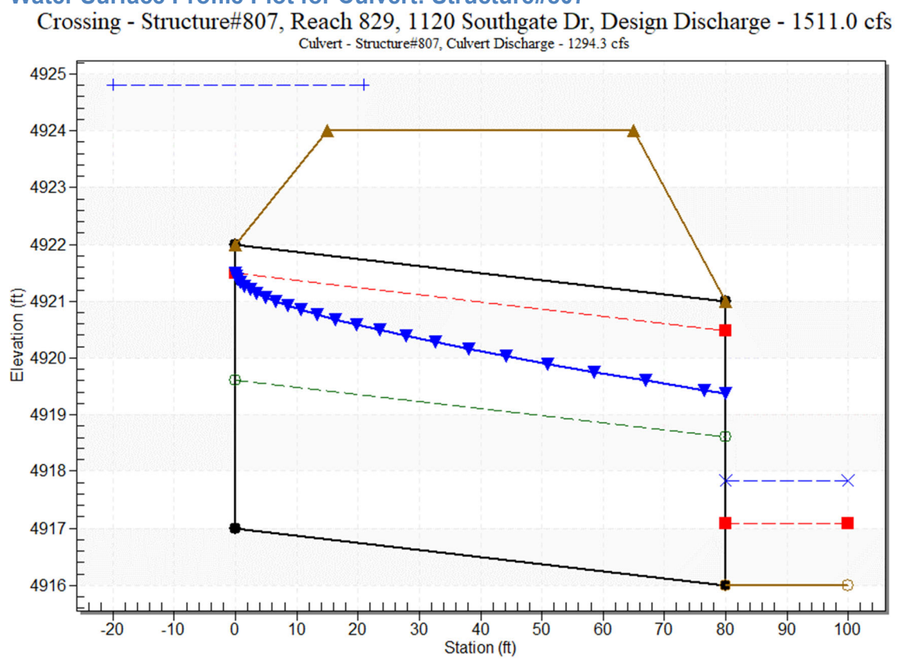
Culvert Summary Table: Structure#807

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	63.00 cfs	63.00 cfs	4917.91	0.91	0.0*	1-S2n	0.38	0.60	0.38	0.27	6.97	0.98
100 Year	1511.00 cfs	1294.26 cfs	4924.80	7.80	6.555	5-S2n	2.61	4.49	3.37	1.82	16.00	3.40

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4917.00 ft,
Outlet Elevation (invert): 4916.00 ft
Culvert Length: 80.01 ft,
Culvert Slope: 0.0125

Water Surface Profile Plot for Culvert: Structure#807



Tailwater Data for Crossing: Structure#807, Reach 829

Downstream Channel Rating Curve (Crossing: Structure#807, Reach 829)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
63.00	4916.27	0.27	0.98	0.09	0.33
1511.00	4917.82	1.82	3.40	0.57	0.45

Tailwater Channel Data - Structure#807, Reach 829

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 235.00 ft
Side Slope (H:V): 5.00 (_:1)
Channel Slope: 0.0050
Channel Manning's n: 0.0450
Channel Invert Elevation: 4916.00 ft

Roadway Data for Crossing: Structure#807, Reach 829

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4924.00 ft
Roadway Surface: Paved
Roadway Top Width: 50.00 ft

Culvert Data: Structure#808

Site Data - Structure#808

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4942.00 ft
Outlet Station: 527.00 ft
Outlet Elevation: 4932.00 ft
Number of Barrels: 1

Culvert Data Summary - Structure#808

Barrel Shape: Circular
Barrel Diameter: 4.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0130
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall (Ke=0.5)
Inlet Depression: None

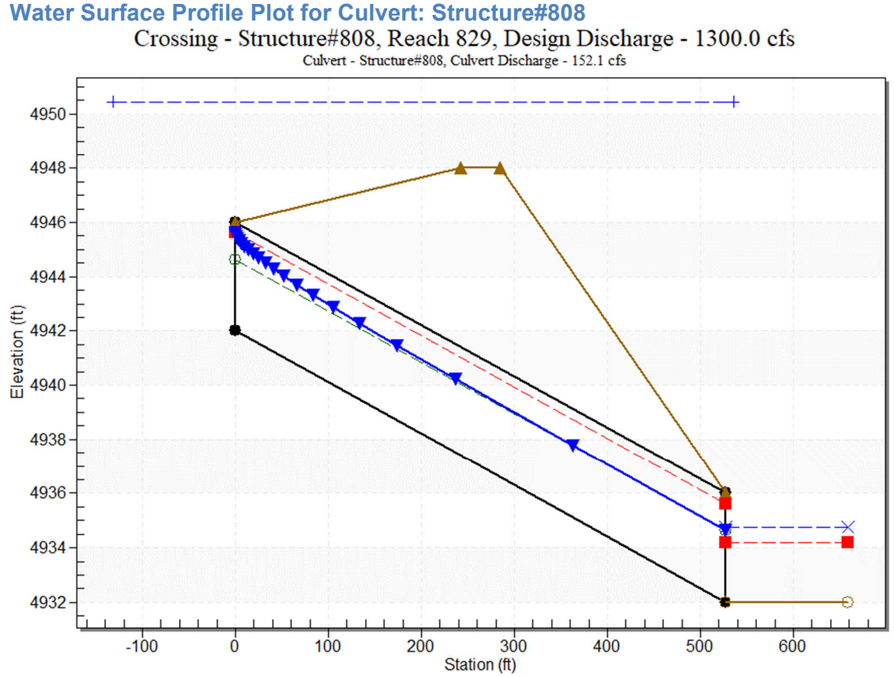
Culvert Summary Table: Structure#808

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	36.03 cfs	36.03 cfs	4944.55	2.55	0.0*	1-S2n	1.15	1.79	1.16	0.33	11.92	1.64
100 Year	1300.00 cfs	152.07 cfs	4950.43	8.43	3.091	5-S2n	2.63	3.61	2.65	2.74	17.18	6.02

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4942.00 ft,
Outlet Elevation (invert): 4932.00 ft
Culvert Length: 527.09 ft,
Culvert Slope: 0.0190

Water Surface Profile Plot for Culvert: Structure#808



Tailwater Data for Crossing: Structure#808, Reach 829

Downstream Channel Rating Curve (Crossing: Structure#808, Reach 829)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
36.03	4932.33	0.33	1.64	0.23	0.51
1300.00	4934.74	2.74	6.02	1.88	0.70

Tailwater Channel Data - Structure#808, Reach 829

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 64.00 ft
Side Slope (H:V): 5.40 (_:1)
Channel Slope: 0.0110
Channel Manning's n: 0.0450
Channel Invert Elevation: 4932.00 ft

Roadway Data for Crossing: Structure#808, Reach 829

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4948.00 ft
Roadway Surface: Paved
Roadway Top Width: 43.00 ft

Culvert Data: Structure#809

Site Data - Structure#809

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4958.00 ft
Outlet Station: 304.00 ft
Outlet Elevation: 4948.00 ft
Number of Barrels: 1

Culvert Data Summary - Structure#809

Barrel Shape: Circular
Barrel Diameter: 4.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0110
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall (Ke=0.5)
Inlet Depression: None

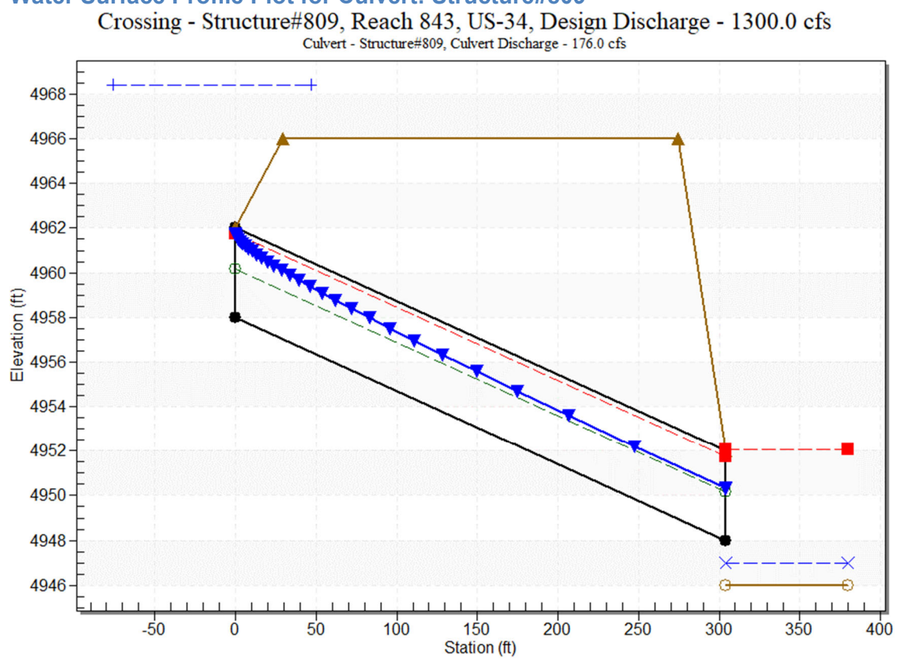
Culvert Summary Table: Structure#809

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	36.03 cfs	36.03 cfs	4960.52	2.52	0.0*	1-S2n	0.92	1.79	0.92	0.11	16.43	21.45
100 Year	1300.00 cfs	175.97 cfs	4968.39	10.39	1.695	5-S2n	2.16	3.76	2.31	0.98	23.45	86.35

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4958.00 ft,
Outlet Elevation (invert): 4948.00 ft
Culvert Length: 304.16 ft,
Culvert Slope: 0.0329

Water Surface Profile Plot for Culvert: Structure#809



Tailwater Data for Crossing: Structure#809, Reach 843

Downstream Channel Rating Curve (Crossing: Structure#809, Reach 843)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
36.03	4946.11	0.11	21.45	34.03	11.45
1300.00	4946.98	0.98	86.35	305.00	15.39

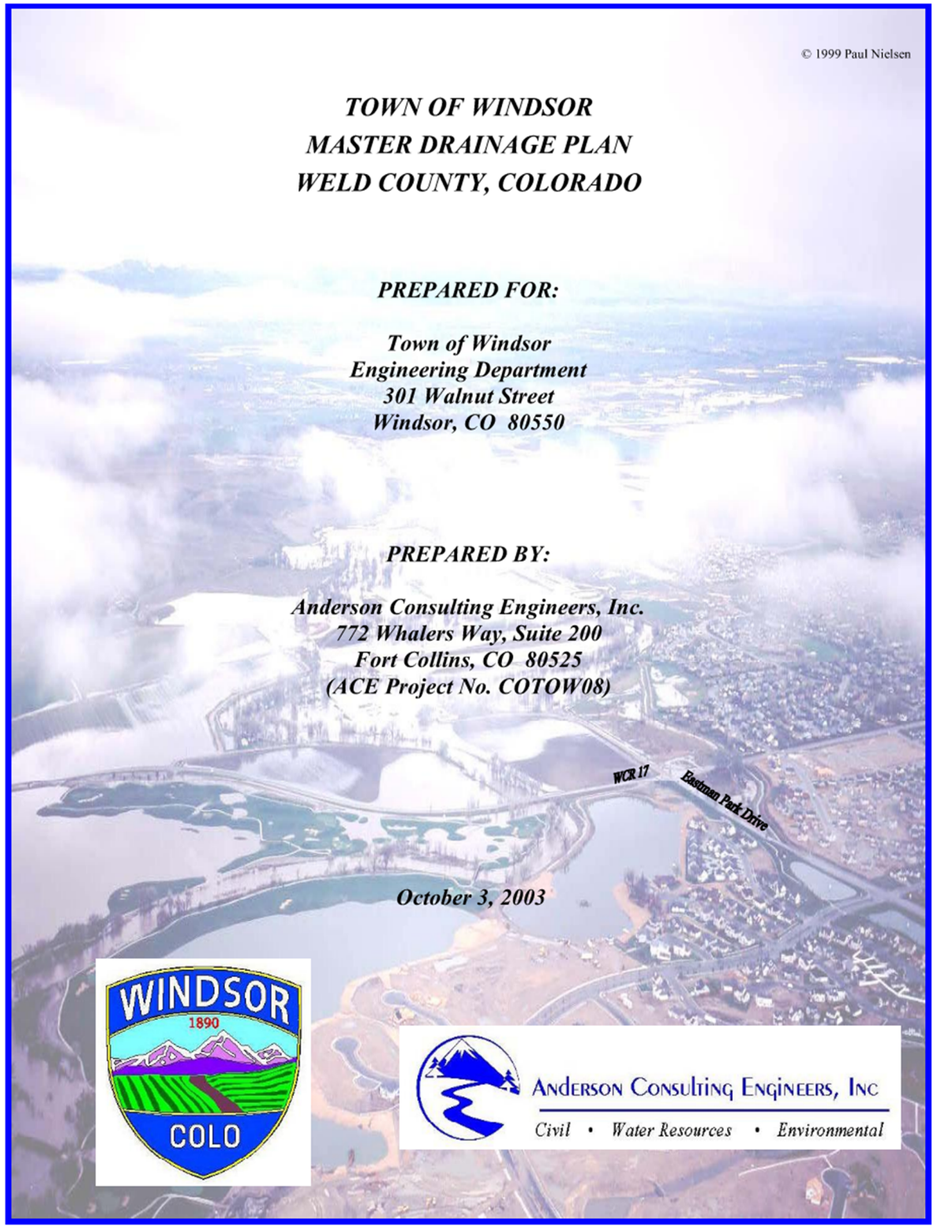
Tailwater Channel Data - Structure#809, Reach 843

Tailwater Channel Option: Rectangular Channel
Bottom Width: 15.40 ft
Channel Slope: 5.0000
Channel Manning's n: 0.0350
Channel Invert Elevation: 4946.00 ft

Roadway Data for Crossing: Structure#809, Reach 843

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4966.00 ft
Roadway Surface: Paved
Roadway Top Width: 245.00 ft

Structure#1001



3.2.7 River Ridge Basin

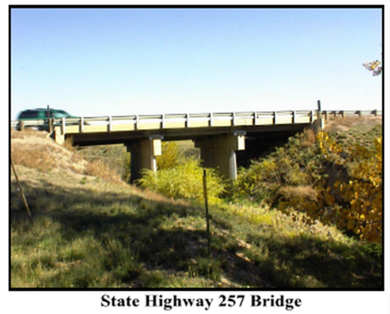
There are two major crossings of the major drainageway in the River Ridge Basin. The crossings at River Edge Road and River West Drive are very similar. Both crossings consist of five, 7-foot diameter reinforced concrete pipes. The depth of flow upstream of the culverts is estimated to be approximately 11 feet prior to overtopping the road. The maximum capacity at River Edge Road and River West Drive prior to overtopping the road is 2,535 cfs and 2,340 cfs respectively. The 100-year existing condition discharge in the major drainageway at the two road crossings is 3,440 cfs.


River West Drive Crossing in the River Ridge Basin

3.2.8 Oklahoma Basin

There are three locations where existing structures convey stormwater across the major drainageway in the Oklahoma Basin. These crossing structures consist of one concrete bridge, one arch corrugated metal pipe (CMP) and one reinforced concrete box culvert (RCB).

State Highway 257 Bridge. The crossing at State Highway 257 consists of a 60-foot span concrete bridge. At this location, roadway overtopping occurs at a depth of approximately 19 feet from the invert of the bridge. However, left bank overtopping will occur at a depth of approximately 14 feet from the invert of the channel. The capacity of the bridge prior to overtopping the road and left bank is 5,000 cfs and 2,900 cfs respectively. The 100-year existing condition discharge at this location along the major drainageway is 5,010 cfs.


State Highway 257 Bridge in the Oklahoma Basin

Great Western Railroad Culvert. The Great Western Railroad crossing is single 12'H x 9'W arched CMP. Railroad overtopping occurs at a depth of approximately 12 feet above the invert of the culvert. The maximum capacity of the culvert before overtopping the railroad is 770 cfs. The

Culvert Data: Structure#1002

Site Data - Structure#1002

Site Data Option: Culvert Invert Data
Inlet Station: 123.00 ft
Inlet Elevation: 4772.00 ft
Outlet Station: 0.00 ft
Outlet Elevation: 4771.50 ft
Number of Barrels: 1

Culvert Data Summary - Structure#1002

Barrel Shape: Arch, Open Bottom
Barrel Span: 12.00 ft
Barrel Rise: 6.25 ft
Barrel Material: Corrugated Steel
Embedment: 0.00 in
Barrel Manning's n: 0.0240 (top and sides)
Manning's n: 0.0240 (bottom)
Culvert Type: Straight
Inlet Configuration: Thin Edge Projecting
Inlet Depression: None

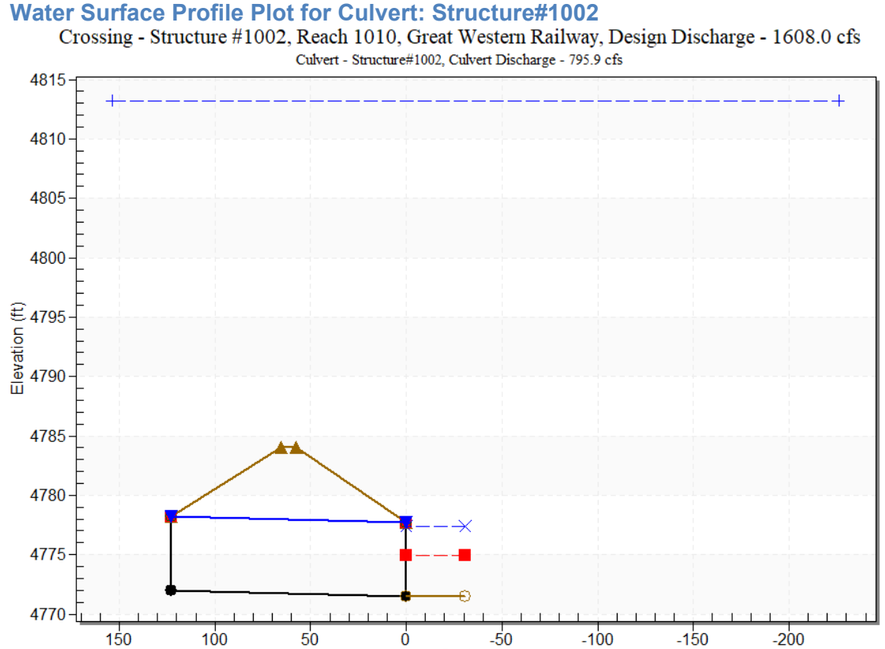
Culvert Summary Table: Structure#1002

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	1608.00	795.88	4785.24	12.77	13.235	7-M2t	6.25	4.94	5.88	5.88	13.65	5.28
100 Year	9916.00	498.11	4790.14	7.63	18.139	4-FFf	6.25	3.73	6.25	15.59	8.41	8.94

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4772.00 ft
Outlet Elevation (invert): 4771.50 ft
Culvert Length: 123.00 ft
Culvert Slope: 0.00 ft/ft

Water Surface Profile Plot for Culvert: Structure#1002



Tailwater Data for Crossing: Structure#1002, Reach 1010

Downstream Channel Rating Curve (Crossing: Structure#1002, Reach 1010)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
1608.00	4777.38	5.28	5.88	1.84	0.42
9916.00	4787.09	8.94	15.59	4.86	0.48

Tailwater Channel Data - Structure#1002, Reach 1010

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 40.00 ft
Side Slope (H:V): 2.00 (_:1)
Channel Slope: 0.01 ft/ft
Channel Manning's n: 0.0550
Channel Invert Elevation: 4771.50 ft

Roadway Data for Crossing: Structure#1002, Reach 1010

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 200.00 ft
Crest Elevation: 4784.00 ft
Roadway Surface: Gravel
Roadway Top Width: 8.00 ft

Culvert Data: Structure#1003

Site Data - Structure#1003

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4807.90 ft
Outlet Station: 113.00 ft
Outlet Elevation: 4807.47 ft
Number of Barrels: 1

Culvert Data Summary - Structure#1003

Barrel Shape: Concrete Box
Barrel Span: 5.50 ft
Barrel Rise: 8.50 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0130
Culvert Type: Straight
Inlet Configuration: Square Edge (90 & 15º flare) Wingwall
Inlet Depression: None

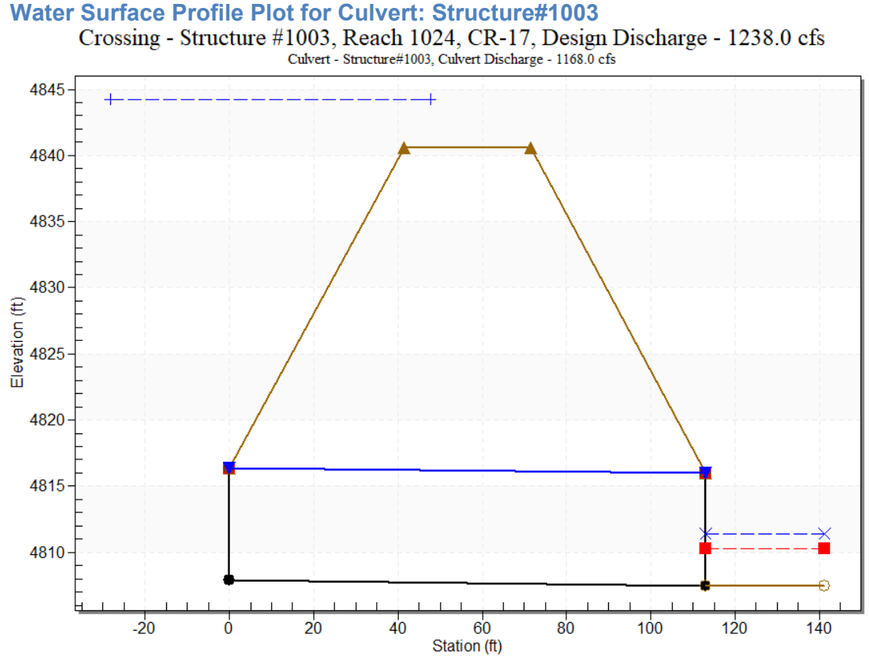
Culvert Summary Table: Structure#1003

Names	Discharge (cfs)	Discharge (cfs)	Elevation (ft)	Control Depth (ft)	Control Depth (ft)	Type	Depth (ft)	Depth (ft)	Depth (ft)	Depth (ft)	Velocity (ft/s)	Velocity (ft/s)
5 Year	1238.00	1168.01	4844.20	36.30	27.448	6-FFc	8.50	8.50	8.50	3.91	26.48	5.69
100 Year	7567.00	1199.46	4842.24	34.34	27.721	4-FFf	8.50	8.50	8.50	9.96	25.66	9.51

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4807.90 ft
Outlet Elevation (invert): 4807.47 ft
Culvert Length: 113.00 ft
Culvert Slope: 0.00 ft/ft

Water Surface Profile Plot for Culvert: Structure#1003



Tailwater Data for Crossing: Structure#1003, Reach 1024

Downstream Channel Rating Curve (Crossing: Structure#1003, Reach 1024)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
1238.00	4811.38	5.69	3.91	2.49	0.57
7567.00	4817.43	9.51	9.96	6.34	0.65

Tailwater Channel Data - Structure#1003, Reach 1024

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 40.00 ft
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.01 ft/ft
Channel Manning's n: 0.0550
Channel Invert Elevation: 4807.47 ft

Roadway Data for Crossing: Structure#1003, Reach 1024

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 200.00 ft
Crest Elevation: 4840.60 ft
Roadway Surface: Paved
Roadway Top Width: 30.00 ft

Culvert Data: Structure#1004

Site Data - Structure#1004

Site Data Option: Culvert Invert Data
Inlet Station: 143.00 ft
Inlet Elevation: 4843.00 ft
Outlet Station: 100.00 ft
Outlet Elevation: 4842.00 ft
Number of Barrels: 2

Culvert Data Summary - Structure#1004

Barrel Shape: Concrete Box
Barrel Span: 7.00 ft
Barrel Rise: 5.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (30-75º flare) Wingwall (Ke=0.4)
Inlet Depression: None

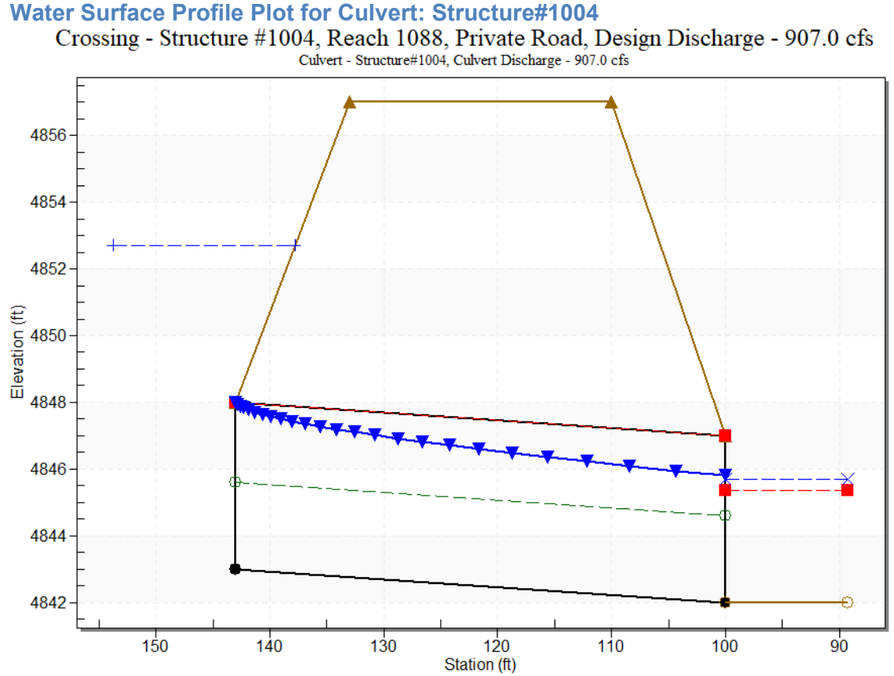
Culvert Summary Table: Structure#1004

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	907.00	907.00	4852.69	9.69	7.933	5-S2n	2.62	5.00	3.80	3.70	17.04	7.90
100 Year	5305.00	1237.22	4858.22	15.20	15.216	4-FFf	3.29	5.00	5.00	8.90	17.67	12.77

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4843.00 ft
Outlet Elevation (invert): 4842.00 ft
Culvert Length: 43.01 ft
Culvert Slope: 0.02 ft/ft

Water Surface Profile Plot for Culvert: Structure#1004



Tailwater Data for Crossing: Structure#1004, Reach 1088

Downstream Channel Rating Curve (Crossing: Structure#1004, Reach 1088)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
907.00	4845.70	7.90	3.70	5.37	0.84
5305.00	4850.90	12.77	8.90	12.94	0.95

Tailwater Channel Data - Structure#1004, Reach 1088

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 20.00 ft
Side Slope (H:V): 3.00 (_:1)
Channel Slope: 0.02 ft/ft
Channel Manning's n: 0.0550
Channel Invert Elevation: 4842.00 ft

Roadway Data for Crossing: Structure#1004, Reach 1088

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 1000.00 ft
Crest Elevation: 4857.00 ft
Roadway Surface: Paved
Roadway Top Width: 23.00 ft

Culvert Data: Structure#1005

Site Data - Structure#1005

Site Data Option: Culvert Invert Data
Inlet Station: 149.00 ft
Inlet Elevation: 4851.00 ft
Outlet Station: 100.00 ft
Outlet Elevation: 4850.50 ft
Number of Barrels: 2

Culvert Data Summary - Structure#1005

Barrel Shape: Circular
Barrel Diameter: 6.00 ft
Barrel Material: Corrugated Steel
Embedment: 2.00 in
Barrel Manning's n: 0.0240 (top and sides)
Manning's n: 0.0350 (bottom)
Culvert Type: Straight
Inlet Configuration: Thin Edge Projecting
Inlet Depression: None

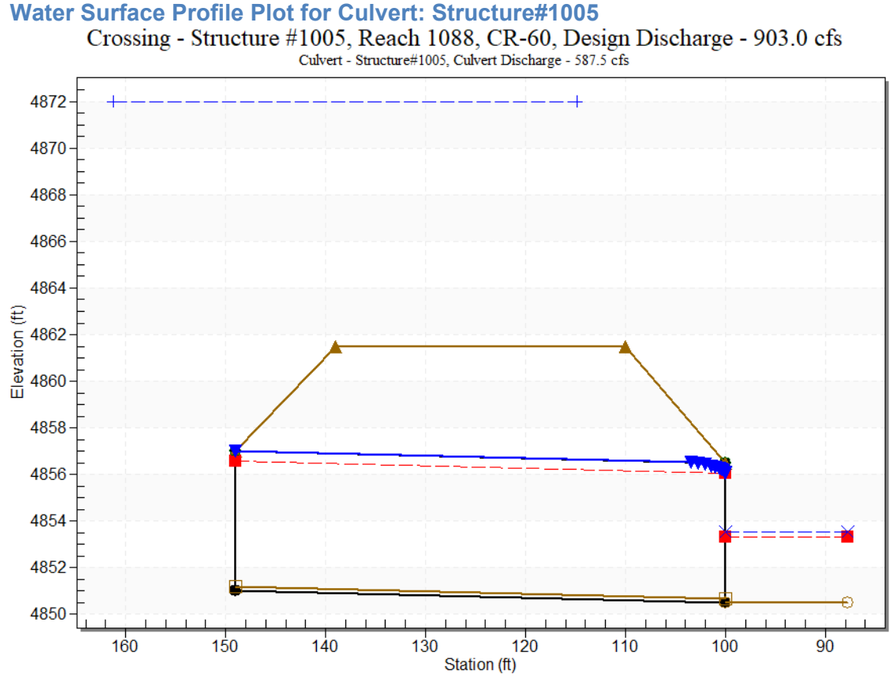
Culvert Summary Table: Structure#1005

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	903.00	587.52	4871.98	20.81	16.291	7-M2c	5.83	5.39	5.39	3.02	16.72	7.46
100 Year	5220.00	618.20	4862.86	11.35	11.698	4-FFf	5.83	4.67	5.83	7.15	11.07	12.02

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4851.17 ft
Outlet Elevation (invert): 4850.67 ft
Culvert Length: 49.00 ft
Culvert Slope: 0.01 ft/ft

Water Surface Profile Plot for Culvert: Structure#1005



Tailwater Data for Crossing: Structure#1005, Reach 1088

Downstream Channel Rating Curve (Crossing: Structure#1005, Reach 1088)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
903.00	4853.52	7.46	3.02	3.28	0.89
5220.00	4857.65	12.02	7.15	7.76	1.00

Tailwater Channel Data - Structure#1005, Reach 1088

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 25.00 ft
Side Slope (H:V): 5.00 (_:1)
Channel Slope: 0.02 ft/ft
Channel Manning's n: 0.0440
Channel Invert Elevation: 4850.50 ft

Roadway Data for Crossing: Structure#1005, Reach 1088

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 1000.00 ft
Crest Elevation: 4861.50 ft
Roadway Surface: Gravel
Roadway Top Width: 29.00 ft

Culvert Data: Structure#1103

Site Data - Structure#1103

Site Data Option: Culvert Invert Data
Inlet Station: 193.00 ft
Inlet Elevation: 4878.00 ft
Outlet Station: 0.00 ft
Outlet Elevation: 4876.50 ft
Number of Barrels: 2

Culvert Data Summary - Structure#1103

Barrel Shape: Elliptical
Barrel Span: 68.00 in
Barrel Rise: 43.00 in
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall
Inlet Depression: None

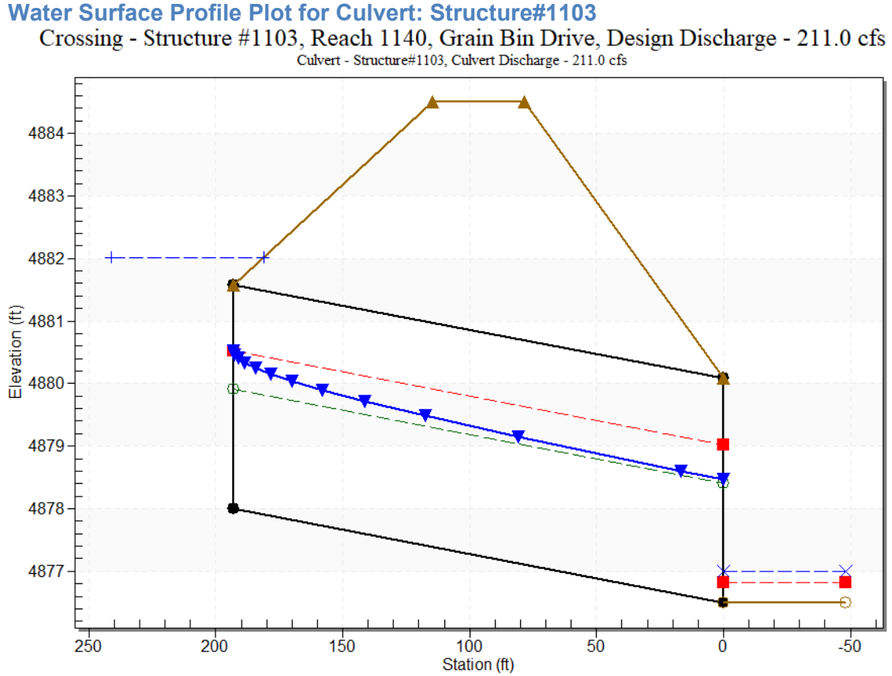
Culvert Summary Table: Structure#1103

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	211.00	211.00	4882.02	4.02	2.452	5-S2n	1.91	2.52	1.97	0.50	11.51	2.05
100 Year	1109.00	354.40	4884.94	6.94	5.936	5-S2n	2.69	3.21	2.76	1.34	13.20	3.87

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4878.00 ft
Outlet Elevation (invert): 4876.50 ft
Culvert Length: 193.01 ft
Culvert Slope: 0.01 ft/ft

Water Surface Profile Plot for Culvert: Structure#1103



Tailwater Data for Crossing: Structure#1103, Reach 1140

Downstream Channel Rating Curve (Crossing: Structure#1103, Reach 1140)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
211.00	4877.00	2.05	0.50	0.47	0.52
1109.00	4877.84	3.87	1.34	1.26	0.61

Tailwater Channel Data - Structure#1103, Reach 1140

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 200.00 ft
Side Slope (H:V): 10.00 (_:1)
Channel Slope: 0.01 ft/ft
Channel Manning's n: 0.0550
Channel Invert Elevation: 4876.50 ft

Roadway Data for Crossing: Structure#1103, Reach 1140

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 1000.00 ft
Crest Elevation: 4884.50 ft
Roadway Surface: Paved
Roadway Top Width: 36.00 ft

Culvert Data: Structure#1203

Site Data - Structure#1203

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4916.14 ft
Outlet Station: 200.92 ft
Outlet Elevation: 4915.00 ft
Number of Barrels: 3

Culvert Data Summary - Structure#1203

Barrel Shape: Circular
Barrel Diameter: 5.50 ft
Barrel Material
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Beveled Edge (1.5:1) (Ke=0.2)
Inlet Depression: None

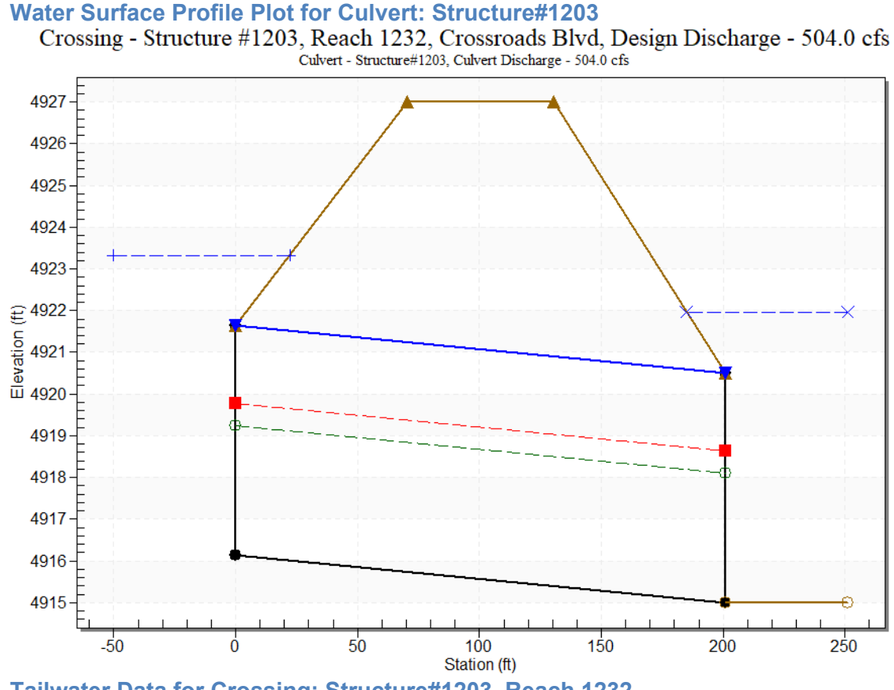
Culvert Summary Table: Structure#1203

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	102.00	102.00	4922.03	2.11	5.886	4-FFf	1.31	1.58	5.50	6.97	1.43	0.00
100 Year	504.00	504.00	4923.33	5.35	7.188	4-FFf	3.11	3.62	5.50	6.97	7.07	0.00

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4916.14 ft
Outlet Elevation (invert): 4915.00 ft
Culvert Length: 200.92 ft
Culvert Slope: 0.01 ft/ft

Water Surface Profile Plot for Culvert: Structure#1203



Tailwater Data for Crossing: Structure#1203, Reach 1232

Downstream Channel Rating Curve (Crossing: Structure#1203, Reach 1232)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
102.00	4921.97	6.97
504.00	4921.97	6.97

Tailwater Channel Data - Structure#1203, Reach 1232

Tailwater Channel Option: Enter Constant Tailwater Elevation
Constant Tailwater Elevation: 4921.97 ft

Roadway Data for Crossing: Structure#1203, Reach 1232

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 500.00 ft
Crest Elevation: 4927.00 ft
Roadway Surface: Paved
Roadway Top Width: 60.00 ft

Culvert Data: Structure#1204

Site Data - Structure#1204

Site Data Option: Culvert Invert Data
Inlet Station: 1090.00 ft
Inlet Elevation: 4939.05 ft
Outlet Station: 1000.00 ft
Outlet Elevation: 4938.69 ft
Number of Barrels: 1

Culvert Data Summary - Structure#1204

Barrel Shape: Circular
Barrel Diameter: 6.50 ft
Barrel Material: Corrugated Steel
Embedment: 0.00 in
Barrel Manning's n: 0.0110
Culvert Type: Straight
Inlet Configuration: Thin Edge Projecting (Ke=0.9)
Inlet Depression: None

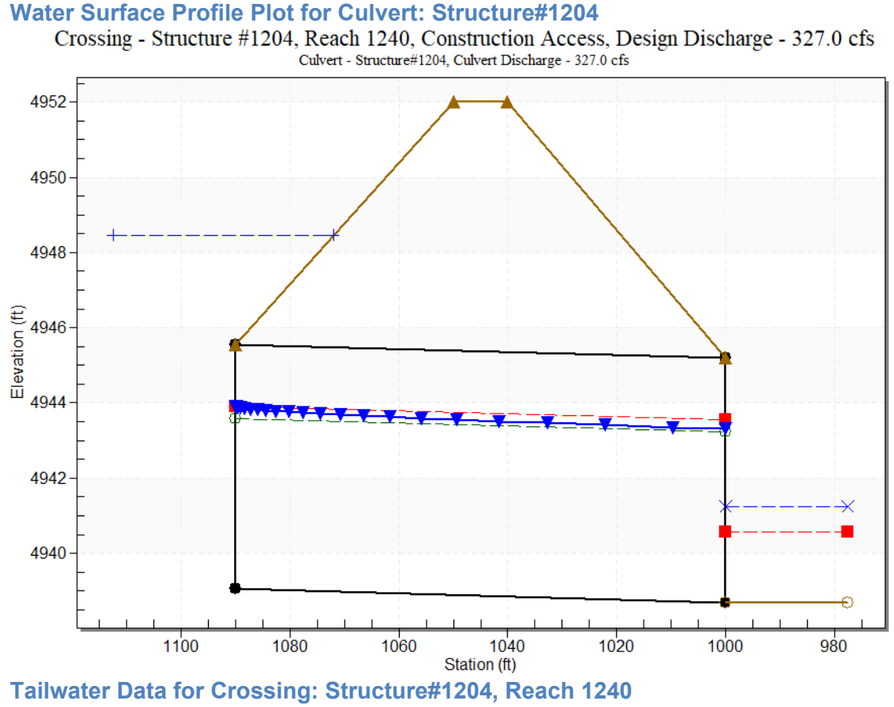
Culvert Summary Table: Structure#1204

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	42.00	42.00	4941.52	2.47	1.368	1-S2n	1.43	1.68	1.47	0.83	7.48	2.39
100 Year	327.00	327.00	4948.46	9.41	7.608	5-S2n	4.53	4.85	4.61	2.56	12.98	4.52

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4939.05 ft
Outlet Elevation (invert): 4938.69 ft
Culvert Length: 90.00 ft
Culvert Slope: 0.00 ft/ft

Water Surface Profile Plot for Culvert: Structure#1204



Tailwater Data for Crossing: Structure#1204, Reach 1240

Downstream Channel Rating Curve (Crossing: Structure#1204, Reach 1240)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
42.00	4939.52	2.39	0.83	0.26	0.50
327.00	4941.25	4.52	2.56	0.80	0.58

Tailwater Channel Data - Structure#1204, Reach 1240

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 18.00 ft
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.01 ft/ft
Channel Manning's n: 0.0350
Channel Invert Elevation: 4938.69 ft

Roadway Data for Crossing: Structure#1204, Reach 1240

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 1000.00 ft
Crest Elevation: 4952.00 ft
Roadway Surface: Gravel
Roadway Top Width: 10.00 ft

Culvert Data: Structure#1205

Site Data - Structure#1205

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4939.69 ft
Outlet Station: 65.54 ft
Outlet Elevation: 4939.36 ft
Number of Barrels: 2

Culvert Data Summary - Structure#1205

Barrel Shape: Circular
Barrel Diameter: 4.50 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Beveled Edge (1.5:1) (Ke=0.2)
Inlet Depression: None

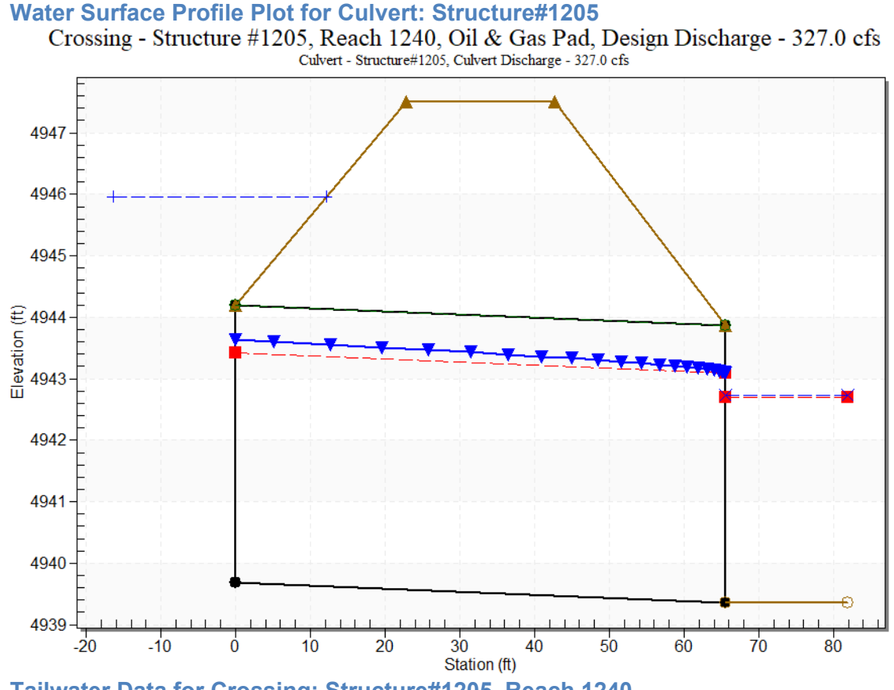
Culvert Summary Table: Structure#1205

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	42.00	42.00	4941.44	1.75	1.268	1-JS1t	1.13	1.30	1.56	1.56	4.29	4.32
100 Year	327.00	327.00	4945.95	6.26	6.227	7-M2c	4.50	3.73	3.73	3.37	11.59	7.21

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4939.69 ft
Outlet Elevation (invert): 4939.36 ft
Culvert Length: 65.54 ft
Culvert Slope: 0.01 ft/ft

Water Surface Profile Plot for Culvert: Structure#1205



Tailwater Data for Crossing: Structure#1205, Reach 1240

Downstream Channel Rating Curve (Crossing: Structure#1205, Reach 1240)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
42.00	4940.92	4.32	1.56	1.46	0.86
327.00	4942.73	7.21	3.37	3.15	0.98

Tailwater Channel Data - Structure#1205, Reach 1240

Tailwater Channel Option: Triangular Channel
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.01 ft/ft
Channel Manning's n: 0.0350
Channel Invert Elevation: 4939.36 ft

Roadway Data for Crossing: Structure#1205, Reach 1240

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 200.00 ft
Crest Elevation: 4947.50 ft
Roadway Surface: Paved
Roadway Top Width: 20.00 ft

Culvert Data: Structure#1206

Site Data - Structure#1206

Site Data Option: Culvert Invert Data
Inlet Station: 61.00 ft
Inlet Elevation: 4953.50 ft
Outlet Station: 0.00 ft
Outlet Elevation: 4952.00 ft
Number of Barrels: 2

Culvert Data Summary - Structure#1206

Barrel Shape: Circular
Barrel Diameter: 4.50 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall (Ke=0.5)
Inlet Depression: None

Culvert Summary Table: Structure#1206

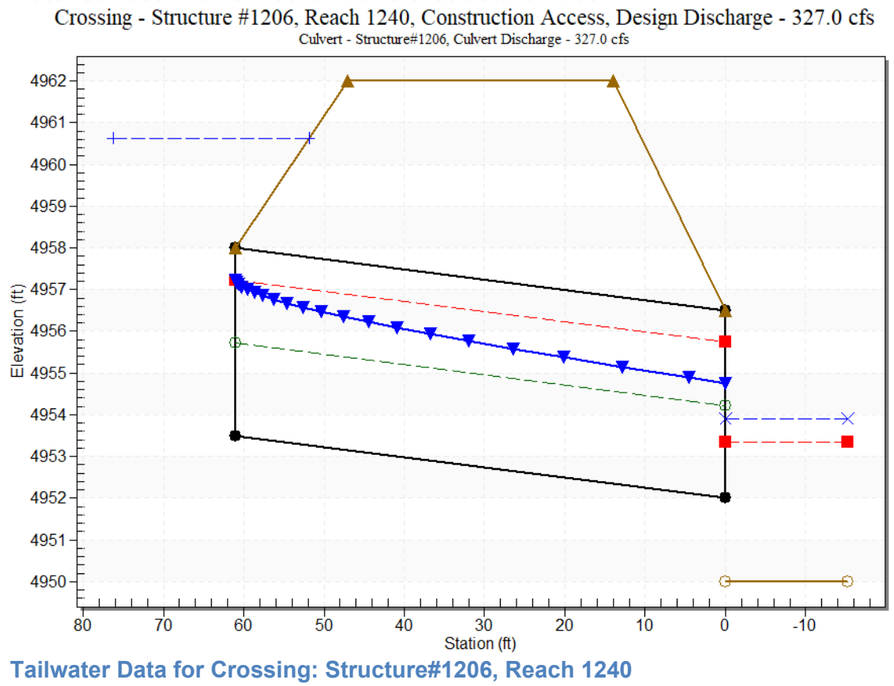
Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	42.00	42.00	4955.26	1.76	0.0*	1-S2n	0.76	1.30	0.83	1.81	10.35	3.21
100 Year	327.00	327.00	4960.63	7.13	5.436	5-S2n	2.22	3.73	2.76	3.90	15.98	5.36

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4953.50 ft
Outlet Elevation (invert): 4952.00 ft
Culvert Length: 61.02 ft
Culvert Slope: 0.02 ft/ft

Water Surface Profile Plot for Culvert: Structure#1206



Tailwater Data for Crossing: Structure#1206, Reach 1240

Downstream Channel Rating Curve (Crossing: Structure#1206, Reach 1240)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
42.00	4951.81	3.21	1.81	0.56	0.59
327.00	4953.90	5.36	3.90	1.22	0.68

Tailwater Channel Data - Structure#1206, Reach 1240

Tailwater Channel Option: Triangular Channel
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.01 ft/ft
Channel Manning's n: 0.0300
Channel Invert Elevation: 4950.00 ft

Roadway Data for Crossing: Structure#1206, Reach 1240

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 1000.00 ft
Crest Elevation: 4962.00 ft
Roadway Surface: Gravel
Roadway Top Width: 33.00 ft

Culvert Data: Structure#1207

Site Data - Structure#1207

Site Data Option: Culvert Invert Data
Inlet Station: 1000.00 ft
Inlet Elevation: 4962.85 ft
Outlet Station: 1208.00 ft
Outlet Elevation: 4961.81 ft
Number of Barrels: 2

Culvert Data Summary - Structure#1207

Barrel Shape: Circular
Barrel Diameter: 5.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall (Ke=0.5)
Inlet Depression: None

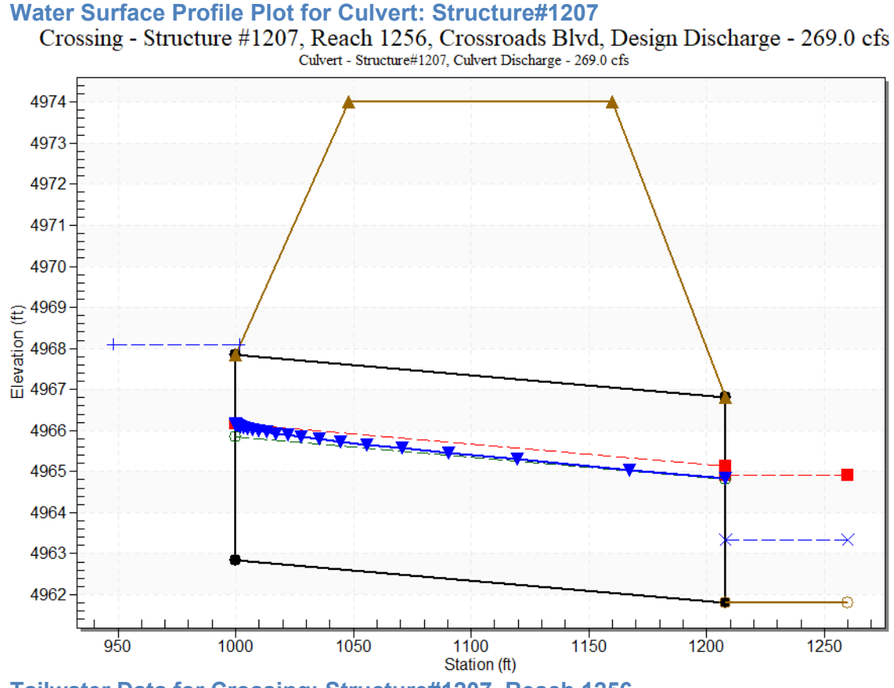
Culvert Summary Table: Structure#1207

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	37.00	37.00	4964.47	1.62	0.175	1-S2n	1.03	1.19	1.03	0.73	6.36	17.49
100 Year	269.00	269.00	4968.08	5.23	3.843	5-S2n	3.00	3.32	3.02	1.53	10.85	28.72

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4962.85 ft
Outlet Elevation (invert): 4961.81 ft
Culvert Length: 208.00 ft
Culvert Slope: 0.00 ft/ft

Water Surface Profile Plot for Culvert: Structure#1207



Tailwater Data for Crossing: Structure#1207, Reach 1256

Downstream Channel Rating Curve (Crossing: Structure#1207, Reach 1256)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
37.00	4962.54	17.49	0.73	22.69	5.11
269.00	4963.34	28.72	1.53	47.75	5.79

Tailwater Channel Data - Structure#1207, Reach 1256

Tailwater Channel Option: Triangular Channel
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.50 ft/ft
Channel Manning's n: 0.0300
Channel Invert Elevation: 4961.81 ft

Roadway Data for Crossing: Structure#1207, Reach 1256

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 1000.00 ft
Crest Elevation: 4974.00 ft
Roadway Surface: Paved
Roadway Top Width: 112.00 ft

Culvert Data: Structure#1208

Site Data - Structure#1208

Site Data Option: Culvert Invert Data
Inlet Station: 100.00 ft
Inlet Elevation: 4970.50 ft
Outlet Station: 0.00 ft
Outlet Elevation: 4970.00 ft
Number of Barrels: 1

Culvert Data Summary - Structure#1208

Barrel Shape: Circular
Barrel Diameter: 5.50 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall (Ke=0.5)
Inlet Depression: None

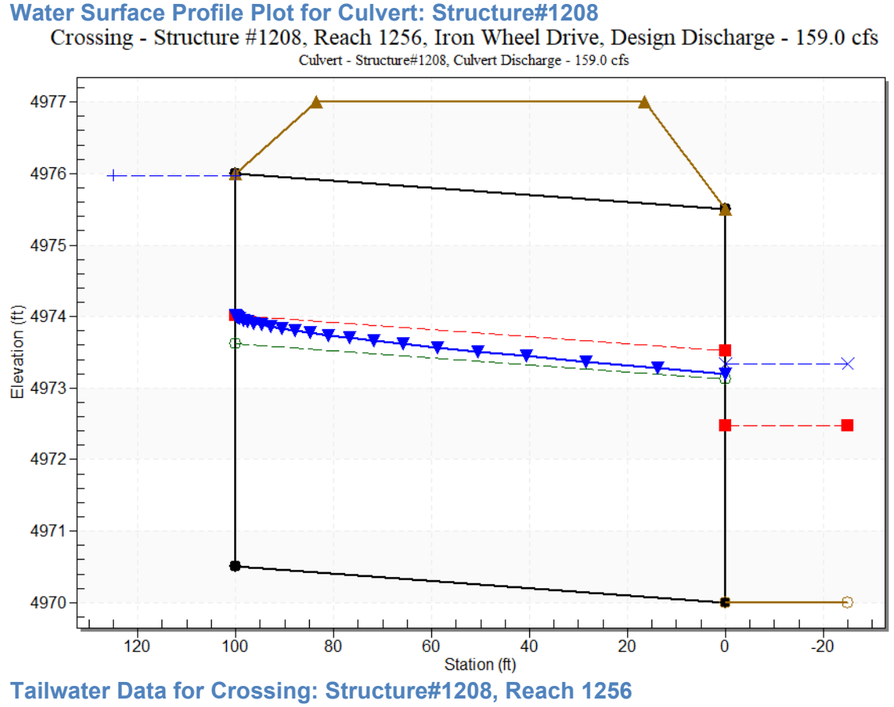
Culvert Summary Table: Structure#1208

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	15.00	15.00	4971.91	1.41	0.551	1-S2n	0.90	1.04	0.90	1.04	5.88	2.37
100 Year	159.00	159.00	4975.97	5.47	4.254	1-S2n	3.12	3.52	3.20	3.34	11.09	4.46

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4970.50 ft
Outlet Elevation (invert): 4970.00 ft
Culvert Length: 100.00 ft
Culvert Slope: 0.01 ft/ft

Water Surface Profile Plot for Culvert: Structure#1208



Tailwater Data for Crossing: Structure#1208, Reach 1256

Downstream Channel Rating Curve (Crossing: Structure#1208, Reach 1256)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
15.00	4971.04	2.37	1.04	0.49	0.48
159.00	4973.34	3.34	4.46	1.56	0.55

Tailwater Channel Data - Structure#1208, Reach 1256

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 4.00 ft
Side Slope (H:V): 2.00 (_:1)
Channel Slope: 0.01 ft/ft
Channel Manning's n: 0.0440
Channel Invert Elevation: 4970.00 ft

Roadway Data for Crossing: Structure#1208, Reach 1256

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 1000.00 ft
Crest Elevation: 4977.00 ft
Roadway Surface: Paved
Roadway Top Width: 67.00 ft

Culvert Data: Structure#1301

Site Data - Structure#1301

Site Data Option: Culvert Invert Data
Inlet Station: 48.00 ft
Inlet Elevation: 4892.00 ft
Outlet Station: 0.00 ft
Outlet Elevation: 4891.00 ft
Number of Barrels: 1

Culvert Data Summary - Structure#1301

Barrel Shape: Circular
Barrel Diameter: 2.50 ft
Barrel Material: Corrugated Steel
Embedment: 6.00 in
Barrel Manning's n: 0.0240 (top and sides)
Manning's n: 0.0350 (bottom)
Culvert Type: Straight
Inlet Configuration: Thin Edge Projecting (Ke=0.9)
Inlet Depression: None

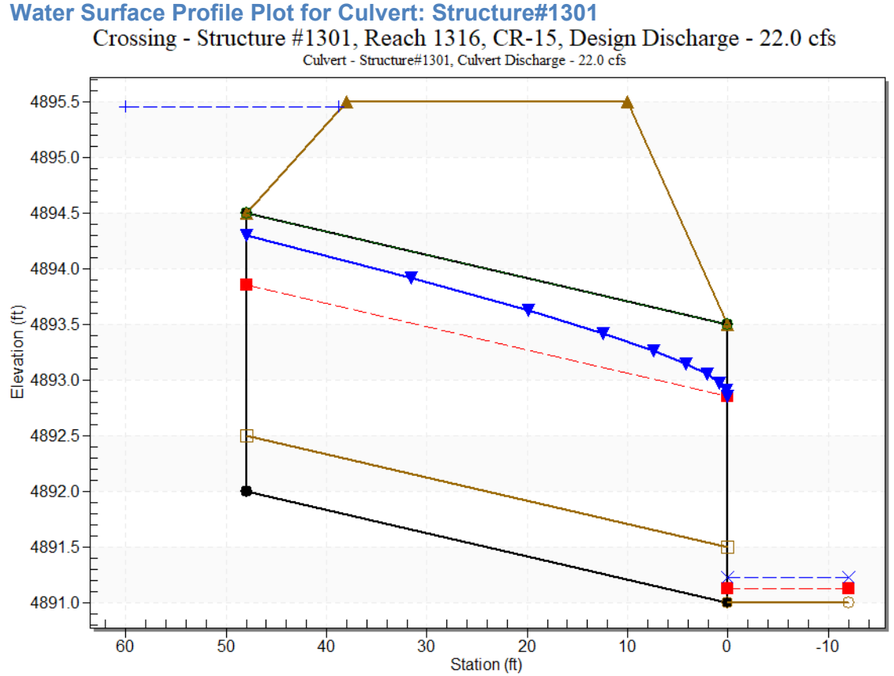
Culvert Summary Table: Structure#1301

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	341.00	23.74	4895.74	3.24	3.00	7-M2c	2.00	1.42	1.42	1.15	7.13	3.17
100 Year	2640.00	19.76	4896.45	2.63	3.95	4-FFf	1.63	1.27	2.00	3.85	4.72	6.75

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4892.50 ft
Outlet Elevation (invert): 4891.50 ft
Culvert Length: 48.01 ft
Culvert Slope: 0.02 ft/ft

Water Surface Profile Plot for Culvert: Structure#1301



Tailwater Data for Crossing: Structure#1301, Reach 1316

Downstream Channel Rating Curve (Crossing: Structure#1301, Reach 1316)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
341.00	4892.15	3.17	1.15	0.87	0.53
2640.00	4894.85	6.75	3.85	2.91	0.64

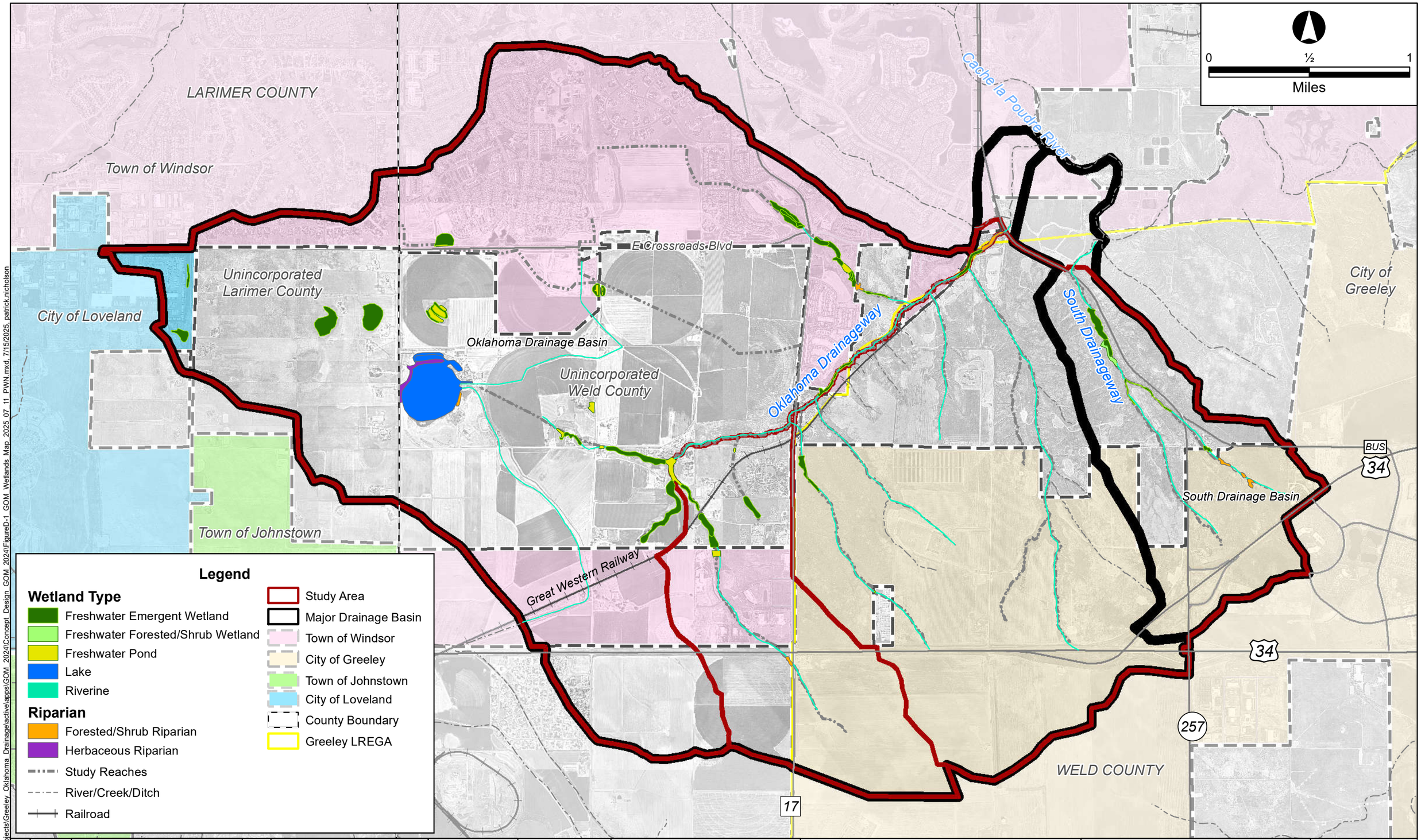
Tailwater Channel Data - Structure#1301, Reach 1316

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 90.00 ft
Side Slope (H:V): 3.00 (_:1)
Channel Slope: 0.01 ft/ft
Channel Manning's n: 0.0550
Channel Invert Elevation: 4891.00 ft

Roadway Data for Crossing: Structure#1301, Reach 1316

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 1000.00 ft
Crest Elevation: 4895.50 ft
Roadway Surface: Gravel
Roadway Top Width: 28.00 ft

APPENDIX D – WETLAND AND RIPARIAN INVENTORY



Legend

Wetland Type
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine

Riparian
- Forested/Shrub Riparian
- Herbaceous Riparian
- Study Reaches
- River/Creek/Ditch
- Railroad

- Study Area
- Major Drainage Basin
- Town of Windsor
- City of Greeley
- Town of Johnstown
- City of Loveland
- County Boundary
- Greeley LREGA

No.	DATE	DESCRIPTION	APPR.

Matrix Excellence by Design

designed by: SL
drawn by: SL
checked by: BL
project no.: 24.906.009
date: 07/11/2025

City of Greeley

CITY OF GREELEY

COMPREHENSIVE DRAINAGE PLAN
OKLAHOMA & SOUTH BASINS

POTENTIAL WETLANDS AND RIPARIAN ZONES MAP

FIGURE D-1

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LARIMER COUNTY

Town of Windsor

City of Loveland

Unincorporated Larimer County

Town of Johnstown

Unincorporated Weld County

WELD COUNTY

City of Greeley

E Crossroads Blvd

Oklahoma Drainage Basin

Oklahoma Drainageway

South Drainageway

South Drainage Basin

Cache la Poudre River

Great Western Railway

BUS 34

34

257

17

0 ½ 1
Miles

Legend

COGCC Well

- Abandoned Location
- Dry and Abandoned
- Plugged and Abandoned
- Producing
- Shut-In
- Temporarily Abandoned
- Study Reaches
- River/Creek/Ditch
- Railroad

- Study Area
- Major Drainage Basin
- Town of Windsor
- City of Greeley
- Town of Johnstown
- City of Loveland
- County Boundary
- Greeley LREGA

Abandoned Location: Permit Vacated; Per Operator: Well has not been spud

No.	DATE	DESCRIPTION	APPR.

Matrix Excellence by Design

designed by: SL
drawn by: SL
checked by: BL
project no.: 24.906.009
date: 07/11/2025

City of Greeley

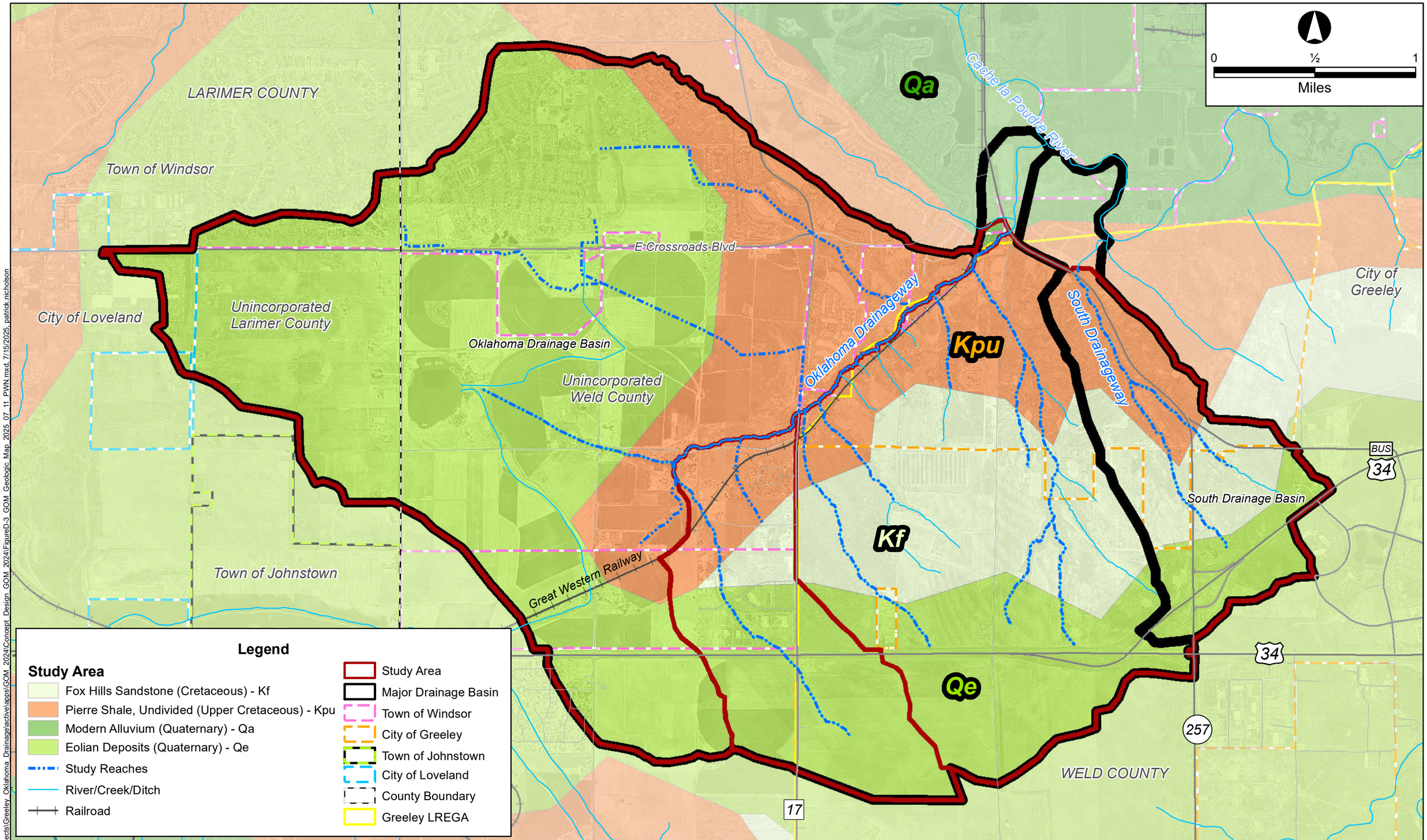
CITY OF GREELEY

COMPREHENSIVE DRAINAGE PLAN
OKLAHOMA & SOUTH BASINS

OIL AND GAS WELLS

FIGURE
D-2

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No.	DATE	DESCRIPTION	APPR.

Matrix Excellence by Design

designed by: SL
drawn by: SL
checked by: BL
project no.: 24.906.009
date: 07/11/2025

City of Greeley, Colorado

CITY OF GREELEY

COMPREHENSIVE DRAINAGE PLAN
OKLAHOMA & SOUTH BASINS

GEOLOGIC MAP

FIGURE
D-3

FILE: G:\gis projects\Greeley_Oklahoma_Drainage\activeapps\GOM_2024\Concept_Design_GOM_2024\FigureD-3_GOM_Geologic_Map_2025_07_11_PWN.mxd, 7/15/2025, patrick.nicholson

APPENDIX E – ALTERNATIVES ANALYSIS

APPENDIX E – 1
Alternatives Map

Click here for Figure E-1: Major Drainageway 100 (GOS)
Click here for Figure E-2: Major Drainageways 200, 300 (GOS)
Click here for Figure E-3: Major Drainageways 500, 600, 800 (GOS)
Click here for Figure E-4: Major Drainageways 700, 800 (GO)
Click here for Figure E-5: Major Drainageways 900, 1000, 1100, 1200, 1300 (GOR)

APPENDIX E – 2
MHFD Detention Workbooks

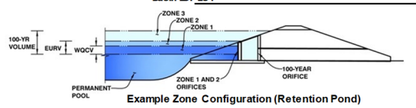
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Clear Workbook

Project: Greely - Oklaoma Basin

Basin ID: 134



Example Zone Configuration (Retention Pond)

Watershed Information

Extended Detention Basin (EDB)	EDB	
Watershed Area =	136.70	acres
Watershed Length =	3,476	ft
Watershed Length to Centroid =	1,780	ft
Watershed Slope =	0.021	ft/ft
Watershed Imperviousness =	63.30%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Run CUHP

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	2.822	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	8.342	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	5.693	acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	8.300	acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	11.371	acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	17.233	acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	22.403	acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	28.637	acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	45.569	acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	5.296	acre-feet		
Approximate 5-yr Detention Volume =	7.918	acre-feet		
Approximate 10-yr Detention Volume =	9.695	acre-feet		
Approximate 25-yr Detention Volume =	12.103	acre-feet		
Approximate 50-yr Detention Volume =	13.629	acre-feet		
Approximate 100-yr Detention Volume =	16.193	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV)	2.822	acre-feet
Zone 2 Volume (EURV - Zone 1)	5.520	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2)	7.851	acre-feet
Total Detention Basin Volume =	16.193	acre-feet
Initial Surcharge Volume (ISV) =	369	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.005	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Initial Surcharge Area (A_{ISV}) =	1,118	ft^2
Surcharge Volume Length (L_{ISV}) =	33.4	ft
Surcharge Volume Width (W_{ISV}) =	33.4	ft
Depth of Basin Floor (H_{FLOOR}) =	2.95	ft
Length of Basin Floor (L_{FLOOR}) =	635.2	ft
Width of Basin Floor (W_{FLOOR}) =	328.4	ft
Area of Basin Floor (A_{FLOOR}) =	208,628	ft^2
Volume of Basin Floor (V_{FLOOR}) =	221,265	ft^3
Depth of Main Basin (H_{MAIN}) =	2.22	ft
Length of Main Basin (L_{MAIN}) =	653.0	ft
Width of Main Basin (W_{MAIN}) =	346.2	ft
Area of Main Basin (A_{MAIN}) =	226,058	ft^2
Volume of Main Basin (V_{MAIN}) =	482,372	ft^3
Calculated Total Basin Volume (V_{total}) =	**16.175**	acre-feet

Depth Increment = 0.50 ft

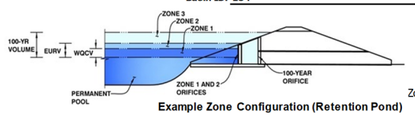
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		33.4	33.4	1,118		0.026		
ISV	0.33		33.4	33.4	1,118		0.026	369	0.008
	0.50		33.4	33.4	1,118		0.026	559	0.013
	1.00		68.1	50.4	3,435		0.079	1,298	0.030
	1.50		170.1	100.4	17,084		0.392	6,002	0.138
	2.00		272.1	150.4	40,933		0.940	20,082	0.461
	2.50		374.1	200.4	74,983		1.721	48,636	1.117
	3.00		476.1	250.4	119,232		2.737	96,764	2.221
Zone 1 (WQCV)	3.21		518.9	271.4	140,858		3.234	124,042	2.848
	3.50		578.1	300.4	173,681		3.987	169,568	3.893
Floor	3.78		635.2	328.4	208,628		4.789	223,016	5.120
	4.00		637.0	330.2	210,327		4.828	269,101	6.178
Zone 2 (EURV)	4.45		640.6	333.8	213,822		4.909	364,534	8.369
	4.50		641.0	334.2	214,212		4.918	375,235	8.614
	5.00		645.0	338.2	218,129		5.008	483,318	11.095
	5.50		649.0	342.2	222,077		5.098	593,369	13.622
Zone 3 (100-year)	6.00		653.0	346.2	226,058		5.190	705,401	16.194
	6.50		657.0	350.2	230,071		5.282	819,432	18.812
	7.00		661.0	354.2	234,116		5.375	935,477	21.476
	7.50		665.0	358.2	238,192		5.468	1,053,553	24.186
	8.00		669.0	362.2	242,301		5.562	1,173,675	26.944
	8.50		673.0	366.2	246,442		5.658	1,295,859	29.749
	9.00		677.0	370.2	250,614		5.753	1,420,122	32.602
	9.50		681.0	374.2	254,819		5.850	1,546,479	35.502
	10.00		685.0	378.2	259,056		5.947	1,674,946	38.451
	10.50		689.0	382.2	263,325		6.045	1,805,540	41.449
	11.00		693.0	386.2	267,625		6.144	1,938,276	44.497
	11.50		697.0	390.2	271,958		6.243	2,073,171	47.593
	12.00		701.0	394.2	276,323		6.343	2,210,240	50.740
	12.50		705.0	398.2	280,719		6.444	2,349,499	53.937
	13.00		709.0	402.2	285,148		6.546	2,490,964	57.185
	13.50		713.0	406.2	289,609		6.649	2,634,652	60.483
	14.00		717.0	410.2	294,102		6.752	2,780,578	63.833
	14.50		721.0	414.2	298,626		6.856	2,928,759	67.235
	15.00		725.0	418.2	303,183		6.960	3,079,210	70.689
	15.50		729.0	422.2	307,772		7.065	3,231,947	74.195
	16.00		733.0	426.2	312,392		7.172	3,386,987	77.755
	16.50		737.0	430.2	317,045		7.278	3,544,345	81.367
	17.00		741.0	434.2	321,730		7.386	3,704,037	85.033
	17.50		745.0	438.2	326,447		7.494	3,866,080	88.753
	18.00		749.0	442.2	331,195		7.603	4,030,489	92.527
	18.50		753.0	446.2	335,976		7.713	4,197,281	96.356
	19.00		757.0	450.2	340,789		7.823	4,366,471	100.240
	19.50		761.0	454.2	345,633		7.935	4,538,075	104.180
	20.00		765.0	458.2	350,510		8.047	4,712,109	108.175
	20.50		769.0	462.2	355,419		8.159	4,888,590	112.227
	21.00		773.0	466.2	360,360		8.273	5,067,534	116.335
	21.50		777.0	470.2	365,332		8.387	5,248,955	120.499
	22.00		781.0	474.2	370,337		8.502	5,432,871	124.722
	22.50		785.0	478.2	375,374		8.617	5,619,298	129.001
	23.00		789.0	482.2	380,442		8.734	5,808,250	133.339
	23.50		793.0	486.2	385,543		8.851	5,999,745	137.735
	24.00		797.0	490.2	390,676		8.969	6,193,799	142.190
	24.50		801.0	494.2	395,841		9.087	6,390,427	146.704
	25.00		805.0	498.2	401,037		9.207	6,589,645	151.277
	25.50		809.0	502.2	406,266		9.327	6,791,469	155.911
	26.00		813.0	506.2	411,527		9.447	6,995,916	160.604
	26.50		817.0	510.2	416,819		9.569	7,203,001	165.358
	27.00		821.0	514.2	422,144		9.691	7,412,741	170.173
	27.50		825.0	518.2	427,501		9.814	7,625,151	175.049
	28.00		829.0	522.2	432,890		9.938	7,840,247	179.987
	28.50		833.0	526.2	438,310		10.062	8,058,046	184.987
	29.00		837.0	530.2	443,763		10.187	8,278,563	190.050
	29.50		841.0	534.2	449,248		10.313	8,501,814	195.175
	30.00		845.0	538.2	454,764		10.440	8,727,816	200.363

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Greely - Oklaoma Basin

Basin ID: 134



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.21	2.822	Orifice Plate
Zone 2 (EURV)	4.45	5.520	Rectangular Orifice
Zone 3 (100-year)	6.00	7.851	Weir&Pipe (Restrict)
Total (all zones)		16.193	

Clear Input Parameters (Including Tables)

Orifice Plate | Vertical Orifice (Rectangular) | Weir and Pipe (w/ Restrictor Plate)

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	7.014E-02	ft^2
Depth at top of Zone using Orifice Plate =	4.45	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	17.80	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	10.10	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft^2

Size Plate to match WQCV Drain Time

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.48	2.97					
Orifice Area (sq. inches)	10.10	10.10	10.10					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangular	Not Selected		Calculated Parameters for Vertical Orifice	Zone 2 Rectangular	Not Selected	
Invert of Vertical Orifice =	3.21	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.17	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	4.45	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.08	N/A	feet
Vertical Orifice Height =	2.00	N/A	inches				
Vertical Orifice Width =	11.89		inches				

Size Vertical Orifice to drain (EURV - WQCV) Only

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 3 Weir	Not Selected		Calculated Parameters for Overflow Weir	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.45	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	7.78	N/A	feet
Overflow Weir Front Edge Length =	250.00	N/A	feet	Overflow Weir Slope Length =	10.54	N/A	feet
Overflow Weir Grate Slope =	3.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	72.85	N/A	
Horiz. Length of Weir Sides =	10.00	N/A	feet	Overflow Grate Open Area w/o Debris =	1834.12	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	917.06	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.33	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	25.18	N/A	ft^2
Outlet Pipe Diameter =	72.00	N/A	inches	Outlet Orifice Centroid =	2.70	N/A	feet
Restrictor Plate Height Above Pipe Invert =	60.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	2.30	N/A	radians

Size Outlet Plate to match 90% of Predevelopment 100-year Peak Runoff Rate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=	6.05	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	1.98	feet
Spillway Crest Length =	50.00	feet	Stage at Top of Freeboard =	9.03	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	5.76	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	32.77	acre-ft

Size Emergency Spillway to pass Developed 100-yr Peak Runoff Rate

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	2.822	8.342	5.693	8.300	11.371	17.233	22.403	28.637	45.569
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	5.693	8.300	11.371	17.233	22.403	28.637	45.569
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	1.4	14.4	40.2	106.4	154.2	216.7	371.3
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.10	0.29	0.78	1.13	1.59	2.72
Peak Inflow Q (cfs) =	N/A	N/A	89.7	131.3	181.2	286.8	372.8	473.9	743.7
Peak Outflow Q (cfs) =	1.2	2.6	2.1	2.5	21.4	82.5	140.8	224.8	397.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.2	0.5	0.8	0.9	1.0	1.1
Structure Controlling Flow =	Vertical Orifice 1	Overflow Weir 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.0	0.0	0.1	0.1	0.1
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	68	57	68	71	68	66	63	56
Time to Drain 99% of Inflow Volume (hours) =	**40**	72	60	73	76	75	74	73	70
Maximum Ponding Depth (ft) =	3.21	4.45	3.83	4.35	4.73	5.20	5.53	5.92	6.96
Area at Maximum Ponding Depth (acres) =	3.23	4.91	4.80	4.89	4.96	5.04	5.10	5.17	5.37
Maximum Volume Stored (acre-ft) =	2.848	8.369	5.359	7.879	9.750	12.050	13.724	15.779	21.261

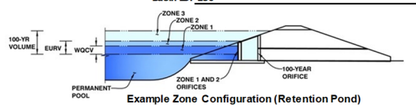
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Clear Workbook

Project: Greely - OK Basin

Basin ID: 150



Example Zone Configuration (Retention Pond)

Watershed Information

Extended Detention Basin (EDB)	EDB	
Watershed Area =	148.90	acres
Watershed Length =	3,715	ft
Watershed Length to Centroid =	2,085	ft
Watershed Slope =	0.032	ft/ft
Watershed Imperviousness =	40.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Run CUHP

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	2.232	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	5.535	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	3.732	acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	5.984	acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	9.050	acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	15.486	acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	20.997	acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	27.899	acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	46.299	acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	3.428	acre-feet		
Approximate 5-yr Detention Volume =	5.632	acre-feet		
Approximate 10-yr Detention Volume =	6.905	acre-feet		
Approximate 25-yr Detention Volume =	8.869	acre-feet		
Approximate 50-yr Detention Volume =	10.094	acre-feet		
Approximate 100-yr Detention Volume =	12.852	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV)	2.232	acre-feet
Zone 2 Volume (EURV - Zone 1)	3.304	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2)	7.317	acre-feet
Total Detention Basin Volume =	12.852	acre-feet
Initial Surcharge Volume (ISV) =	292	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.005	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	
Initial Surcharge Area (A_{ISV}) =	884	ft^2
Surcharge Volume Length (L_{ISV}) =	29.7	ft
Surcharge Volume Width (W_{ISV}) =	29.7	ft
Depth of Basin Floor (H_{FLOOR}) =	2.49	ft
Length of Basin Floor (L_{FLOOR}) =	537.7	ft
Width of Basin Floor (W_{FLOOR}) =	278.7	ft
Area of Basin Floor (A_{FLOOR}) =	149,868	ft^2
Volume of Basin Floor (V_{FLOOR}) =	134,675	ft^3
Depth of Main Basin (H_{MAIN}) =	2.68	ft
Length of Main Basin (L_{MAIN}) =	559.1	ft
Width of Main Basin (W_{MAIN}) =	300.2	ft
Area of Main Basin (A_{MAIN}) =	167,831	ft^2
Volume of Main Basin (V_{MAIN}) =	425,490	ft^3
Calculated Total Basin Volume (V_{total}) =	**12.876**	acre-feet

Depth Increment = 0.50 ft

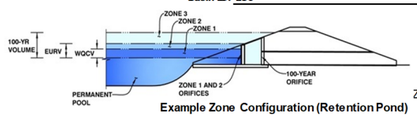
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		29.7	29.7	884		0.020		
ISV	0.33		29.7	29.7	884		0.020	292	0.007
	0.50		29.7	29.7	884		0.020	442	0.010
	1.00		64.4	46.7	3,010		0.069	1,048	0.024
	1.50		166.4	96.7	16,096		0.370	5,399	0.124
	2.00		268.4	146.7	39,382		0.904	18,844	0.433
	2.50		370.4	196.7	72,869		1.673	46,481	1.067
	3.00		472.4	246.7	116,555		2.676	93,413	2.144
Zone 1 (WQCV)	3.04		480.6	250.7	120,491		2.766	98,153	2.253
Floor	3.32		537.7	278.7	149,868		3.440	135,929	3.120
	3.50		539.1	280.2	151,045		3.468	163,011	3.742
	4.00		543.1	284.2	154,339		3.543	239,356	5.495
Zone 2 (EURV)	4.02		543.3	284.3	154,471		3.546	242,444	5.566
	4.50		547.1	288.2	157,664		3.619	317,355	7.285
	5.00		551.1	292.2	161,021		3.697	397,025	9.114
	5.50		555.1	296.2	164,410		3.774	478,381	10.982
Zone 3 (100-year)	6.00		559.1	300.2	167,831		3.853	561,440	12.889
	6.50		563.1	304.2	171,284		3.932	646,218	14.835
	7.00		567.1	308.2	174,770		4.012	732,730	16.821
	7.50		571.1	312.2	178,287		4.093	820,993	18.847
	8.00		575.1	316.2	181,836		4.174	911,022	20.914
	8.50		579.1	320.2	185,417		4.257	1,002,834	23.022
	9.00		583.1	324.2	189,030		4.340	1,096,444	25.171
	9.50		587.1	328.2	192,675		4.423	1,191,870	27.362
	10.00		591.1	332.2	196,353		4.508	1,289,125	29.594
	10.50		595.1	336.2	200,062		4.593	1,388,228	31.869
	11.00		599.1	340.2	203,803		4.679	1,489,192	34.187
	11.50		603.1	344.2	207,576		4.765	1,592,036	36.548
	12.00		607.1	348.2	211,381		4.853	1,696,774	38.953
	12.50		611.1	352.2	215,219		4.941	1,803,423	41.401
	13.00		615.1	356.2	219,088		5.030	1,911,998	43.893
	13.50		619.1	360.2	222,989		5.119	2,022,516	46.431
	14.00		623.1	364.2	226,922		5.209	2,134,992	49.013
	14.50		627.1	368.2	230,887		5.300	2,249,443	51.640
	15.00		631.1	372.2	234,884		5.392	2,365,885	54.313
	15.50		635.1	376.2	238,914		5.485	2,484,333	57.032
	16.00		639.1	380.2	242,975		5.578	2,604,803	59.798
	16.50		643.1	384.2	247,068		5.672	2,727,313	62.610
	17.00		647.1	388.2	251,193		5.767	2,851,877	65.470
	17.50		651.1	392.2	255,350		5.862	2,978,511	68.377
	18.00		655.1	396.2	259,539		5.958	3,107,232	71.332
	18.50		659.1	400.2	263,761		6.055	3,238,056	74.336
	19.00		663.1	404.2	268,014		6.153	3,370,998	77.387
	19.50		667.1	408.2	272,299		6.251	3,506,075	80.488
	20.00		671.1	412.2	276,616		6.350	3,643,303	83.639
	20.50		675.1	416.2	280,965		6.450	3,782,697	86.839
	21.00		679.1	420.2	285,346		6.551	3,924,273	90.089
	21.50		683.1	424.2	289,760		6.652	4,068,048	93.390
	22.00		687.1	428.2	294,205		6.754	4,214,038	96.741
	22.50		691.1	432.2	298,682		6.857	4,362,259	100.144
	23.00		695.1	436.2	303,191		6.960	4,512,726	103.598
	23.50		699.1	440.2	307,732		7.065	4,665,455	107.104
	24.00		703.1	444.2	312,306		7.170	4,820,463	110.663
	24.50		707.1	448.2	316,911		7.275	4,977,766	114.274
	25.00		711.1	452.2	321,548		7.382	5,137,379	117.938
	25.50		715.1	456.2	326,217		7.489	5,299,319	121.656
	26.00		719.1	460.2	330,918		7.597	5,463,602	125.427
	26.50		723.1	464.2	335,651		7.705	5,630,243	129.253
	27.00		727.1	468.2	340,417		7.815	5,799,258	133.133
	27.50		731.1	472.2	345,214		7.925	5,970,665	137.068
	28.00		735.1	476.2	350,043		8.036	6,144,477	141.058
	28.50		739.1	480.2	354,904		8.147	6,320,713	145.104
	29.00		743.1	484.2	359,797		8.260	6,499,387	149.205
	29.50		747.1	488.2	364,722		8.373	6,680,515	153.364
	30.00		751.1	492.2	369,680		8.487	6,864,115	157.578

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Greely - OK Basin

Basin ID: 150



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type	
Zone 1 (WQCV)	3.04	2.232	Orifice Plate	Orifice Plate
Zone 2 (EURV)	4.02	3.304	Rectangular Orifice	Vertical Orifice (Rectangular)
Zone 3 (100-year)	6.00	7.317	Weir&Pipe (Restrict)	Weir and Pipe (w/ Restrictor Plate)
Total (all zones)		12.852		

Clear Input Parameters (Including Tables)

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	4.472E-02	ft^2
Depth at top of Zone using Orifice Plate =	3.04	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	12.20	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	6.44	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft^2

Size Plate to match WQCV Drain Time

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.01	2.03					
Orifice Area (sq. inches)	6.44	6.44	6.44					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangula	Not Selected		Calculated Parameters for Vertical Orifice	Zone 2 Rectangula	Not Selected	
Invert of Vertical Orifice =	3.04	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.07	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	4.02	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.08	N/A	feet
Vertical Orifice Height =	2.00	N/A	inches				
Vertical Orifice Width =	5.29		inches				

Size Vertical Orifice to drain (EURV - WQCV) Only

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 3 Weir	Not Selected		Calculated Parameters for Overflow Weir	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.02	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	7.35	N/A	feet
Overflow Weir Front Edge Length =	146.00	N/A	feet	Overflow Weir Slope Length =	10.54	N/A	feet
Overflow Weir Grate Slope =	3.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	45.96	N/A	
Horiz. Length of Weir Sides =	10.00	N/A	feet	Overflow Grate Open Area w/o Debris =	1071.13	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	535.56	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.33	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	23.31	N/A	ft^2
Outlet Pipe Diameter =	84.00	N/A	inches	Outlet Orifice Centroid =	2.32	N/A	feet
Restrictor Plate Height Above Pipe Invert =	49.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.74	N/A	radians

Size Outlet Plate to match 90% of Predevelopment 100-year Peak Runoff Rate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=	6.15	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.98	feet
Spillway Crest Length =	132.00	feet	Stage at Top of Freeboard =	8.13	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	4.20	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	21.46	acre-ft

Size Emergency Spillway to pass Developed 100-yr Peak Runoff Rate

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	2.232	5.535	3.732	5.984	9.050	15.486	20.997	27.899	46.299
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	3.732	5.984	9.050	15.486	20.997	27.899	46.299
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	1.5	15.9	44.5	117.6	170.4	239.4	410.2
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.11	0.30	0.79	1.14	1.61	2.75
Peak Inflow Q (cfs) =	N/A	N/A	48.7	81.0	124.0	224.8	301.8	395.8	640.7
Peak Outflow Q (cfs) =	0.9	1.4	1.2	2.0	24.0	87.7	144.5	227.3	485.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.1	0.5	0.7	0.8	0.9	1.2
Structure Controlling Flow =	Vertical Orifice 1	Overflow Weir 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.0	0.0	0.1	0.1	0.2	0.2
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	69	55	72	72	68	65	61	52
Time to Drain 99% of Inflow Volume (hours) =	**40**	72	57	76	77	75	74	72	68
Maximum Ponding Depth (ft) =	3.04	4.02	3.43	4.06	4.48	5.14	5.58	6.12	6.85
Area at Maximum Ponding Depth (acres) =	2.77	3.55	3.46	3.55	3.62	3.72	3.79	3.87	3.99
Maximum Volume Stored (acre-ft) =	2.253	5.566	3.500	5.672	7.213	9.596	11.247	13.352	16.221

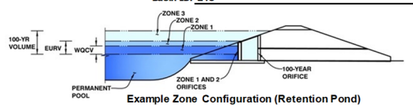
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Clear Workbook

Project: Greeley-Oklahoma

Basin ID: 248



Example Zone Configuration (Retention Pond)

Watershed Information

Extended Detention Basin (EDB)	EDB	
Watershed Area =	140.20	acres
Watershed Length =	3,613	ft
Watershed Length to Centroid =	1,652	ft
Watershed Slope =	0.019	ft/ft
Watershed Imperviousness =	72.58%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Run CUHP

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	3.355	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	9.918	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	6.851	acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	9.719	acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	13.001	acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	19.029	acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	24.412	acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	30.796	acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	48.268	acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	6.380	acre-feet		
Approximate 5-yr Detention Volume =	9.244	acre-feet		
Approximate 10-yr Detention Volume =	11.364	acre-feet		
Approximate 25-yr Detention Volume =	14.112	acre-feet		
Approximate 50-yr Detention Volume =	15.836	acre-feet		
Approximate 100-yr Detention Volume =	18.413	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV)	3.355	acre-feet
Zone 2 Volume (EURV - Zone 1)	6.563	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2)	8.495	acre-feet
Total Detention Basin Volume =	18.413	acre-feet
Initial Surcharge Volume (ISV) =	438	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.005	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	
Initial Surcharge Area (A_{ISV}) =	1,329	ft^2
Surcharge Volume Length (L_{ISV}) =	36.5	ft
Surcharge Volume Width (W_{ISV}) =	36.5	ft
Depth of Basin Floor (H_{FLOOR}) =	3.27	ft
Length of Basin Floor (L_{FLOOR}) =	703.5	ft
Width of Basin Floor (W_{FLOOR}) =	363.5	ft
Area of Basin Floor (A_{FLOOR}) =	255,699	ft^2
Volume of Basin Floor (V_{FLOOR}) =	300,251	ft^3
Depth of Main Basin (H_{MAIN}) =	1.90	ft
Length of Main Basin (L_{MAIN}) =	718.7	ft
Width of Main Basin (W_{MAIN}) =	378.7	ft
Area of Main Basin (A_{MAIN}) =	272,148	ft^2
Volume of Main Basin (V_{MAIN}) =	501,373	ft^3
Calculated Total Basin Volume (V_{total}) =	**18.428**	acre-feet

Depth Increment = 0.50 ft

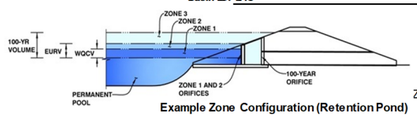
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		36.5	36.5	1,328.66		0.031		
ISV	0.33		36.5	36.5	1,328.66		0.031	438	0.010
	0.50		36.5	36.5	1,328.66		0.031	664	0.015
	1.00		71.1	53.5	3,802.00		0.087	1,522	0.035
	1.50		173.1	103.5	17,910.53		0.411	6,525	0.150
	2.00		275.1	153.5	42,219.06		0.969	21,133	0.485
	2.50		377.1	203.5	76,727.59		1.761	50,444	1.158
	3.00		479.1	253.5	121,436.12		2.788	99,560	2.286
Zone 1 (WQCV)	3.34		548.5	287.5	157,664.16		3.619	146,874	3.372
	3.50		581.1	303.5	176,344.65		4.048	173,580	3.985
	4.00		683.1	353.5	241,453.18		5.543	277,605	6.373
Floor	4.10		703.5	363.5	255,698.88		5.870	302,459	6.944
	4.50		706.7	366.7	259,123.46		5.949	405,423	9.307
Zone 2 (EURV)	4.61		707.6	367.5	260,068.81		5.970	433,979	9.963
	5.00		710.7	370.7	263,432.99		6.048	536,061	12.306
	5.50		714.7	374.7	267,774.52		6.147	668,861	15.355
Zone 3 (100-year)	6.00		718.7	378.7	272,148.04		6.248	803,841	18.454
	6.50		722.7	382.7	276,553.57		6.349	941,015	21.603
	7.00		726.7	386.7	280,991.10		6.451	1,080,399	24.803
	7.50		730.7	390.7	285,460.62		6.553	1,222,011	28.054
	8.00		734.7	394.7	289,962.15		6.657	1,365,865	31.356
	8.50		738.7	398.7	294,495.68		6.761	1,511,979	34.710
	9.00		742.7	402.7	299,061.21		6.866	1,660,366	38.117
	9.50		746.7	406.7	303,658.73		6.971	1,811,045	41.576
	10.00		750.7	410.7	308,288.26		7.077	1,964,031	45.088
	10.50		754.7	414.7	312,949.79		7.184	2,119,339	48.653
	11.00		758.7	418.7	317,643.31		7.292	2,276,986	52.272
	11.50		762.7	422.7	322,368.84		7.401	2,436,987	55.946
	12.00		766.7	426.7	327,126.37		7.510	2,599,360	59.673
	12.50		770.7	430.7	331,915.89		7.620	2,764,119	63.455
	13.00		774.7	434.7	336,737.42		7.730	2,931,281	67.293
	13.50		778.7	438.7	341,590.95		7.842	3,100,862	71.186
	14.00		782.7	442.7	346,476.47		7.954	3,272,877	75.135
	14.50		786.7	446.7	351,394.00		8.067	3,447,344	79.140
	15.00		790.7	450.7	356,343.53		8.181	3,624,277	83.202
	15.50		794.7	454.7	361,325.05		8.295	3,803,692	87.321
	16.00		798.7	458.7	366,338.58		8.410	3,985,607	91.497
	16.50		802.7	462.7	371,384.11		8.526	4,170,036	95.731
	17.00		806.7	466.7	376,461.63		8.642	4,356,996	100.023
	17.50		810.7	470.7	381,571.16		8.760	4,546,503	104.373
	18.00		814.7	474.7	386,712.69		8.878	4,738,573	108.783
	18.50		818.7	478.7	391,886.21		8.996	4,933,221	113.251
	19.00		822.7	482.7	397,091.74		9.116	5,130,465	117.779
	19.50		826.7	486.7	402,329.27		9.236	5,330,318	122.367
	20.00		830.7	490.7	407,598.79		9.357	5,532,799	127.016
	20.50		834.7	494.7	412,900.32		9.479	5,737,923	131.725
	21.00		838.7	498.7	418,233.85		9.601	5,945,705	136.495
	21.50		842.7	502.7	423,599.37		9.725	6,156,162	141.326
	22.00		846.7	506.7	428,996.90		9.848	6,369,309	146.219
	22.50		850.7	510.7	434,426.43		9.973	6,585,164	151.175
	23.00		854.7	514.7	439,887.95		10.098	6,803,741	156.192
	23.50		858.7	518.7	445,381.48		10.225	7,025,057	161.273
	24.00		862.7	522.7	450,907.01		10.351	7,249,128	166.417
	24.50		866.7	526.7	456,464.54		10.479	7,475,970	171.625
	25.00		870.7	530.7	462,054.06		10.607	7,705,598	176.896
	25.50		874.7	534.7	467,675.59		10.736	7,938,029	182.232
	26.00		878.7	538.7	473,329.12		10.866	8,173,279	187.633
	26.50		882.7	542.7	479,014.64		10.997	8,411,363	193.098
	27.00		886.7	546.7	484,732.17		11.128	8,652,299	198.629
	27.50		890.7	550.7	490,481.70		11.260	8,896,101	204.226
	28.00		894.7	554.7	496,263.22		11.393	9,142,786	209.889
	28.50		898.7	558.7	502,076.75		11.526	9,392,370	215.619
	29.00		902.7	562.7	507,922.28		11.660	9,644,868	221.416
	29.50		906.7	566.7	513,799.80		11.795	9,900,297	227.280
	30.00		910.7	570.7	519,709.33		11.931	10,158,673	233.211

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley-Oklahoma

Basin ID: 248



Example Zone Configuration (Retention Pond)

Clear Input Parameters (Including Tables)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type	
Zone 1 (WQCV)	3.34	3.355	Orifice Plate	Orifice Plate
Zone 2 (EURV)	4.61	6.563	Rectangular Orifice	Vertical Orifice (Rectangular)
Zone 3 (100-year)	6.00	8.495	Weir&Pipe (Restrict)	Weir and Pipe (w/ Restrictor Plate)
	Total (all zones)	18.413		

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	6.542E-02	ft^2
Depth at top of Zone using Orifice Plate =	3.34	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	13.40	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	9.42	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft^2

Size Plate to match WQCV Drain Time

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.11	2.23					
Orifice Area (sq. inches)	9.42	9.42	9.42					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangula	Not Selected		Calculated Parameters for Vertical Orifice	Zone 2 Rectangula	Not Selected	
Invert of Vertical Orifice =	3.34	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	4.28	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	4.61	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	2.50	N/A	feet
Vertical Orifice Height =	60.00	N/A	inches				
Vertical Orifice Width =	10.26		inches				

Size Vertical Orifice to drain (EURV - WQCV) Only

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 3 Weir	Not Selected		Calculated Parameters for Overflow Weir	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.61	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	7.94	N/A	feet
Overflow Weir Front Edge Length =	220.00	N/A	feet	Overflow Weir Slope Length =	10.54	N/A	feet
Overflow Weir Grate Slope =	3.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	75.37	N/A	
Horiz. Length of Weir Sides =	10.00	N/A	feet	Overflow Grate Open Area w/o Debris =	1614.03	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	807.01	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.33	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	21.41	N/A	ft^2
Outlet Pipe Diameter =	72.00	N/A	inches	Outlet Orifice Centroid =	2.37	N/A	feet
Restrictor Plate Height Above Pipe Invert =	51.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	2.00	N/A	radians

Size Outlet Plate to match 90% of Predevelopment 100-year Peak Runoff Rate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=	7.90	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.98	feet
Spillway Crest Length =	177.00	feet	Stage at Top of Freeboard =	9.88	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	7.05	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	44.24	acre-ft

Size Emergency Spillway to pass Developed 100-yr Peak Runoff Rate

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	3.355	9.918	6.851	9.719	13.001	19.029	24.412	30.796	48.268
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	6.851	9.719	13.001	19.029	24.412	30.796	48.268
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	1.4	14.7	41.2	109.3	158.4	222.5	381.2
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.11	0.29	0.78	1.13	1.59	2.72
Peak Inflow Q (cfs) =	N/A	N/A	115.4	162.7	216.9	329.6	422.0	532.2	823.6
Peak Outflow Q (cfs) =	1.4	4.4	2.5	4.0	19.9	70.3	124.8	205.2	243.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.3	0.5	0.6	0.8	0.9	0.6
Structure Controlling Flow =	Vertical Orifice 1	Overflow Weir 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.0	0.0	0.1	0.1	0.1
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	68	60	69	71	69	66	64	58
Time to Drain 99% of Inflow Volume (hours) =	**40**	72	63	72	76	75	74	73	71
Maximum Ponding Depth (ft) =	3.34	4.61	4.02	4.48	4.87	5.30	5.65	6.07	7.63
Area at Maximum Ponding Depth (acres) =	3.62	5.97	5.61	5.94	6.02	6.11	6.18	6.26	6.58
Maximum Volume Stored (acre-ft) =	3.372	9.963	6.484	9.129	11.462	14.129	16.218	18.829	28.841

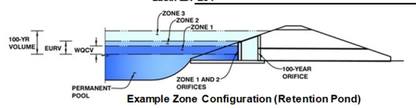
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Clear Workbook

Project: Greely - Oklaoma Basin

Basin ID: 264



Example Zone Configuration (Retention Pond)

Watershed Information

Extended Detention Basin (EDB)	EDB	
Watershed Area =	127.40	acres
Watershed Length =	3,476	ft
Watershed Length to Centroid =	1,780	ft
Watershed Slope =	0.021	ft/ft
Watershed Imperviousness =	62.02%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Run CUHP

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	2.581	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	7.605	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	5.224	acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	7.581	acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	10.425	acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	15.878	acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	20.677	acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	26.477	acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 3 in.) =	28.852	acre-feet	3.00	inches
Approximate 2-yr Detention Volume =	4.851	acre-feet		
Approximate 5-yr Detention Volume =	7.239	acre-feet		
Approximate 10-yr Detention Volume =	8.859	acre-feet		
Approximate 25-yr Detention Volume =	11.070	acre-feet		
Approximate 50-yr Detention Volume =	12.472	acre-feet		
Approximate 100-yr Detention Volume =	14.866	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV)	2.581	acre-feet
Zone 2 Volume (EURV - Zone 1)	5.024	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2)	7.261	acre-feet
Total Detention Basin Volume =	14.866	acre-feet
Initial Surcharge Volume (ISV) =	337	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.005	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	
Initial Surcharge Area (A_{ISV}) =	1,022	ft^2
Surcharge Volume Length (L_{ISV}) =	32.0	ft
Surcharge Volume Width (W_{ISV}) =	32.0	ft
Depth of Basin Floor (H_{FLOOR}) =	2.77	ft
Length of Basin Floor (L_{FLOOR}) =	597.1	ft
Width of Basin Floor (W_{FLOOR}) =	309.0	ft
Area of Basin Floor (A_{FLOOR}) =	184,471	ft^2
Volume of Basin Floor (V_{FLOOR}) =	183,950	ft^3
Depth of Main Basin (H_{MAIN}) =	2.40	ft
Length of Main Basin (L_{MAIN}) =	616.3	ft
Width of Main Basin (W_{MAIN}) =	328.2	ft
Area of Main Basin (A_{MAIN}) =	202,235	ft^2
Volume of Main Basin (V_{MAIN}) =	463,884	ft^3
Calculated Total Basin Volume (V_{total}) =	**14.892**	acre-feet

Depth Increment = 0.50 ft

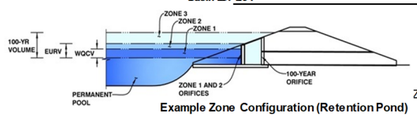
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		32.0	32.0	1,022.10		0.023		
ISV	0.33		32.0	32.0	1,022.10		0.023	337	0.008
	0.50		32.0	32.0	1,022.10		0.023	511	0.012
	1.00		66.7	49.0	3,263.88		0.075	1,196	0.027
	1.50		168.7	99.0	16,691.36		0.383	5,760	0.132
	2.00		270.7	149.0	40,318.83		0.926	19,587	0.450
	2.50		372.7	199.0	74,146.31		1.702	47,779	1.097
	3.00		474.7	249.0	118,173.79		2.713	95,434	2.191
Zone 1 (WQCV)	3.14		503.2	263.0	132,329.32		3.038	112,959	2.593
	3.50		576.7	299.0	172,401.27		3.958	167,652	3.849
Floor	3.60		597.1	309.0	184,470.76		4.235	185,493	4.258
	4.00		600.3	312.2	187,380.27		4.302	259,862	5.966
Zone 2 (EURV)	4.38		603.3	315.2	190,163.27		4.366	331,595	7.612
	4.50		604.3	316.2	191,045.95		4.386	354,467	8.137
	5.00		608.3	320.2	194,743.63		4.471	450,913	10.352
	5.50		612.3	324.2	198,473.32		4.556	549,216	12.608
Zone 3 (100-year)	6.00		616.3	328.2	202,235.00		4.643	649,392	14.908
	6.50		620.3	332.2	206,028.68		4.730	751,457	17.251
	7.00		624.3	336.2	209,854.36		4.818	855,426	19.638
	7.50		628.3	340.2	213,712.04		4.906	961,316	22.069
	8.00		632.3	344.2	217,601.72		4.995	1,069,143	24.544
	8.50		636.3	348.2	221,523.41		5.085	1,178,923	27.064
	9.00		640.3	352.2	225,477.09		5.176	1,290,672	29.630
	9.50		644.3	356.2	229,462.77		5.268	1,404,406	32.241
	10.00		648.3	360.2	233,480.45		5.360	1,520,140	34.898
	10.50		652.3	364.2	237,530.13		5.453	1,637,892	37.601
	11.00		656.3	368.2	241,611.82		5.547	1,757,676	40.351
	11.50		660.3	372.2	245,725.50		5.641	1,879,509	43.148
	12.00		664.3	376.2	249,871.18		5.736	2,003,407	45.992
	12.50		668.3	380.2	254,048.86		5.832	2,129,385	48.884
	13.00		672.3	384.2	258,258.54		5.929	2,257,461	51.824
	13.50		676.3	388.2	262,500.23		6.026	2,387,649	54.813
	14.00		680.3	392.2	266,773.91		6.124	2,519,966	57.850
	14.50		684.3	396.2	271,079.59		6.223	2,654,428	60.937
	15.00		688.3	400.2	275,417.27		6.323	2,791,051	64.074
	15.50		692.3	404.2	279,786.95		6.423	2,929,851	67.260
	16.00		696.3	408.2	284,188.64		6.524	3,070,844	70.497
	16.50		700.3	412.2	288,622.32		6.626	3,214,045	73.784
	17.00		704.3	416.2	293,088.00		6.728	3,359,471	77.123
	17.50		708.3	420.2	297,585.68		6.832	3,507,138	80.513
	18.00		712.3	424.2	302,115.36		6.936	3,657,062	83.955
	18.50		716.3	428.2	306,677.05		7.040	3,809,259	87.449
	19.00		720.3	432.2	311,270.73		7.146	3,963,745	90.995
	19.50		724.3	436.2	315,896.41		7.252	4,120,535	94.594
	20.00		728.3	440.2	320,554.09		7.359	4,279,646	98.247
	20.50		732.3	444.2	325,243.77		7.467	4,441,094	101.953
	21.00		736.3	448.2	329,965.46		7.575	4,604,895	105.714
	21.50		740.3	452.2	334,719.14		7.684	4,771,065	109.529
	22.00		744.3	456.2	339,504.82		7.794	4,939,620	113.398
	22.50		748.3	460.2	344,322.50		7.905	5,110,575	117.323
	23.00		752.3	464.2	349,172.18		8.016	5,283,948	121.303
	23.50		756.3	468.2	354,053.87		8.128	5,459,753	125.339
	24.00		760.3	472.2	358,967.55		8.241	5,638,007	129.431
	24.50		764.3	476.2	363,913.23		8.354	5,818,726	133.580
	25.00		768.3	480.2	368,890.91		8.469	6,001,925	137.785
	25.50		772.3	484.2	373,900.59		8.584	6,187,622	142.048
	26.00		776.3	488.2	378,942.28		8.699	6,375,831	146.369
	26.50		780.3	492.2	384,015.96		8.816	6,566,570	150.748
	27.00		784.3	496.2	389,121.64		8.933	6,759,853	155.185
	27.50		788.3	500.2	394,259.32		9.051	6,955,697	159.681
	28.00		792.3	504.2	399,429.00		9.170	7,154,117	164.236
	28.50		796.3	508.2	404,630.69		9.289	7,355,131	168.851
	29.00		800.3	512.2	409,864.37		9.409	7,558,753	173.525
	29.50		804.3	516.2	415,130.05		9.530	7,765,001	178.260
	30.00		808.3	520.2	420,427.73		9.652	7,973,889	183.055

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Greely - Oklaoma Basin

Basin ID: 264



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type	
Zone 1 (WQCV)	3.14	2.581	Orifice Plate	Orifice Plate
Zone 2 (EURV)	4.38	5.024	Rectangular Orifice	Vertical Orifice (Rectangular)
Zone 3 (100-year)	6.00	7.261	Weir&Pipe (Restrict)	Weir and Pipe (w/ Restrictor Plate)
Total (all zones)		14.866		

Clear Input Parameters (Including Tables)

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	5.118E-02	ft^2
Depth at top of Zone using Orifice Plate =	3.14	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	12.60	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	7.37	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft^2

Size Plate to match WQCV Drain Time

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.05	2.09					
Orifice Area (sq. inches)	7.37	7.37	7.37					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangular	Not Selected		Calculated Parameters for Vertical Orifice	Zone 2 Rectangular	Not Selected	
Invert of Vertical Orifice =	3.14	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.20	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	4.38	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.08	N/A	feet
Vertical Orifice Height =	2.00	N/A	inches				
Vertical Orifice Width =	14.59		inches				

Size Vertical Orifice to drain (EURV - WQCV) Only

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 3 Weir	Not Selected		Calculated Parameters for Overflow Weir	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.38	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	7.71	N/A	feet
Overflow Weir Front Edge Length =	157.00	N/A	feet	Overflow Weir Slope Length =	10.54	N/A	feet
Overflow Weir Grate Slope =	3.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	60.90	N/A	
Horiz. Length of Weir Sides =	10.00	N/A	feet	Overflow Grate Open Area w/o Debris =	1151.83	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	575.91	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.33	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	18.91	N/A	ft^2
Outlet Pipe Diameter =	66.00	N/A	inches	Outlet Orifice Centroid =	2.26	N/A	feet
Restrictor Plate Height Above Pipe Invert =	49.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	2.08	N/A	radians

Size Outlet Plate to match 90% of Predevelopment 100-year Peak Runoff Rate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=	6.30	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.98	feet
Spillway Crest Length =	143.00	feet	Stage at Top of Freeboard =	8.28	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	5.05	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	25.95	acre-ft

Size Emergency Spillway to pass Developed 100-yr Peak Runoff Rate

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	3.00
CUHP Runoff Volume (acre-ft) =	2.581	7.605	5.224	7.581	10.425	15.878	20.677	26.477	28.852
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	5.224	7.581	10.425	15.878	20.677	26.477	28.852
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	1.3	13.1	36.8	97.6	141.5	198.8	220.6
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.10	0.29	0.77	1.11	1.56	1.73
Peak Inflow Q (cfs) =	N/A	N/A	80.4	117.3	162.7	259.3	337.8	429.8	467.5
Peak Outflow Q (cfs) =	1.0	2.4	1.9	2.3	17.5	66.3	114.9	185.8	194.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.2	0.5	0.7	0.8	0.9	0.9
Structure Controlling Flow =	Vertical Orifice 1	Overflow Weir 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.0	0.1	0.1	0.2	0.2
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	68	57	69	72	69	66	63	62
Time to Drain 99% of Inflow Volume (hours) =	**40**	72	60	73	77	76	75	73	73
Maximum Ponding Depth (ft) =	3.14	4.38	3.76	4.29	4.71	5.25	5.65	6.13	6.34
Area at Maximum Ponding Depth (acres) =	3.04	4.37	4.26	4.35	4.42	4.51	4.58	4.67	4.70
Maximum Volume Stored (acre-ft) =	2.593	7.612	4.895	7.177	9.062	11.475	13.248	15.513	16.450

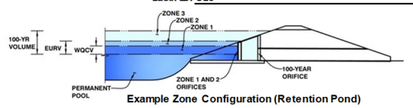
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Clear Workbook

Project: Greely - Oklahoma Basin

Basin ID: 510



Example Zone Configuration (Retention Pond)

Watershed Information

Extended Detention Basin (EDB)	EDB	
Watershed Area =	168.30	acres
Watershed Length =	5,098	ft
Watershed Length to Centroid =	2,895	ft
Watershed Slope =	0.025	ft/ft
Watershed Imperviousness =	56.60%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Run CUHP

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	3.159	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	9.102	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	6.210	acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	9.236	acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	12.929	acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	20.171	acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	26.507	acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	34.232	acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	55.096	acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	5.743	acre-feet		
Approximate 5-yr Detention Volume =	8.776	acre-feet		
Approximate 10-yr Detention Volume =	10.724	acre-feet		
Approximate 25-yr Detention Volume =	13.463	acre-feet		
Approximate 50-yr Detention Volume =	15.203	acre-feet		
Approximate 100-yr Detention Volume =	18.381	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV)	3.159	acre-feet
Zone 2 Volume (EURV - Zone 1)	5.943	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2)	9.280	acre-feet
Total Detention Basin Volume =	18.381	acre-feet
Initial Surcharge Volume (ISV) =	413	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.005	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	
Initial Surcharge Area (A_{ISV}) =	1,251	ft^2
Surcharge Volume Length (L_{ISV}) =	35.4	ft
Surcharge Volume Width (W_{ISV}) =	35.4	ft
Depth of Basin Floor (H_{FLOOR}) =	3.28	ft
Length of Basin Floor (L_{FLOOR}) =	704.5	ft
Width of Basin Floor (W_{FLOOR}) =	363.4	ft
Area of Basin Floor (A_{FLOOR}) =	255,991	ft^2
Volume of Basin Floor (V_{FLOOR}) =	300,817	ft^3
Depth of Main Basin (H_{MAIN}) =	1.89	ft
Length of Main Basin (L_{MAIN}) =	719.6	ft
Width of Main Basin (W_{MAIN}) =	378.5	ft
Area of Main Basin (A_{MAIN}) =	272,366	ft^2
Volume of Main Basin (V_{MAIN}) =	499,217	ft^3
Calculated Total Basin Volume (V_{total}) =	**18.390**	acre-feet

Depth Increment = 0.50 ft

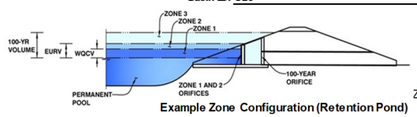
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		35.4	35.4	1,251		0.029		
ISV	0.33		35.4	35.4	1,251		0.029	413	0.009
	0.50		35.4	35.4	1,251		0.029	626	0.014
	1.00		70.1	52.4	3,669		0.084	1,440	0.033
	1.50		172.1	102.4	17,613		0.404	6,335	0.145
	2.00		274.1	152.4	41,757		0.959	20,753	0.476
	2.50		376.1	202.4	76,101		1.747	49,792	1.143
	3.00		478.1	252.4	120,646		2.770	98,554	2.262
Zone 1 (WQCV)	3.29		537.2	281.4	151,155		3.470	137,882	3.165
	3.50		580.1	302.4	175,390		4.026	172,138	3.952
	4.00		682.1	352.4	240,334		5.517	275,644	6.328
Floor	4.11		704.5	363.4	255,991		5.877	302,938	6.954
Zone 2 (EURV)	4.48		707.5	366.3	259,161		5.950	398,240	9.142
	4.50		707.6	366.5	259,332		5.953	403,425	9.261
	5.00		711.6	370.5	263,645		6.052	534,168	12.263
	5.50		715.6	374.5	267,989		6.152	667,075	15.314
Zone 3 (100-year)	6.00		719.6	378.5	272,366		6.253	802,163	18.415
	6.50		723.6	382.5	276,774		6.354	939,446	21.567
	7.00		727.6	386.5	281,214		6.456	1,078,942	24.769
	7.50		731.6	390.5	285,687		6.558	1,220,666	28.023
	8.00		735.6	394.5	290,191		6.662	1,364,634	31.328
	8.50		739.6	398.5	294,728		6.766	1,510,863	34.685
	9.00		743.6	402.5	299,296		6.871	1,659,367	38.094
	9.50		747.6	406.5	303,896		6.977	1,810,164	41.556
	10.00		751.6	410.5	308,529		7.083	1,963,269	45.070
	10.50		755.6	414.5	313,193		7.190	2,118,698	48.639
	11.00		759.6	418.5	317,890		7.298	2,276,468	52.261
	11.50		763.6	422.5	322,618		7.406	2,436,593	55.936
	12.00		767.6	426.5	327,378		7.516	2,599,091	59.667
	12.50		771.6	430.5	332,171		7.626	2,763,977	63.452
	13.00		775.6	434.5	336,995		7.736	2,931,267	67.293
	13.50		779.6	438.5	341,852		7.848	3,100,978	71.189
	14.00		783.6	442.5	346,740		7.960	3,273,124	75.141
	14.50		787.6	446.5	351,660		8.073	3,447,723	79.149
	15.00		791.6	450.5	356,613		8.187	3,624,790	83.214
	15.50		795.6	454.5	361,597		8.301	3,804,341	87.336
	16.00		799.6	458.5	366,614		8.416	3,986,393	91.515
	16.50		803.6	462.5	371,662		8.532	4,170,960	95.752
	17.00		807.6	466.5	376,743		8.649	4,358,060	100.047
	17.50		811.6	470.5	381,855		8.766	4,547,708	104.401
	18.00		815.6	474.5	386,999		8.884	4,739,920	108.814
	18.50		819.6	478.5	392,176		9.003	4,934,713	113.285
	19.00		823.6	482.5	397,384		9.123	5,132,101	117.817
	19.50		827.6	486.5	402,625		9.243	5,332,102	122.408
	20.00		831.6	490.5	407,897		9.364	5,534,731	127.060
	20.50		835.6	494.5	413,201		9.486	5,740,004	131.772
	21.00		839.6	498.5	418,538		9.608	5,947,938	136.546
	21.50		843.6	502.5	423,906		9.732	6,158,547	141.381
	22.00		847.6	506.5	429,307		9.856	6,371,849	146.278
	22.50		851.6	510.5	434,739		9.980	6,587,859	151.236
	23.00		855.6	514.5	440,203		10.106	6,806,594	156.258
	23.50		859.6	518.5	445,700		10.232	7,028,068	161.342
	24.00		863.6	522.5	451,228		10.359	7,252,299	166.490
	24.50		867.6	526.5	456,789		10.486	7,479,301	171.701
	25.00		871.6	530.5	462,381		10.615	7,709,093	176.976
	25.50		875.6	534.5	468,005		10.744	7,941,688	182.316
	26.00		879.6	538.5	473,662		10.874	8,177,103	187.720
	26.50		883.6	542.5	479,350		11.004	8,415,355	193.190
	27.00		887.6	546.5	485,071		11.136	8,656,459	198.725
	27.50		891.6	550.5	490,823		11.268	8,900,431	204.326
	28.00		895.6	554.5	496,607		11.401	9,147,287	209.993
	28.50		899.6	558.5	502,424		11.534	9,397,043	215.726
	29.00		903.6	562.5	508,272		11.668	9,649,716	221.527
	29.50		907.6	566.5	514,153		11.803	9,905,321	227.395
	30.00		911.6	570.5	520,065		11.939	10,163,874	233.330

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Greely - Oklahoma Basin

Basin ID: 510



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type	
Zone 1 (WQCV)	3.29	3.159	Orifice Plate	Orifice Plate
Zone 2 (EURV)	4.48	5.943	Rectangular Orifice	Vertical Orifice (Rectangular)
Zone 3 (100-year)	6.00	9.280	Weir&Pipe (Restrict)	Weir and Pipe (w/ Restrictor Plate)
Total (all zones)		18.381		

Clear Input Parameters (Including Tables)

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	6.174E-02	ft^2
Depth at top of Zone using Orifice Plate =	3.29	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	13.20	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	8.89	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft^2

Size Plate to match WQCV Drain Time

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.10	2.19					
Orifice Area (sq. inches)	8.89	8.89	8.89					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangula	Not Selected		Calculated Parameters for Vertical Orifice	Zone 2 Rectangula	Not Selected	
Invert of Vertical Orifice =	3.29	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.22	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	4.48	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.08	N/A	feet
Vertical Orifice Height =	2.00	N/A	inches				
Vertical Orifice Width =	15.59		inches				

Size Vertical Orifice to drain (EURV - WQCV) Only

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 3 Weir	Not Selected		Calculated Parameters for Overflow Weir	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.48	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	7.81	N/A	feet
Overflow Weir Front Edge Length =	250.00	N/A	feet	Overflow Weir Slope Length =	10.54	N/A	feet
Overflow Weir Grate Slope =	3.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	72.85	N/A	
Horiz. Length of Weir Sides =	10.00	N/A	feet	Overflow Grate Open Area w/o Debris =	1834.12	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	917.06	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.33	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	25.18	N/A	ft^2
Outlet Pipe Diameter =	72.00	N/A	inches	Outlet Orifice Centroid =	2.70	N/A	feet
Restrictor Plate Height Above Pipe Invert =	60.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	2.30	N/A	radians

Size Outlet Plate to match 90% of Predevelopment 100-year Peak Runoff Rate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway	
Spillway Invert Stage=	6.05	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	2.17 feet
Spillway Crest Length =	40.00	feet	Stage at Top of Freeboard =	9.22 feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	6.92 acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	39.54 acre-ft

Size Emergency Spillway to pass Developed 100-yr Peak Runoff Rate

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	3.159	9.102	6.210	9.236	12.929	20.171	26.507	34.232	55.096
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	6.210	9.236	12.929	20.171	26.507	34.232	55.096
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	1.3	13.3	38.1	103.0	150.3	212.6	367.0
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.08	0.23	0.61	0.89	1.26	2.18
Peak Inflow Q (cfs) =	N/A	N/A	76.7	115.3	162.0	269.4	352.7	453.2	717.9
Peak Outflow Q (cfs) =	1.3	2.7	2.2	2.7	24.5	87.4	146.4	230.4	401.9
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.2	0.6	0.8	1.0	1.1	1.1
Structure Controlling Flow =	Vertical Orifice 1	Overflow Weir 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.0	0.0	0.1	0.1	0.1
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	68	57	69	72	68	66	63	55
Time to Drain 99% of Inflow Volume (hours) =	**40**	72	60	73	77	76	75	73	70
Maximum Ponding Depth (ft) =	3.29	4.48	3.90	4.41	4.79	5.26	5.58	5.99	7.09
Area at Maximum Ponding Depth (acres) =	3.47	5.95	5.20	5.94	6.01	6.10	6.17	6.25	6.47
Maximum Volume Stored (acre-ft) =	3.165	9.142	5.792	8.726	10.996	13.782	15.807	18.290	25.351

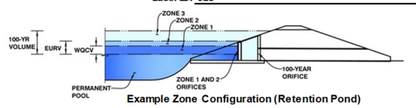
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Clear Workbook

Project: Greely - Oklahoma Basin

Basin ID: 618



Example Zone Configuration (Retention Pond)

Watershed Information

Extended Detention Basin (EDB)	EDB	
Watershed Area =	156.60	acres
Watershed Length =	5,600	ft
Watershed Length to Centroid =	3,528	ft
Watershed Slope =	0.021	ft/ft
Watershed Imperviousness =	75.30%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Run CUHP

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	3.930	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	11.527	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	7.886	acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	11.206	acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	14.899	acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	21.608	acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	27.617	acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	34.712	acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	54.174	acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	7.386	acre-feet		
Approximate 5-yr Detention Volume =	10.693	acre-feet		
Approximate 10-yr Detention Volume =	13.164	acre-feet		
Approximate 25-yr Detention Volume =	16.329	acre-feet		
Approximate 50-yr Detention Volume =	18.306	acre-feet		
Approximate 100-yr Detention Volume =	21.161	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV)	3.930	acre-feet
Zone 2 Volume (EURV - Zone 1)	7.598	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2)	9.634	acre-feet
Total Detention Basin Volume =	21.161	acre-feet
Initial Surcharge Volume (ISV) =	514	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.005	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	
Initial Surcharge Area (A_{ISV}) =	1,556	ft^2
Surcharge Volume Length (L_{ISV}) =	39.4	ft
Surcharge Volume Width (W_{ISV}) =	39.4	ft
Depth of Basin Floor (H_{FLOOR}) =	3.71	ft
Length of Basin Floor (L_{FLOOR}) =	796.3	ft
Width of Basin Floor (W_{FLOOR}) =	410.4	ft
Area of Basin Floor (A_{FLOOR}) =	326,835	ft^2
Volume of Basin Floor (V_{FLOOR}) =	434,001	ft^3
Depth of Main Basin (H_{MAIN}) =	1.46	ft
Length of Main Basin (L_{MAIN}) =	808.0	ft
Width of Main Basin (W_{MAIN}) =	422.1	ft
Area of Main Basin (A_{MAIN}) =	341,067	ft^2
Volume of Main Basin (V_{MAIN}) =	487,532	ft^3
Calculated Total Basin Volume (V_{total}) =	**21.185**	acre-feet

Depth Increment = 0.50 ft

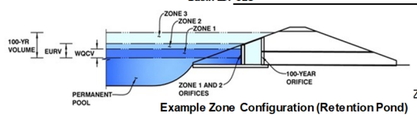
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		39.4	39.4	1,556		0.036		
ISV	0.33		39.4	39.4	1,556		0.036	514	0.012
	0.50		39.4	39.4	1,556		0.036	778	0.018
	1.00		74.1	56.4	4,184		0.096	1,763	0.040
	1.50		176.1	106.4	18,749		0.430	7,071	0.162
	2.00		278.1	156.4	43,513		0.999	22,211	0.510
	2.50		380.1	206.4	78,477		1.802	52,284	1.200
	3.00		482.1	256.4	123,641		2.838	102,388	2.351
Zone 1 (WQCV)	3.47		578.0	303.4	175,396		4.027	172,309	3.956
	3.50		584.1	306.4	179,005		4.109	177,625	4.078
	4.00		686.1	356.4	244,569		5.615	283,094	6.499
	4.50		788.1	406.4	320,334		7.354	423,895	9.731
Floor	4.54		796.3	410.4	326,835		7.503	436,838	10.028
Zone 2 (EURV)	4.74		797.9	412.0	328,769		7.547	502,398	11.533
	5.00		800.0	414.1	331,290		7.605	588,205	13.503
	5.50		804.0	418.1	336,162		7.717	755,067	17.334
Zone 3 (100-year)	6.00		808.0	422.1	341,067		7.830	924,373	21.221
	6.50		812.0	426.1	346,003		7.943	1,096,139	25.164
	7.00		816.0	430.1	350,971		8.057	1,270,381	29.164
	7.50		820.0	434.1	355,972		8.172	1,447,116	33.221
	8.00		824.0	438.1	361,004		8.288	1,626,358	37.336
	8.50		828.0	442.1	366,068		8.404	1,808,125	41.509
	9.00		832.0	446.1	371,165		8.521	1,992,432	45.740
	9.50		836.0	450.1	376,293		8.639	2,179,295	50.030
	10.00		840.0	454.1	381,454		8.757	2,368,731	54.379
	10.50		844.0	458.1	386,646		8.876	2,560,754	58.787
	11.00		848.0	462.1	391,870		8.996	2,755,382	63.255
	11.50		852.0	466.1	397,127		9.117	2,952,630	67.783
	12.00		856.0	470.1	402,415		9.238	3,152,514	72.372
	12.50		860.0	474.1	407,736		9.360	3,355,050	77.021
	13.00		864.0	478.1	413,088		9.483	3,560,255	81.732
	13.50		868.0	482.1	418,472		9.607	3,768,144	86.505
	14.00		872.0	486.1	423,889		9.731	3,978,733	91.339
	14.50		876.0	490.1	429,337		9.856	4,192,038	96.236
	15.00		880.0	494.1	434,818		9.982	4,408,075	101.195
	15.50		884.0	498.1	440,330		10.109	4,626,861	106.218
	16.00		888.0	502.1	445,874		10.236	4,848,410	111.304
	16.50		892.0	506.1	451,451		10.364	5,072,740	116.454
	17.00		896.0	510.1	457,059		10.493	5,299,866	121.668
	17.50		900.0	514.1	462,699		10.622	5,529,805	126.947
	18.00		904.0	518.1	468,372		10.752	5,762,571	132.290
	18.50		908.0	522.1	474,076		10.883	5,998,182	137.699
	19.00		912.0	526.1	479,813		11.015	6,236,653	143.174
	19.50		916.0	530.1	485,581		11.147	6,478,000	148.714
	20.00		920.0	534.1	491,381		11.281	6,722,239	154.321
	20.50		924.0	538.1	497,214		11.414	6,969,387	159.995
	21.00		928.0	542.1	503,078		11.549	7,219,458	165.736
	21.50		932.0	546.1	508,975		11.684	7,472,470	171.544
	22.00		936.0	550.1	514,903		11.821	7,728,438	177.421
	22.50		940.0	554.1	520,863		11.957	7,987,378	183.365
	23.00		944.0	558.1	526,856		12.095	8,249,307	189.378
	23.50		948.0	562.1	532,880		12.233	8,514,239	195.460
	24.00		952.0	566.1	538,936		12.372	8,782,192	201.611
	24.50		956.0	570.1	545,025		12.512	9,053,181	207.832
	25.00		960.0	574.1	551,145		12.653	9,327,222	214.124
	25.50		964.0	578.1	557,298		12.794	9,604,332	220.485
	26.00		968.0	582.1	563,482		12.936	9,884,525	226.917
	26.50		972.0	586.1	569,698		13.078	10,167,819	233.421
	27.00		976.0	590.1	575,947		13.222	10,454,229	239.996
	27.50		980.0	594.1	582,227		13.366	10,743,771	246.643
	28.00		984.0	598.1	588,540		13.511	11,036,462	253.362
	28.50		988.0	602.1	594,884		13.657	11,332,316	260.154
	29.00		992.0	606.1	601,260		13.803	11,631,351	267.019
	29.50		996.0	610.1	607,669		13.950	11,933,582	273.957
	30.00		1,000.0	614.1	614,109		14.098	12,239,025	280.969

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Greely - Oklahoma Basin

Basin ID: 618



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type	
Zone 1 (WQCV)	3.47	3.930	Orifice Plate	Orifice Plate
Zone 2 (EURV)	4.74	7.598	Rectangular Orifice	Vertical Orifice (Rectangular)
Zone 3 (100-year)	6.00	9.634	Weir&Pipe (Restrict)	Weir and Pipe (w/ Restrictor Plate)
Total (all zones)		21.161		

Clear Input Parameters (Including Tables)

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	7.576E-02	ft^2
Depth at top of Zone using Orifice Plate =	3.47	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	13.90	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	10.91	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft^2

Size Plate to match WQCV Drain Time

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.16	2.31					
Orifice Area (sq. inches)	10.91	10.91	10.91					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangular	Not Selected		Calculated Parameters for Vertical Orifice	Zone 2 Rectangular	Not Selected	
Invert of Vertical Orifice =	3.47	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.27	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	4.74	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.08	N/A	feet
Vertical Orifice Height =	2.00	N/A	inches				
Vertical Orifice Width =	19.09		inches				

Size Vertical Orifice to drain (EURV - WQCV) Only

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 3 Weir	Not Selected		Calculated Parameters for Overflow Weir	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.74	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	8.07	N/A	feet
Overflow Weir Front Edge Length =	388.00	N/A	feet	Overflow Weir Slope Length =	10.54	N/A	feet
Overflow Weir Grate Slope =	3.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	121.13	N/A	
Horiz. Length of Weir Sides =	10.00	N/A	feet	Overflow Grate Open Area w/o Debris =	2846.56	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	1423.28	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.33	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	23.50	N/A	ft^2
Outlet Pipe Diameter =	78.00	N/A	inches	Outlet Orifice Centroid =	2.43	N/A	feet
Restrictor Plate Height Above Pipe Invert =	52.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.91	N/A	radians

Size Outlet Plate to match 90% of Predevelopment 100-year Peak Runoff Rate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=	5.85	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	1.89	feet
Spillway Crest Length =	50.00	feet	Stage at Top of Freeboard =	8.74	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	8.46	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	43.45	acre-ft

Size Emergency Spillway to pass Developed 100-yr Peak Runoff Rate

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	3.930	11.527	7.886	11.206	14.899	21.608	27.617	34.712	54.174
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	7.886	11.206	14.899	21.608	27.617	34.712	54.174
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	1.0	10.2	29.5	80.8	118.4	169.7	293.1
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A						235.3	
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.06	0.19	0.52	0.76	1.50	1.87
Peak Inflow Q (cfs) =	N/A	N/A	95.4	134.3	176.5	272.5	347.6	437.5	676.8
Peak Outflow Q (cfs) =	1.6	3.4	2.9	3.3	22.7	80.3	135.2	214.0	356.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.3	0.8	1.0	1.1	0.9	1.2
Structure Controlling Flow =	Vertical Orifice 1	Overflow Weir 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.0	0.0	0.0	0.1	0.1
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	68	57	68	72	69	67	64	59
Time to Drain 99% of Inflow Volume (hours) =	**40**	72	60	72	76	76	75	74	71
Maximum Ponding Depth (ft) =	3.47	4.74	4.15	4.62	4.96	5.28	5.52	5.81	6.66
Area at Maximum Ponding Depth (acres) =	4.03	7.55	6.11	7.52	7.59	7.67	7.72	7.78	7.98
Maximum Volume Stored (acre-ft) =	3.956	11.533	7.378	10.554	13.123	15.642	17.411	19.659	26.358

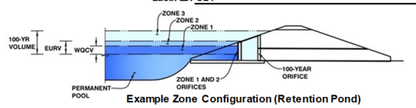
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Clear Workbook

Project: Greely - Oklahoma Basin

Basin ID: 814



Example Zone Configuration (Retention Pond)

Watershed Information

Extended Detention Basin (EDB)	EDB	
Watershed Area =	210.60	acres
Watershed Length =	4,665	ft
Watershed Length to Centroid =	2,450	ft
Watershed Slope =	0.019	ft/ft
Watershed Imperviousness =	64.50%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Run CUHP

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	4.426	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	13.115	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	8.993	acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	13.071	acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	17.845	acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	26.911	acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	34.919	acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	44.551	acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	70.739	acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	8.334	acre-feet		
Approximate 5-yr Detention Volume =	12.417	acre-feet		
Approximate 10-yr Detention Volume =	15.210	acre-feet		
Approximate 25-yr Detention Volume =	18.972	acre-feet		
Approximate 50-yr Detention Volume =	21.353	acre-feet		
Approximate 100-yr Detention Volume =	25.297	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV)	4.426	acre-feet
Zone 2 Volume (EURV - Zone 1)	8.689	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2)	12.181	acre-feet
Total Detention Basin Volume =	25.297	acre-feet
Initial Surcharge Volume (ISV) =	578	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.005	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Initial Surcharge Area (A_{ISV}) =	1,753	ft^2
Surcharge Volume Length (L_{ISV}) =	41.9	ft
Surcharge Volume Width (W_{ISV}) =	41.9	ft
Depth of Basin Floor (H_{FLOOR}) =	4.78	ft
Length of Basin Floor (L_{FLOOR}) =	1,017.0	ft
Width of Basin Floor (W_{FLOOR}) =	519.9	ft
Area of Basin Floor (A_{FLOOR}) =	528,698	ft^2
Volume of Basin Floor (V_{FLOOR}) =	893,690	ft^3
Depth of Main Basin (H_{MAIN}) =	0.39	ft
Length of Main Basin (L_{MAIN}) =	1,020.1	ft
Width of Main Basin (W_{MAIN}) =	523.0	ft
Area of Main Basin (A_{MAIN}) =	533,503	ft^2
Volume of Main Basin (V_{MAIN}) =	207,128	ft^3
Calculated Total Basin Volume (V_{total}) =	**25.305**	acre-feet

Depth Increment = 0.50 ft

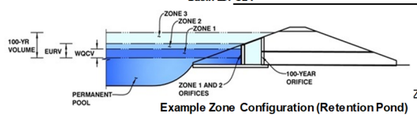
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		41.9	41.9	1,753		0.040		
ISV	0.33		41.9	41.9	1,753		0.040	578	0.013
	0.50		41.9	41.9	1,753		0.040	876	0.020
	1.00		76.5	58.9	4,506		0.103	1,970	0.045
	1.50		178.5	108.9	19,438		0.446	7,531	0.173
	2.00		280.5	158.9	44,570		1.023	23,108	0.530
	2.50		382.5	208.9	79,901		1.834	53,801	1.235
	3.00		484.5	258.9	125,433		2.880	104,710	2.404
	3.50		586.5	308.9	181,165		4.159	180,934	4.154
Zone 1 (WQCV)	3.57		600.8	315.9	189,781		4.357	193,916	4.452
	4.00		688.5	358.9	247,097		5.673	287,575	6.602
	4.50		790.5	408.9	323,229		7.420	429,731	9.865
Zone 2 (EURV)	4.90		872.1	448.9	391,478		8.987	572,455	13.142
	5.00		892.5	458.9	409,560		9.402	612,503	14.061
	5.50		994.5	508.9	506,092		11.618	840,991	19.307
Floor	5.61		1,017.0	519.9	528,698		12.137	897,900	20.613
Zone 3 (100-year)	6.00		1,020.1	523.0	533,503		12.248	1,105,029	25.368
	6.50		1,024.1	527.0	539,691		12.390	1,373,326	31.527
	7.00		1,028.1	531.0	545,912		12.532	1,644,725	37.758
	7.50		1,032.1	535.0	552,164		12.676	1,919,243	44.060
	8.00		1,036.1	539.0	558,448		12.820	2,196,895	50.434
	8.50		1,040.1	543.0	564,765		12.965	2,477,697	56.880
	9.00		1,044.1	547.0	571,113		13.111	2,761,665	63.399
	9.50		1,048.1	551.0	577,493		13.257	3,048,815	69.991
	10.00		1,052.1	555.0	583,906		13.405	3,339,164	76.657
	10.50		1,056.1	559.0	590,350		13.553	3,632,726	83.396
	11.00		1,060.1	563.0	596,827		13.701	3,929,519	90.209
	11.50		1,064.1	567.0	603,335		13.851	4,229,558	97.097
	12.00		1,068.1	571.0	609,875		14.001	4,532,859	104.060
	12.50		1,072.1	575.0	616,448		14.152	4,839,439	111.098
	13.00		1,076.1	579.0	623,052		14.303	5,149,312	118.212
	13.50		1,080.1	583.0	629,688		14.456	5,462,496	125.402
	14.00		1,084.1	587.0	636,357		14.609	5,779,006	132.668
	14.50		1,088.1	591.0	643,057		14.763	6,098,858	140.011
	15.00		1,092.1	595.0	649,790		14.917	6,422,069	147.430
	15.50		1,096.1	599.0	656,554		15.072	6,748,653	154.928
	16.00		1,100.1	603.0	663,350		15.228	7,078,628	162.503
	16.50		1,104.1	607.0	670,179		15.385	7,412,009	170.156
	17.00		1,108.1	611.0	677,039		15.543	7,748,812	177.888
	17.50		1,112.1	615.0	683,931		15.701	8,089,053	185.699
	18.00		1,116.1	619.0	690,856		15.860	8,432,749	193.589
	18.50		1,120.1	623.0	697,812		16.020	8,779,915	201.559
	19.00		1,124.1	627.0	704,801		16.180	9,130,566	209.609
	19.50		1,128.1	631.0	711,821		16.341	9,484,720	217.739
	20.00		1,132.1	635.0	718,873		16.503	9,842,393	225.950
	20.50		1,136.1	639.0	725,958		16.666	10,203,599	234.242
	21.00		1,140.1	643.0	733,074		16.829	10,568,356	242.616
	21.50		1,144.1	647.0	740,222		16.993	10,936,679	251.072
	22.00		1,148.1	651.0	747,403		17.158	11,308,584	259.609
	22.50		1,152.1	655.0	754,615		17.324	11,684,087	268.230
	23.00		1,156.1	659.0	761,860		17.490	12,063,204	276.933
	23.50		1,160.1	663.0	769,136		17.657	12,445,952	285.720
	24.00		1,164.1	667.0	776,444		17.825	12,832,346	294.590
	24.50		1,168.1	671.0	783,785		17.993	13,222,401	303.545
	25.00		1,172.1	675.0	791,157		18.162	13,616,136	312.583
	25.50		1,176.1	679.0	798,561		18.332	14,013,564	321.707
	26.00		1,180.1	683.0	805,998		18.503	14,414,702	330.916
	26.50		1,184.1	687.0	813,466		18.675	14,819,567	340.210
	27.00		1,188.1	691.0	820,967		18.847	15,228,174	349.591
	27.50		1,192.1	695.0	828,499		19.020	15,640,539	359.057
	28.00		1,196.1	699.0	836,063		19.193	16,056,678	368.611
	28.50		1,200.1	703.0	843,660		19.368	16,476,608	378.251
	29.00		1,204.1	707.0	851,288		19.543	16,900,343	387.978
	29.50		1,208.1	711.0	858,949		19.719	17,327,901	397.794
	30.00		1,212.1	715.0	866,641		19.895	17,759,297	407.697

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Greely - Oklahoma Basin

Basin ID: 814



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type	
Zone 1 (WQCV)	3.57	4.426	Orifice Plate	Orifice Plate
Zone 2 (EURV)	4.90	8.689	Rectangular Orifice	Vertical Orifice (Rectangular)
Zone 3 (100-year)	6.00	12.181	Weir&Pipe (Restrict)	Weir and Pipe (w/ Restrictor Plate)
Total (all zones)		25.297		

Clear Input Parameters (Including Tables)

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	8.458E-02	ft^2
Depth at top of Zone using Orifice Plate =	3.57	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	14.30	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	12.18	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft^2

Size Plate to match WQCV Drain Time

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.19	2.38					
Orifice Area (sq. inches)	12.18	12.18	12.18					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangular	Not Selected		Calculated Parameters for Vertical Orifice	Zone 2 Rectangular	Not Selected	
Invert of Vertical Orifice =	3.57	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.30	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	4.90	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.08	N/A	feet
Vertical Orifice Height =	2.00	N/A	inches				
Vertical Orifice Width =	21.39		inches				

Size Vertical Orifice to drain (EURV - WQCV) Only

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 3 Weir	Not Selected		Calculated Parameters for Overflow Weir	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.90	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	8.23	N/A	feet
Overflow Weir Front Edge Length =	425.00	N/A	feet	Overflow Weir Slope Length =	10.54	N/A	feet
Overflow Weir Grate Slope =	3.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	103.59	N/A	
Horiz. Length of Weir Sides =	10.00	N/A	feet	Overflow Grate Open Area w/o Debris =	3118.01	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	1559.00	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.33	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	30.10	N/A	ft^2
Outlet Pipe Diameter =	90.00	N/A	inches	Outlet Orifice Centroid =	2.73	N/A	feet
Restrictor Plate Height Above Pipe Invert =	58.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.86	N/A	radians

Size Outlet Plate to match 90% of Predevelopment 100-year Peak Runoff Rate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=	6.15	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	2.45	feet
Spillway Crest Length =	50.00	feet	Stage at Top of Freeboard =	9.60	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	13.29	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	71.32	acre-ft

Size Emergency Spillway to pass Developed 100-yr Peak Runoff Rate

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	4.426	13.115	8.993	13.071	17.845	26.911	34.919	44.551	70.739
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	8.993	13.071	17.845	26.911	34.919	44.551	70.739
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	1.8	18.6	53.2	142.5	207.1	292.7	502.7
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.09	0.25	0.68	0.98	1.39	2.39
Peak Inflow Q (cfs) =	N/A	N/A	128.0	185.8	251.8	403.9	521.3	666.8	1040.9
Peak Outflow Q (cfs) =	1.8	3.9	3.3	3.8	30.3	105.6	175.2	277.6	445.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.2	0.6	0.7	0.8	0.9	0.9
Structure Controlling Flow =	Vertical Orifice 1	Overflow Weir 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.0	0.0	0.1	0.1	0.1
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	68	57	69	71	69	66	63	57
Time to Drain 99% of Inflow Volume (hours) =	**40**	72	60	73	77	76	75	73	70
Maximum Ponding Depth (ft) =	3.57	4.90	4.30	4.82	5.15	5.52	5.77	6.09	7.04
Area at Maximum Ponding Depth (acres) =	4.36	8.99	6.69	8.62	10.04	11.66	12.18	12.27	12.54
Maximum Volume Stored (acre-ft) =	4.452	13.142	8.455	12.349	15.519	19.423	22.559	26.471	38.259

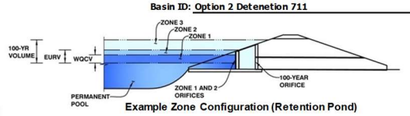
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Clear Workbook

Project: 23.1447.001 Greeley - Oklahoma Drainage MP

Basin ID: Option 2 Detenetion 711



Example Zone Configuration (Retention Pond)

Watershed Information

Extended Detention Basin (EDB)	EDB	
Watershed Area =	90.00	acres
Watershed Length =	2,406	ft
Watershed Length to Centroid =	1,738	ft
Watershed Slope =	0.031	ft/ft
Watershed Imperviousness =	30.20%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Run CUHP

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	1.141	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	2.470	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	1.595	acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	2.802	acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	4.588	acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	8.478	acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	11.755	acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	15.950	acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	27.018	acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	1.515	acre-feet		
Approximate 5-yr Detention Volume =	2.643	acre-feet		
Approximate 10-yr Detention Volume =	3.285	acre-feet		
Approximate 25-yr Detention Volume =	4.314	acre-feet		
Approximate 50-yr Detention Volume =	4.931	acre-feet		
Approximate 100-yr Detention Volume =	6.534	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV)	1.141	acre-feet
Zone 2 Volume (EURV - Zone 1)	1.329	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2)	4.064	acre-feet
Total Detention Basin Volume =	6.534	acre-feet
Initial Surcharge Volume (ISV) =	578	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.003	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	
Initial Surcharge Area (A_{ISV}) =	1,752	ft^2
Surcharge Volume Length (L_{ISV}) =	41.9	ft
Surcharge Volume Width (W_{ISV}) =	41.9	ft
Depth of Basin Floor (H_{FLOOR}) =	0.78	ft
Length of Basin Floor (L_{FLOOR}) =	305.0	ft
Width of Basin Floor (W_{FLOOR}) =	171.9	ft
Area of Basin Floor (A_{FLOOR}) =	52,410	ft^2
Volume of Basin Floor (V_{FLOOR}) =	16,573	ft^3
Depth of Main Basin (H_{MAIN}) =	4.39	ft
Length of Main Basin (L_{MAIN}) =	340.1	ft
Width of Main Basin (W_{MAIN}) =	207.0	ft
Area of Main Basin (A_{MAIN}) =	70,389	ft^2
Volume of Main Basin (V_{MAIN}) =	268,575	ft^3
Calculated Total Basin Volume (V_{total}) =	**6.579**	acre-feet

Depth Increment = 0.50 ft

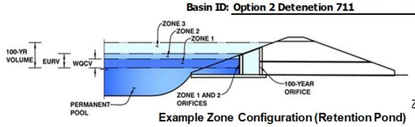
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		41.9	41.9	1,752		0.040		
ISV	0.33		41.9	41.9	1,752		0.040	578	0.013
	0.50		41.9	41.9	1,752		0.040	876	0.020
	1.00		99.2	70.2	6,962		0.160	2,148	0.049
	1.50		267.9	153.5	41,122		0.944	12,998	0.298
Floor	1.61		305.0	171.9	52,410		1.203	18,130	0.416
	2.00		308.1	175.0	53,907		1.238	38,861	0.892
Zone 1 (WQCV)	2.20		309.7	176.6	54,683		1.255	49,720	1.141
	2.50		312.1	179.0	55,855		1.282	66,300	1.522
	3.00		316.1	183.0	57,836		1.328	94,722	2.175
Zone 2 (EURV)	3.23		317.9	184.8	58,757		1.349	108,130	2.482
	3.50		320.1	187.0	59,848		1.374	124,141	2.850
	4.00		324.1	191.0	61,892		1.421	154,575	3.549
	4.50		328.1	195.0	63,968		1.469	186,038	4.271
	5.00		332.1	199.0	66,077		1.517	218,548	5.017
	5.50		336.1	203.0	68,217		1.566	252,120	5.788
Zone 3 (100-year)	5.97		339.9	206.7	70,258		1.613	284,661	6.535
	6.00		340.1	207.0	70,389		1.616	286,770	6.583
	6.50		344.1	211.0	72,593		1.667	322,515	7.404
	7.00		348.1	215.0	74,830		1.718	359,369	8.250
	7.50		352.1	219.0	77,098		1.770	397,350	9.122
	8.00		356.1	223.0	79,398		1.823	436,472	10.020
	8.50		360.1	227.0	81,730		1.876	476,753	10.945
	9.00		364.1	231.0	84,095		1.931	518,208	11.896
	9.50		368.1	235.0	86,491		1.986	560,853	12.875
	10.00		372.1	239.0	88,919		2.041	604,704	13.882
	10.50		376.1	243.0	91,379		2.098	649,777	14.917
	11.00		380.1	247.0	93,872		2.155	696,089	15.980
	11.50		384.1	251.0	96,396		2.213	743,654	17.072
	12.00		388.1	255.0	98,952		2.272	792,490	18.193
	12.50		392.1	259.0	101,540		2.331	842,611	19.344
	13.00		396.1	263.0	104,161		2.391	894,035	20.524
	13.50		400.1	267.0	106,813		2.452	946,777	21.735
	14.00		404.1	271.0	109,497		2.514	1,000,853	22.976
	14.50		408.1	275.0	112,213		2.576	1,056,280	24.249
	15.00		412.1	279.0	114,962		2.639	1,113,072	25.553
	15.50		416.1	283.0	117,742		2.703	1,171,246	26.888
	16.00		420.1	287.0	120,554		2.768	1,230,819	28.256
	16.50		424.1	291.0	123,398		2.833	1,291,806	29.656
	17.00		428.1	295.0	126,275		2.899	1,354,223	31.089
	17.50		432.1	299.0	129,183		2.966	1,418,086	32.555
	18.00		436.1	303.0	132,123		3.033	1,483,411	34.054
	18.50		440.1	307.0	135,095		3.101	1,550,214	35.588
	19.00		444.1	311.0	138,100		3.170	1,618,511	37.156
	19.50		448.1	315.0	141,136		3.240	1,688,319	38.758
	20.00		452.1	319.0	144,204		3.310	1,759,652	40.396
	20.50		456.1	323.0	147,304		3.382	1,832,528	42.069
	21.00		460.1	327.0	150,436		3.454	1,906,962	43.778
	21.50		464.1	331.0	153,601		3.526	1,982,970	45.523
	22.00		468.1	335.0	156,797		3.600	2,060,568	47.304
	22.50		472.1	339.0	160,025		3.674	2,139,772	49.122
	23.00		476.1	343.0	163,285		3.749	2,220,599	50.978
	23.50		480.1	347.0	166,578		3.824	2,303,063	52.871
	24.00		484.1	351.0	169,902		3.900	2,387,182	54.802
	24.50		488.1	355.0	173,258		3.977	2,472,970	56.772
	25.00		492.1	359.0	176,646		4.055	2,560,445	58.780
	25.50		496.1	363.0	180,067		4.134	2,649,622	60.827
	26.00		500.1	367.0	183,519		4.213	2,740,517	62.914
	26.50		504.1	371.0	187,003		4.293	2,833,147	65.040
	27.00		508.1	375.0	190,519		4.374	2,927,526	67.207
	27.50		512.1	379.0	194,068		4.455	3,023,671	69.414
	28.00		516.1	383.0	197,648		4.537	3,121,599	71.662
	28.50		520.1	387.0	201,260		4.620	3,221,325	73.951
	29.00		524.1	391.0	204,904		4.704	3,322,865	76.282
	29.50		528.1	395.0	208,581		4.788	3,426,234	78.656
	30.00		532.1	399.0	212,289		4.873	3,531,451	81.071

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: 23.1447.001 Greeley - Oklahoma Drainage MP

Basin ID: Option 2 Detenetion 711



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.20	1.141	Orifice Plate
Zone 2 (EURV)	3.23	1.329	Rectangular Orifice
Zone 3 (100-year)	5.97	4.064	Weir&Pipe (Restrict)
Total (all zones)		6.534	

Clear Input Parameters (Including Tables)

Orifice Plate | Vertical Orifice (Rectangular) | Weir and Pipe (w/ Restrictor Plate)

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	2.861E-02	ft^2
Depth at top of Zone using Orifice Plate =	2.20	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	8.80	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	4.12	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft^2

Size Plate to match WQCV Drain Time

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.73	1.47					
Orifice Area (sq. inches)	4.12	4.12	4.12					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangular	Not Selected		Calculated Parameters for Vertical Orifice	Zone 2 Rectangular	Not Selected	
Invert of Vertical Orifice =	2.20	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.26	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	3.23	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.08	N/A	feet
Vertical Orifice Height =	2.00	N/A	inches				
Vertical Orifice Width =	18.79		inches				

Size Vertical Orifice to drain (EURV - WQCV) Only

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 3 Weir	Not Selected		Calculated Parameters for Overflow Weir	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.23	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	6.56	N/A	feet
Overflow Weir Front Edge Length =	83.00	N/A	feet	Overflow Weir Slope Length =	10.54	N/A	feet
Overflow Weir Grate Slope =	3.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	38.07	N/A	
Horiz. Length of Weir Sides =	10.00	N/A	feet	Overflow Grate Open Area w/o Debris =	608.93	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	304.46	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.33	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	16.00	N/A	ft^2
Outlet Pipe Diameter =	66.00	N/A	inches	Outlet Orifice Centroid =	1.98	N/A	feet
Restrictor Plate Height Above Pipe Invert =	42.10		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.85	N/A	radians

Size Outlet Plate to match 90% of Predevelopment 100-year Peak Runoff Rate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway	
Spillway Invert Stage=	6.15	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.97 feet
Spillway Crest Length =	69.00	feet	Stage at Top of Freeboard =	8.12 feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	1.84 acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	10.24 acre-ft

Size Emergency Spillway to pass Developed 100-yr Peak Runoff Rate

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	1.141	2.470	1.595	2.802	4.588	8.478	11.755	15.950	27.018
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.595	2.802	4.588	8.478	11.755	15.950	27.018
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	1.0	10.6	29.5	76.5	111.1	155.2	266.0
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.12	0.33	0.85	1.23	1.72	2.96
Peak Inflow Q (cfs) =	N/A	N/A	19.3	35.4	58.3	113.8	156.0	207.4	342.7
Peak Outflow Q (cfs) =	0.5	1.9	1.0	2.1	18.1	62.7	99.2	150.9	277.4
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.2	0.6	0.8	0.9	1.0	1.0
Structure Controlling Flow =	Vertical Orifice 1	Overflow Weir 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.0	0.0	0.1	0.2	0.2	0.3
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	37	49	45	51	50	45	41	37	27
Time to Drain 99% of Inflow Volume (hours) =	**40**	52	48	55	54	52	51	49	44
Maximum Ponding Depth (ft) =	2.20	3.23	2.45	3.26	3.76	4.50	4.95	5.50	6.77
Area at Maximum Ponding Depth (acres) =	1.26	1.35	1.28	1.35	1.40	1.47	1.51	1.57	1.69
Maximum Volume Stored (acre-ft) =	1.141	2.482	1.445	2.509	3.210	4.256	4.941	5.772	7.841

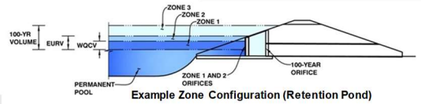
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Clear Workbook

Project: 23.1447.001 Greeley - Oklahoma Drainage MP

Basin ID: Option 2, Detention 823



Example Zone Configuration (Retention Pond)

Watershed Information

Extended Detention Basin (EDB)	EDB	
Watershed Area =	327.00	acres
Watershed Length =	4,753	ft
Watershed Length to Centroid =	2,751	ft
Watershed Slope =	0.012	ft/ft
Watershed Imperviousness =	72.98%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Run CUHP

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	7.879	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	23.271	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	16.082	acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	22.795	acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	30.462	acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	44.522	acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	57.083	acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	71.969	acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	112.726	acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	14.974	acre-feet		
Approximate 5-yr Detention Volume =	21.673	acre-feet		
Approximate 10-yr Detention Volume =	26.650	acre-feet		
Approximate 25-yr Detention Volume =	33.089	acre-feet		
Approximate 50-yr Detention Volume =	37.124	acre-feet		
Approximate 100-yr Detention Volume =	43.128	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV)	7.879	acre-feet
Zone 2 Volume (EURV - Zone 1)	15.391	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2)	19.857	acre-feet
Total Detention Basin Volume =	43.128	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	user	acre-feet

Depth Increment = 1.00 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	37,664	0.865		
	--	1.00	--	--	--	77,436	1.778	57,550	1.321
	--	2.00	--	--	--	133,078	3.055	162,807	3.738
	--	3.00	--	--	--	163,864	3.762	311,278	7.146
	--	4.00	--	--	--	190,605	4.376	488,512	11.215
	--	5.00	--	--	--	204,897	4.704	686,263	15.754
	--	6.00	--	--	--	215,528	4.948	896,476	20.580
	--	7.00	--	--	--	226,286	5.195	1,117,383	25.652
	--	8.00	--	--	--	237,198	5.445	1,349,125	30.972
	--	8.49	--	--	--	273,603	6.281	1,474,271	33.845
	--	9.00	--	--	--	273,603	6.281	1,613,808	37.048
	--	10.00	--	--	--	273,603	6.281	1,887,411	43.329
	--		--	--	--				
	--		--	--	--				
	--		--	--	--			

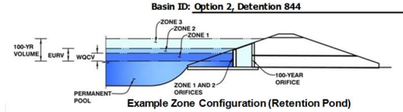
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Clear Workbook

Project: 23.1447.001 Greeley - Oklahoma Drainage MP

Basin ID: Option 2, Detention 844



Example Zone Configuration (Retention Pond)

Watershed Information

Extended Detention Basin (EDB)	EDB	
Watershed Area =	126.60	acres
Watershed Length =	3,111	ft
Watershed Length to Centroid =	1,437	ft
Watershed Slope =	0.019	ft/ft
Watershed Imperviousness =	76.20%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Run CUHP

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	3.229 acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	9.439 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	6.502 acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	9.158 acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	12.151 acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	17.573 acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	22.433 acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	28.164 acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	43.897 acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	6.088 acre-feet		
Approximate 5-yr Detention Volume =	8.743 acre-feet		
Approximate 10-yr Detention Volume =	10.768 acre-feet		
Approximate 25-yr Detention Volume =	13.353 acre-feet		
Approximate 50-yr Detention Volume =	14.966 acre-feet		
Approximate 100-yr Detention Volume =	17.267 acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV)	3.229	acre-feet
Zone 2 Volume (EURV - Zone 1)	6.211	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2)	7.827	acre-feet
Total Detention Basin Volume =	17.267	acre-feet
Initial Surcharge Volume (ISV) =	578	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.003	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	
Initial Surcharge Area (A_{ISV}) =	1,752	ft^2
Surcharge Volume Length (L_{ISV}) =	41.9	ft
Surcharge Volume Width (W_{ISV}) =	41.9	ft
Depth of Basin Floor (H_{FLOOR}) =	1.54	ft
Length of Basin Floor (L_{FLOOR}) =	561.3	ft
Width of Basin Floor (W_{FLOOR}) =	298.5	ft
Area of Basin Floor (A_{FLOOR}) =	167,571	ft^2
Volume of Basin Floor (V_{FLOOR}) =	95,713	ft^3
Depth of Main Basin (H_{MAIN}) =	3.63	ft
Length of Main Basin (L_{MAIN}) =	590.4	ft
Width of Main Basin (W_{MAIN}) =	327.6	ft
Area of Main Basin (A_{MAIN}) =	193,385	ft^2
Volume of Main Basin (V_{MAIN}) =	654,577	ft^3
Calculated Total Basin Volume (V_{total}) =	**17.258**	acre-feet

Depth Increment = 0.50 ft

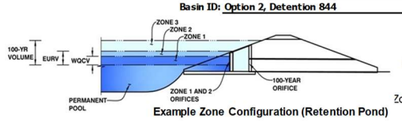
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		41.9	41.9	1,752		0.040		
ISV	0.33		41.9	41.9	1,752		0.040	578	0.013
	0.50		41.9	41.9	1,752		0.040	876	0.020
	1.00		99.2	70.2	6,962		0.160	2,148	0.049
	1.50		267.9	153.5	41,122		0.944	12,998	0.298
	2.00		436.5	236.9	103,393		2.374	47,956	1.101
Floor	2.37		561.3	298.5	167,571		3.847	97,609	2.241
	2.50		562.4	299.6	168,467		3.867	119,452	2.742
Zone 1 (WQCV)	2.63		563.4	300.6	169,364		3.888	141,411	3.246
	3.00		566.4	303.6	171,930		3.947	204,550	4.696
	3.50		570.4	307.6	175,426		4.027	291,387	6.689
	4.00		574.4	311.6	178,954		4.108	379,981	8.723
Zone 2 (EURV)	4.18		575.8	313.0	180,232		4.138	412,308	9.465
	4.50		578.4	315.6	182,514		4.190	470,347	10.798
	5.00		582.4	319.6	186,105		4.272	562,500	12.913
	5.50		586.4	323.6	189,729		4.356	656,457	15.070
Zone 3 (100-year)	6.00		590.4	327.6	193,385		4.440	752,235	17.269
	6.50		594.4	331.6	197,073		4.524	849,848	19.510
	7.00		598.4	335.6	200,793		4.610	949,313	21.793
	7.50		602.4	339.6	204,544		4.696	1,050,646	24.120
	8.00		606.4	343.6	208,328		4.783	1,153,862	26.489
	8.50		610.4	347.6	212,144		4.870	1,258,979	28.902
	9.00		614.4	351.6	215,992		4.958	1,366,012	31.359
	9.50		618.4	355.6	219,871		5.048	1,474,976	33.861
	10.00		622.4	359.6	223,783		5.137	1,585,888	36.407
	10.50		626.4	363.6	227,727		5.228	1,698,765	38.998
	11.00		630.4	367.6	231,703		5.319	1,813,621	41.635
	11.50		634.4	371.6	235,710		5.411	1,930,473	44.318
	12.00		638.4	375.6	239,750		5.504	2,049,336	47.046
	12.50		642.4	379.6	243,822		5.597	2,170,228	49.822
	13.00		646.4	383.6	247,926		5.692	2,293,164	52.644
	13.50		650.4	387.6	252,062		5.787	2,418,159	55.513
	14.00		654.4	391.6	256,229		5.882	2,545,231	58.430
	14.50		658.4	395.6	260,429		5.979	2,674,394	61.396
	15.00		662.4	399.6	264,661		6.076	2,805,665	64.409
	15.50		666.4	403.6	268,925		6.174	2,939,060	67.472
	16.00		670.4	407.6	273,220		6.272	3,074,595	70.583
	16.50		674.4	411.6	277,548		6.372	3,212,286	73.744
	17.00		678.4	415.6	281,908		6.472	3,352,149	76.955
	17.50		682.4	419.6	286,300		6.573	3,494,199	80.216
	18.00		686.4	423.6	290,723		6.674	3,638,454	83.527
	18.50		690.4	427.6	295,179		6.776	3,784,928	86.890
	19.00		694.4	431.6	299,667		6.879	3,933,638	90.304
	19.50		698.4	435.6	304,187		6.983	4,084,600	93.770
	20.00		702.4	439.6	308,739		7.088	4,237,830	97.287
	20.50		706.4	443.6	313,322		7.193	4,393,344	100.857
	21.00		710.4	447.6	317,938		7.299	4,551,158	104.480
	21.50		714.4	451.6	322,586		7.406	4,711,288	108.156
	22.00		718.4	455.6	327,266		7.513	4,873,749	111.886
	22.50		722.4	459.6	331,977		7.621	5,038,558	115.669
	23.00		726.4	463.6	336,721		7.730	5,205,732	119.507
	23.50		730.4	467.6	341,497		7.840	5,375,285	123.400
	24.00		734.4	471.6	346,305		7.950	5,547,234	127.347
	24.50		738.4	475.6	351,144		8.061	5,721,595	131.350
	25.00		742.4	479.6	356,016		8.173	5,898,384	135.408
	25.50		746.4	483.6	360,920		8.286	6,077,617	139.523
	26.00		750.4	487.6	365,856		8.399	6,259,309	143.694
	26.50		754.4	491.6	370,824		8.513	6,443,478	147.922
	27.00		758.4	495.6	375,823		8.628	6,630,138	152.207
	27.50		762.4	499.6	380,855		8.743	6,819,306	156.550
	28.00		766.4	503.6	385,919		8.859	7,010,998	160.950
	28.50		770.4	507.6	391,015		8.976	7,205,230	165.409
	29.00		774.4	511.6	396,142		9.094	7,402,018	169.927
	29.50		778.4	515.6	401,302		9.213	7,601,378	174.504
	30.00		782.4	519.6	406,494		9.332	7,803,326	179.140

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: 23.1447.001 Greeley - Oklahoma Drainage MP

Basin ID: Option 2, Detention 844



Example Zone Configuration (Retention Pond)

Clear Input Parameters (Including Tables)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type	
Zone 1 (WQCV)	2.63	3.229	Orifice Plate	Orifice Plate
Zone 2 (EURV)	4.18	6.211	Rectangular Orifice	Vertical Orifice (Rectangular)
Zone 3 (100-year)	6.00	7.827	Weir&Pipe (Restrict)	Weir and Pipe (w/ Restrictor Plate)
Total (all zones)		17.267		

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	8.528E-02	ft^2
Depth at top of Zone using Orifice Plate =	3.55	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	14.20	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	12.28	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft^2

Size Plate to match WQCV Drain Time

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.18	2.37					
Orifice Area (sq. inches)	12.28	12.28	12.28					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangular	Not Selected		Calculated Parameters for Vertical Orifice	Zone 2 Rectangular	Not Selected	
Invert of Vertical Orifice =	2.63	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	1.39	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	4.18	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.08	N/A	feet
Vertical Orifice Height =	2.00	N/A	inches				
Vertical Orifice Width =	99.87		inches				

Size Vertical Orifice to drain (EURV - WQCV) Only

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 3 Weir	Not Selected		Calculated Parameters for Overflow Weir	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.83	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	8.16	N/A	feet
Overflow Weir Front Edge Length =	263.00	N/A	feet	Overflow Weir Slope Length =	10.54	N/A	feet
Overflow Weir Grate Slope =	3.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	94.15	N/A	
Horiz. Length of Weir Sides =	10.00	N/A	feet	Overflow Grate Open Area w/o Debris =	1929.50	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	964.75	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.33	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	20.49	N/A	ft^2
Outlet Pipe Diameter =	72.00	N/A	inches	Outlet Orifice Centroid =	2.29	N/A	feet
Restrictor Plate Height Above Pipe Invert =	49.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.94	N/A	radians

Size Outlet Plate to match 90% of Predevelopment 100-year Peak Runoff Rate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway	
Spillway Invert Stage=	6.10	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.98 feet
Spillway Crest Length =	174.00	feet	Stage at Top of Freeboard =	8.08 feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	4.80 acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	26.87 acre-ft

Size Emergency Spillway to pass Developed 100-yr Peak Runoff Rate

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	3.229	9.439	6.502	9.158	12.151	17.573	22.433	28.164	43.897
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	6.502	9.158	12.151	17.573	22.433	28.164	43.897
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	1.4	14.7	41.1	106.6	155.2	216.5	372.0
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.12	0.32	0.84	1.23	1.71	2.94
Peak Inflow Q (cfs) =	N/A	N/A	119.6	166.5	218.6	325.1	413.4	522.6	803.0
Peak Outflow Q (cfs) =	1.4	10.1	6.7	9.0	11.1	46.8	107.7	198.6	478.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.6	0.3	0.4	0.7	0.9	1.3
Structure Controlling Flow =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.0	0.0	0.1	0.1
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	48	47	49	51	51	49	46	41
Time to Drain 99% of Inflow Volume (hours) =	**40**	52	50	53	55	56	56	55	52
Maximum Ponding Depth (ft) =	2.63	4.18	3.26	3.83	4.48	5.24	5.64	6.09	6.73
Area at Maximum Ponding Depth (acres) =	3.89	4.14	3.99	4.08	4.19	4.31	4.38	4.45	4.56
Maximum Volume Stored (acre-ft) =	3.246	9.465	5.688	7.986	10.672	13.900	15.638	17.625	20.509

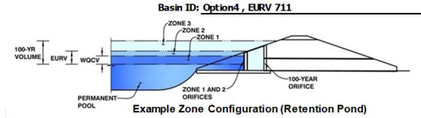
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Clear Workbook

Project: 23.1447.001 Greeley - Oklahoma Drainage MP

Basin ID: Option4 , EURV 711



Example Zone Configuration (Retention Pond)

Watershed Information

Extended Detention Basin (EDB)	EDB	
Watershed Area =	90.00	acres
Watershed Length =	3,900	ft
Watershed Length to Centroid =	1,738	ft
Watershed Slope =	0.031	ft/ft
Watershed Imperviousness =	30.20%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Run CUHP

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	1.141 acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	2.470 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	1.598 acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	2.010 acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	4.602 acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	8.506 acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	11.792 acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	15.995 acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	27.074 acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	1.515 acre-feet		
Approximate 5-yr Detention Volume =	2.643 acre-feet		
Approximate 10-yr Detention Volume =	3.285 acre-feet		
Approximate 25-yr Detention Volume =	4.314 acre-feet		
Approximate 50-yr Detention Volume =	4.931 acre-feet		
Approximate 100-yr Detention Volume =	6.534 acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV)	1.141	acre-feet
Zone 2 Volume (EURV - Zone 1)	1.329	acre-feet
Select Zone 3 Storage Volume (Optional)		acre-feet
Total Detention Basin Volume =	2.470	acre-feet
Initial Surcharge Volume (ISV) =	578	ft³
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.003	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Initial Surcharge Area (A_{ISV}) =	1,752	ft²
Surcharge Volume Length (L_{ISV}) =	41.9	ft
Surcharge Volume Width (W_{ISV}) =	41.9	ft
Depth of Basin Floor (H_{FLOOR}) =	0.35	ft
Length of Basin Floor (L_{FLOOR}) =	159.9	ft
Width of Basin Floor (W_{FLOOR}) =	100.2	ft
Area of Basin Floor (A_{FLOOR}) =	16,021	ft²
Volume of Basin Floor (V_{FLOOR}) =	2,692	ft³
Depth of Main Basin (H_{MAIN}) =	4.82	ft
Length of Main Basin (L_{MAIN}) =	198.5	ft
Width of Main Basin (W_{MAIN}) =	138.7	ft
Area of Main Basin (A_{MAIN}) =	27,538	ft²
Volume of Main Basin (V_{MAIN}) =	103,732	ft³
Calculated Total Basin Volume (V_{total}) =	**2.477**	acre-feet

Total detention volume is less than 100-year volume.

Depth Increment = 0.50 ft

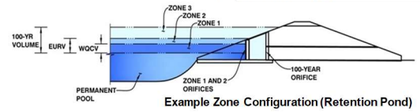
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft²)	Optional Override Area (ft²)	Area (acre)	Volume (ft³)	Volume (ac-ft)
Top of Micropool	0.00		41.9	41.9	1,752		0.040		
ISV	0.33		41.9	41.9	1,752		0.040	578	0.013
	0.50		41.9	41.9	1,752		0.040	876	0.020
	1.00		99.2	70.2	6,962		0.160	2,148	0.049
Floor	1.18		159.9	100.2	16,021		0.368	4,162	0.096
	1.50		162.5	102.7	16,694		0.383	9,396	0.216
	2.00		166.5	106.7	17,771		0.408	18,011	0.413
	2.50		170.5	110.7	18,879		0.433	27,172	0.624
	3.00		174.5	114.7	20,020		0.460	36,896	0.847
	3.50		178.5	118.7	21,193		0.487	47,198	1.084
Zone 1 (WQCV)	3.62		179.4	119.7	21,479		0.493	49,758	1.142
	4.00		182.5	122.7	22,398		0.514	58,094	1.334
	4.50		186.5	126.7	23,635		0.543	69,601	1.598
	5.00		190.5	130.7	24,904		0.572	81,735	1.876
	5.50		194.5	134.7	26,205		0.602	94,511	2.170
Zone 2 (EURV)	5.99		198.4	138.7	27,511		0.632	107,670	2.472
	6.00		198.5	138.7	27,538		0.632	107,945	2.478
	6.50		202.5	142.7	28,903		0.664	122,054	2.802
	7.00		206.5	146.7	30,299		0.696	136,853	3.142
	7.50		210.5	150.7	31,728		0.728	152,358	3.498
	8.00		214.5	154.7	33,189		0.762	168,586	3.870
	8.50		218.5	158.7	34,682		0.796	185,553	4.260
	9.00		222.5	162.7	36,207		0.831	203,274	4.667
	9.50		226.5	166.7	37,764		0.867	221,765	5.091
	10.00		230.5	170.7	39,353		0.903	241,043	5.534
	10.50		234.5	174.7	40,974		0.941	261,123	5.995
	11.00		238.5	178.7	42,627		0.979	282,022	6.474
	11.50		242.5	182.7	44,311		1.017	303,755	6.973
	12.00		246.5	186.7	46,028		1.057	326,339	7.492
	12.50		250.5	190.7	47,777		1.097	349,789	8.030
	13.00		254.5	194.7	49,558		1.138	374,122	8.589
	13.50		258.5	198.7	51,371		1.179	399,353	9.168
	14.00		262.5	202.7	53,216		1.222	425,498	9.768
	14.50		266.5	206.7	55,093		1.265	452,574	10.390
	15.00		270.5	210.7	57,002		1.309	480,596	11.033
	15.50		274.5	214.7	58,943		1.353	509,581	11.698
	16.00		278.5	218.7	60,915		1.398	539,544	12.386
	16.50		282.5	222.7	62,920		1.444	570,502	13.097
	17.00		286.5	226.7	64,957		1.491	602,470	13.831
	17.50		290.5	230.7	67,026		1.539	635,464	14.588
	18.00		294.5	234.7	69,127		1.587	669,501	15.370
	18.50		298.5	238.7	71,260		1.636	704,597	16.175
	19.00		302.5	242.7	73,425		1.686	740,766	17.006
	19.50		306.5	246.7	75,622		1.736	778,027	17.861
	20.00		310.5	250.7	77,851		1.787	816,393	18.742
	20.50		314.5	254.7	80,111		1.839	855,883	19.648
	21.00		318.5	258.7	82,404		1.892	896,510	20.581
	21.50		322.5	262.7	84,729		1.945	938,292	21.540
	22.00		326.5	266.7	87,086		1.999	981,245	22.526
	22.50		330.5	270.7	89,475		2.054	1,025,384	23.540
	23.00		334.5	274.7	91,896		2.110	1,070,725	24.580
	23.50		338.5	278.7	94,349		2.166	1,117,285	25.649
	24.00		342.5	282.7	96,834		2.223	1,165,079	26.747
	24.50		346.5	286.7	99,351		2.281	1,214,124	27.872
	25.00		350.5	290.7	101,899		2.339	1,264,435	29.027
	25.50		354.5	294.7	104,480		2.399	1,316,029	30.212
	26.00		358.5	298.7	107,093		2.459	1,368,921	31.426
	26.50		362.5	302.7	109,738		2.519	1,423,127	32.671
	27.00		366.5	306.7	112,415		2.581	1,478,664	33.945
	27.50		370.5	310.7	115,124		2.643	1,535,548	35.251
	28.00		374.5	314.7	117,865		2.706	1,593,794	36.588
	28.50		378.5	318.7	120,638		2.769	1,653,418	37.957
	29.00		382.5	322.7	123,443		2.834	1,714,437	39.358
	29.50		386.5	326.7	126,279		2.899	1,776,866	40.791
	30.00		390.5	330.7	129,148		2.965	1,840,721	42.257

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: 23.1447.001 Greeley - Oklahoma Drainage MP

Basin ID: Option4 , EURV 711



Example Zone Configuration (Retention Pond)

Clear Input Parameters (Including Tables)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type	
Zone 1 (WQCV)	3.62	1.141	Orifice Plate	Orifice Plate
Zone 2 (EURV)	5.99	1.329	Weir&Pipe (Restrict)	Weir and Pipe (w/ Restrictor Plate)
Zone 3			Not Utilized	Zone 3 Not Utilized
Total (all zones)		2.470		

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	N/A	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft²
Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	3.62	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	14.50	inches
Orifice Plate: Orifice Area per Row =	4.41	sq. inches (use rectangular openings)

Calculated Parameters for Plate

WQ Orifice Area per Row =	3.063E-02	ft²
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft²

Size Plate to match WQCV Drain Time

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.21	2.41					
Orifice Area (sq. inches)	4.41	4.41	4.41					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft²
Vertical Orifice Centroid =	N/A	N/A	feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.00	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	800.00	N/A	feet
Overflow Weir Grate Slope =	3.00	N/A	H:V
Horiz. Length of Weir Sides =	10.00	N/A	feet
Overflow Grate Type =	Type C Grate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 2 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	7.33	N/A	feet
Overflow Weir Slope Length =	10.54	N/A	feet
Grate Open Area / 100-yr Orifice Area =	11382.38	N/A	
Overflow Grate Open Area w/o Debris =	5869.19	N/A	ft²
Overflow Grate Open Area w/ Debris =	2934.59	N/A	ft²

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	6.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 2 Restrictor	Not Selected	
Outlet Orifice Area =	0.52	N/A	ft²
Outlet Orifice Centroid =	0.29	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.23	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	9.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	59.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Size Emergency Spillway to pass Developed 100-yr Peak Runoff Rate

Calculated Parameters for Spillway

Spillway Design Flow Depth=	0.96	feet
Stage at Top of Freeboard =	10.96	feet
Basin Area at Top of Freeboard =	0.98	acres
Basin Volume at Top of Freeboard =	6.44	acre-ft

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	1.141	2.470	1.598	2.810	4.602	8.506	11.792	15.995	27.074
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.598	2.810	4.602	8.506	11.792	15.995	27.074
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.8	8.6	24.1	64.2	93.3	131.2	225.3
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.10	0.27	0.71	1.04	1.46	2.50
Peak Inflow Q (cfs) =	N/A	N/A	16.2	29.4	48.3	95.8	131.0	176.7	291.6
Peak Outflow Q (cfs) =	0.7	7.1	4.1	6.7	7.7	52.8	98.6	157.8	291.4
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.8	0.3	0.8	1.1	1.2	1.3
Structure Controlling Flow =	Plate	Outlet Plate 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	40	43	41	40	36	32	27	19
Time to Drain 99% of Inflow Volume (hours) =	**40**	44	46	45	46	45	43	40	35
Maximum Ponding Depth (ft) =	3.62	5.99	4.04	5.15	7.43	9.39	9.62	9.87	10.31
Area at Maximum Ponding Depth (acres) =	0.49	0.63	0.52	0.58	0.72	0.86	0.88	0.89	0.93
Maximum Volume Stored (acre-ft) =	1.142	2.472	1.354	1.963	3.447	4.996	5.196	5.408	5.808

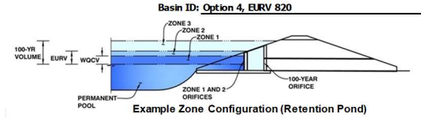
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Clear Workbook

Project: 23.1447.001 Greeley - Oklahoma Drainage MP

Basin ID: Option 4, EURV 820



Example Zone Configuration (Retention Pond)

Watershed Information

Extended Detention Basin (EDB)	EDB	
Watershed Area =	81.00	acres
Watershed Length =	2,600	ft
Watershed Length to Centroid =	720	ft
Watershed Slope =	0.022	ft/ft
Watershed Imperviousness =	69.80%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Run CUHP

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	1.850 acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	5.493 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	3.732 acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	5.323 acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	7.165 acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	10.587 acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	13.634 acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	17.263 acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	27.180 acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	3.526 acre-feet		
Approximate 5-yr Detention Volume =	5.146 acre-feet		
Approximate 10-yr Detention Volume =	6.318 acre-feet		
Approximate 25-yr Detention Volume =	7.856 acre-feet		
Approximate 50-yr Detention Volume =	8.825 acre-feet		
Approximate 100-yr Detention Volume =	10.325 acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV)	1.850	acre-feet
Zone 2 Volume (EURV - Zone 1)	3.643	acre-feet
Select Zone 3 Storage Volume (Optional)		acre-feet
Total Detention Basin Volume =	5.493	acre-feet
Initial Surcharge Volume (ISV) =	578	ft³
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.003	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Initial Surcharge Area (A_{ISV}) =	1,752	ft²
Surcharge Volume Length (L_{ISV}) =	41.9	ft
Surcharge Volume Width (W_{ISV}) =	41.9	ft
Depth of Basin Floor (H_{FLOOR}) =	0.68	ft
Length of Basin Floor (L_{FLOOR}) =	271.2	ft
Width of Basin Floor (W_{FLOOR}) =	155.2	ft
Area of Basin Floor (A_{FLOOR}) =	42,092	ft²
Volume of Basin Floor (V_{FLOOR}) =	11,884	ft³
Depth of Main Basin (H_{MAIN}) =	4.49	ft
Length of Main Basin (L_{MAIN}) =	307.2	ft
Width of Main Basin (W_{MAIN}) =	191.1	ft
Area of Main Basin (A_{MAIN}) =	58,699	ft²
Volume of Main Basin (V_{MAIN}) =	225,245	ft³
Calculated Total Basin Volume (V_{total}) =	**5.477**	acre-feet

Total detention volume is less than 100-year volume.

Depth Increment = 0.50 ft

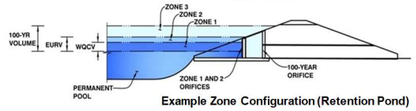
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft²)	Optional Override Area (ft²)	Area (acre)	Volume (ft³)	Volume (ac-ft)
Top of Micropool	0.00		41.9	41.9	1,752		0.040		
ISV	0.33		41.9	41.9	1,752		0.040	578	0.013
	0.50		41.9	41.9	1,752		0.040	876	0.020
	1.00		99.2	70.2	6,962		0.160	2,148	0.049
	1.50		267.9	153.5	41,122		0.944	12,998	0.298
Floor	1.51		271.2	155.2	42,092		0.966	13,414	0.308
	2.00		275.2	159.1	43,779		1.005	34,451	0.791
	2.50		279.2	163.1	45,532		1.045	56,778	1.303
	3.00		283.2	167.1	47,317		1.086	79,988	1.836
Zone 1 (WQCV)	3.02		283.3	167.3	47,389		1.088	80,935	1.858
	3.50		287.2	171.1	49,134		1.128	104,100	2.390
	4.00		291.2	175.1	50,983		1.170	129,128	2.964
	4.50		295.2	179.1	52,864		1.214	155,088	3.560
	5.00		299.2	183.1	54,777		1.258	181,997	4.178
	5.50		303.2	187.1	56,722		1.302	209,871	4.818
	6.00		307.2	191.1	58,699		1.348	238,725	5.480
Zone 2 (EURV)	6.01		307.2	191.2	58,739		1.348	239,312	5.494
	6.50		311.2	195.1	60,708		1.394	268,575	6.166
	7.00		315.2	199.1	62,749		1.441	299,430	6.874
	7.50		319.2	203.1	64,822		1.488	331,330	7.606
	8.00		323.2	207.1	66,927		1.536	364,266	8.362
	8.50		327.2	211.1	69,064		1.586	398,263	9.143
	9.00		331.2	215.1	71,234		1.635	433,336	9.948
	9.50		335.2	219.1	73,435		1.686	469,501	10.778
	10.00		339.2	223.1	75,668		1.737	506,776	11.634
	10.50		343.2	227.1	77,933		1.789	545,174	12.515
	11.00		347.2	231.1	80,230		1.842	584,714	13.423
	11.50		351.2	235.1	82,559		1.895	625,409	14.357
	12.00		355.2	239.1	84,920		1.949	667,278	15.319
	12.50		359.2	243.1	87,313		2.004	710,335	16.307
	13.00		363.2	247.1	89,738		2.060	754,596	17.323
	13.50		367.2	251.1	92,195		2.117	800,078	18.367
	14.00		371.2	255.1	94,684		2.174	846,796	19.440
	14.50		375.2	259.1	97,205		2.232	894,767	20.541
	15.00		379.2	263.1	99,758		2.290	944,007	21.671
	15.50		383.2	267.1	102,343		2.349	994,530	22.831
	16.00		387.2	271.1	104,960		2.410	1,046,355	24.021
	16.50		391.2	275.1	107,609		2.470	1,099,496	25.241
	17.00		395.2	279.1	110,290		2.532	1,153,970	26.491
	17.50		399.2	283.1	113,003		2.594	1,209,792	27.773
	18.00		403.2	287.1	115,748		2.657	1,266,978	29.086
	18.50		407.2	291.1	118,525		2.721	1,325,545	30.430
	19.00		411.2	295.1	121,334		2.785	1,385,509	31.807
	19.50		415.2	299.1	124,176		2.851	1,446,885	33.216
	20.00		419.2	303.1	127,049		2.917	1,509,690	34.658
	20.50		423.2	307.1	129,954		2.983	1,573,939	36.133
	21.00		427.2	311.1	132,891		3.051	1,639,649	37.641
	21.50		431.2	315.1	135,860		3.119	1,706,835	39.184
	22.00		435.2	319.1	138,861		3.188	1,775,514	40.760
	22.50		439.2	323.1	141,894		3.257	1,845,701	42.371
	23.00		443.2	327.1	144,959		3.328	1,917,413	44.018
	23.50		447.2	331.1	148,056		3.399	1,990,665	45.699
	24.00		451.2	335.1	151,185		3.471	2,065,474	47.417
	24.50		455.2	339.1	154,346		3.543	2,141,856	49.170
	25.00		459.2	343.1	157,539		3.617	2,219,826	50.960
	25.50		463.2	347.1	160,764		3.691	2,299,400	52.787
	26.00		467.2	351.1	164,021		3.765	2,380,595	54.651
	26.50		471.2	355.1	167,310		3.841	2,463,427	56.552
	27.00		475.2	359.1	170,631		3.917	2,547,911	58.492
	27.50		479.2	363.1	173,984		3.994	2,634,063	60.470
	28.00		483.2	367.1	177,369		4.072	2,721,900	62.486
	28.50		487.2	371.1	180,786		4.150	2,811,438	64.542
	29.00		491.2	375.1	184,235		4.229	2,902,692	66.637
	29.50		495.2	379.1	187,717		4.309	2,995,679	68.771
	30.00		499.2	383.1	191,230		4.390	3,090,414	70.946

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: 23.1447.001 Greeley - Oklahoma Drainage MP

Basin ID: Option 4, EURV 820



Example Zone Configuration (Retention Pond)

Clear Input Parameters (Including Tables)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type	
Zone 1 (WQCV)	3.02	1.850	Orifice Plate	Orifice Plate
Zone 2 (EURV)	6.01	3.643	Weir&Pipe (Restrict)	Weir and Pipe (w/ Restrictor Plate)
Zone 3			Not Utilized	Zone 3 Not Utilized
Total (all zones)		5.493		

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	N/A	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft²
Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	3.60	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	14.40	inches
Orifice Plate: Orifice Area per Row =	7.34	sq. inches (use rectangular openings)

Calculated Parameters for Plate

WQ Orifice Area per Row =	5.097E-02	ft²
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft²

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

Size Plate to match WQCV Drain Time

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.20	2.40					
Orifice Area (sq. inches)	7.34	7.34	7.34					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft²
Vertical Orifice Centroid =	N/A	N/A	feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.02	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	800.00	N/A	feet
Overflow Weir Grate Slope =	3.00	N/A	H:V
Horiz. Length of Weir Sides =	10.00	N/A	feet
Overflow Grate Type =	Type C Grate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 2 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	6.35	N/A	feet
Overflow Weir Slope Length =	10.54	N/A	feet
Grate Open Area / 100-yr Orifice Area =	11382.38	N/A	
Overflow Grate Open Area w/o Debris =	5869.19	N/A	ft²
Overflow Grate Open Area w/ Debris =	2934.59	N/A	ft²

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	3.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	6.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 2 Restrictor	Not Selected	
Outlet Orifice Area =	0.52	N/A	ft²
Outlet Orifice Centroid =	0.29	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.23	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	72.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Size Emergency Spillway to pass Developed 100-yr Peak Runoff Rate

Calculated Parameters for Spillway

Spillway Design Flow Depth=	0.97	feet
Stage at Top of Freeboard =	7.97	feet
Basin Area at Top of Freeboard =	1.53	acres
Basin Volume at Top of Freeboard =	8.32	acre-ft

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	1.850	5.493	3.732	5.323	7.165	10.587	13.634	17.263	27.180
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	3.732	5.323	7.165	10.587	13.634	17.263	27.180
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	1.1	11.7	32.5	82.7	120.4	166.0	285.0
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.14	0.40	1.02	1.49	2.05	3.52
Peak Inflow Q (cfs) =	N/A	N/A	76.5	108.0	143.4	215.3	277.2	355.1	547.6
Peak Outflow Q (cfs) =	0.9	7.3	6.4	7.0	17.3	102.6	169.8	269.5	507.4
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.6	0.5	1.2	1.4	1.6	1.8
Structure Controlling Flow =	Overflow Weir 1	Spillway	Outlet Plate 1	Outlet Plate 1	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	40	40	41	41	38	36	33	27
Time to Drain 99% of Inflow Volume (hours) =	**40**	45	43	45	46	45	44	43	40
Maximum Ponding Depth (ft) =	3.02	6.01	3.98	5.16	6.13	6.57	6.81	7.10	7.67
Area at Maximum Ponding Depth (acres) =	1.09	1.35	1.17	1.27	1.36	1.40	1.42	1.45	1.50
Maximum Volume Stored (acre-ft) =	1.858	5.494	2.941	4.368	5.643	6.249	6.588	7.019	7.846

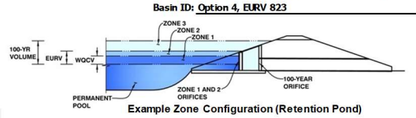
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Clear Workbook

Project: 23.1447.001 Greeley - Oklahoma Drainage MP

Basin ID: Option 4, EURV 823



Example Zone Configuration (Retention Pond)

Watershed Information

Extended Detention Basin (EDB)	EDB	
Watershed Area =	327.00	acres
Watershed Length =	4,753	ft
Watershed Length to Centroid =	2,751	ft
Watershed Slope =	0.012	ft/ft
Watershed Imperviousness =	72.98%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Run CUHP

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	7.879	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	23.271	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	16.082	acre-feet	0.85 inches
5-yr Runoff Volume (P1 = 1.12 in.) =	22.795	acre-feet	1.12 inches
10-yr Runoff Volume (P1 = 1.4 in.) =	30.462	acre-feet	1.40 inches
25-yr Runoff Volume (P1 = 1.87 in.) =	44.522	acre-feet	1.87 inches
50-yr Runoff Volume (P1 = 2.3 in.) =	57.083	acre-feet	2.30 inches
100-yr Runoff Volume (P1 = 2.79 in.) =	71.969	acre-feet	2.79 inches
500-yr Runoff Volume (P1 = 4.16 in.) =	112.726	acre-feet	4.16 inches
Approximate 2-yr Detention Volume =	14.974	acre-feet	
Approximate 5-yr Detention Volume =	21.673	acre-feet	
Approximate 10-yr Detention Volume =	26.650	acre-feet	
Approximate 25-yr Detention Volume =	33.089	acre-feet	
Approximate 50-yr Detention Volume =	37.124	acre-feet	
Approximate 100-yr Detention Volume =	43.128	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV)	7.879	acre-feet
Zone 2 Volume (EURV - Zone 1)	15.391	acre-feet
Select Zone 3 Storage Volume (Optional)		acre-feet
Total Detention Basin Volume =	23.271	acre-feet
Initial Surcharge Volume (ISV) =	578	ft³
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.003	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Initial Surcharge Area (A_{ISV}) =	1,752	ft²
Surcharge Volume Length (L_{ISV}) =	41.9	ft
Surcharge Volume Width (W_{ISV}) =	41.9	ft
Depth of Basin Floor (H_{FLOOR}) =	1.90	ft
Length of Basin Floor (L_{FLOOR}) =	682.8	ft
Width of Basin Floor (W_{FLOOR}) =	358.5	ft
Area of Basin Floor (A_{FLOOR}) =	244,790	ft²
Volume of Basin Floor (V_{FLOOR}) =	169,257	ft³
Depth of Main Basin (H_{MAIN}) =	3.27	ft
Length of Main Basin (L_{MAIN}) =	708.9	ft
Width of Main Basin (W_{MAIN}) =	384.7	ft
Area of Main Basin (A_{MAIN}) =	272,715	ft²
Volume of Main Basin (V_{MAIN}) =	845,711	ft³
Calculated Total Basin Volume (V_{total}) =	**23.334**	acre-feet

Total detention volume is less than 100-year volume.

Depth Increment = 0.50 ft

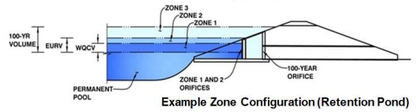
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft²)	Optional Override Area (ft²)	Area (acre)	Volume (ft³)	Volume (ac-ft)
Top of Micropool	0.00		41.9	41.9	1,752		0.040		
ISV	0.33		41.9	41.9	1,752		0.040	578	0.013
	0.50		41.9	41.9	1,752		0.040	876	0.020
	1.00		99.2	70.2	6,962		0.160	2,148	0.049
	1.50		267.9	153.5	41,122		0.944	12,998	0.298
	2.00		436.5	236.9	103,393		2.374	47,956	1.101
	2.50		605.2	320.2	193,775		4.448	121,076	2.780
Floor	2.73		682.8	358.5	244,790		5.620	171,397	3.935
	3.00		684.9	360.7	247,044		5.671	237,795	5.459
Zone 1 (WQCV)	3.43		688.4	364.1	250,653		5.754	344,799	7.915
	3.50		688.9	364.7	251,243		5.768	362,365	8.319
	4.00		692.9	368.7	255,473		5.865	489,043	11.227
	4.50		696.9	372.7	259,736		5.963	617,844	14.184
	5.00		700.9	376.7	264,030		6.061	748,784	17.190
	5.50		704.9	380.7	268,357		6.161	881,879	20.245
Zone 2 (EURV)	5.99		708.9	384.6	272,628		6.259	1,014,419	23.288
	6.00		708.9	384.7	272,715		6.261	1,017,146	23.350
	6.50		712.9	388.7	277,106		6.361	1,154,600	26.506
	7.00		716.9	392.7	281,520		6.463	1,294,257	29.712
	7.50		720.9	396.7	285,983		6.565	1,436,133	32.969
	8.00		724.9	400.7	290,469		6.668	1,580,245	36.277
	8.50		728.9	404.7	294,988		6.772	1,726,608	39.637
	9.00		732.9	408.7	299,538		6.876	1,875,238	43.050
	9.50		736.9	412.7	304,121		6.982	2,026,151	46.514
	10.00		740.9	416.7	308,735		7.088	2,179,364	50.031
	10.50		744.9	420.7	313,382		7.194	2,334,891	53.602
	11.00		748.9	424.7	318,060		7.302	2,492,750	57.226
	11.50		752.9	428.7	322,771		7.410	2,652,957	60.904
	12.00		756.9	432.7	327,513		7.519	2,815,526	64.636
	12.50		760.9	436.7	332,288		7.628	2,980,475	68.422
	13.00		764.9	440.7	337,094		7.739	3,147,819	72.264
	13.50		768.9	444.7	341,933		7.850	3,317,574	76.161
	14.00		772.9	448.7	346,803		7.962	3,489,757	80.114
	14.50		776.9	452.7	351,705		8.074	3,664,383	84.123
	15.00		780.9	456.7	356,640		8.187	3,841,468	88.188
	15.50		784.9	460.7	361,606		8.301	4,021,028	92.310
	16.00		788.9	464.7	366,605		8.416	4,203,080	96.489
	16.50		792.9	468.7	371,635		8.532	4,387,638	100.726
	17.00		796.9	472.7	376,698		8.648	4,574,720	105.021
	17.50		800.9	476.7	381,792		8.765	4,764,342	109.374
	18.00		804.9	480.7	386,919		8.882	4,956,518	113.786
	18.50		808.9	484.7	392,077		9.001	5,151,266	118.257
	19.00		812.9	488.7	397,268		9.120	5,348,601	122.787
	19.50		816.9	492.7	402,490		9.240	5,548,539	127.377
	20.00		820.9	496.7	407,745		9.361	5,751,097	132.027
	20.50		824.9	500.7	413,031		9.482	5,956,289	136.738
	21.00		828.9	504.7	418,350		9.604	6,164,133	141.509
	21.50		832.9	508.7	423,700		9.727	6,374,644	146.342
	22.00		836.9	512.7	429,083		9.850	6,587,839	151.236
	22.50		840.9	516.7	434,497		9.975	6,803,733	156.192
	23.00		844.9	520.7	439,944		10.100	7,022,342	161.211
	23.50		848.9	524.7	445,422		10.225	7,243,682	166.292
	24.00		852.9	528.7	450,933		10.352	7,467,769	171.436
	24.50		856.9	532.7	456,475		10.479	7,694,620	176.644
	25.00		860.9	536.7	462,050		10.607	7,924,250	181.916
	25.50		864.9	540.7	467,656		10.736	8,156,675	187.251
	26.00		868.9	544.7	473,295		10.865	8,391,911	192.652
	26.50		872.9	548.7	478,965		10.996	8,629,975	198.117
	27.00		876.9	552.7	484,668		11.126	8,870,882	203.647
	27.50		880.9	556.7	490,402		11.258	9,114,648	209.244
	28.00		884.9	560.7	496,169		11.390	9,361,289	214.906
	28.50		888.9	564.7	501,967		11.524	9,610,822	220.634
	29.00		892.9	568.7	507,798		11.657	9,863,262	226.429
	29.50		896.9	572.7	513,660		11.792	10,118,625	232.292
	30.00		900.9	576.7	519,555		11.927	10,376,927	238.221

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: 23.1447.001 Greeley - Oklahoma Drainage MP

Basin ID: Option 4, EURV 823



Example Zone Configuration (Retention Pond)

Clear Input Parameters (Including Tables)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type	
Zone 1 (WQCV)	3.43	7.879	Orifice Plate	Orifice Plate
Zone 2 (EURV)	5.99	15.391	Weir&Pipe (Restrict)	Weir and Pipe (w/ Restrictor Plate)
Zone 3			Not Utilized	Zone 3 Not Utilized
Total (all zones)		23.271		

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	N/A	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft²
Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	3.60	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	14.40	inches
Orifice Plate: Orifice Area per Row =	22.99	sq. inches (use rectangular openings)

Calculated Parameters for Plate

WQ Orifice Area per Row =	1.597E-01	ft²
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft²

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

Size Plate to match WQCV Drain Time

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.20	2.40					
Orifice Area (sq. inches)	22.99	22.99	22.99					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft²
Vertical Orifice Centroid =	N/A	N/A	feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.43	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	800.00	N/A	feet
Overflow Weir Grate Slope =	3.00	N/A	H:V
Horiz. Length of Weir Sides =	10.00	N/A	feet
Overflow Grate Type =	Type C Grate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 2 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	6.76	N/A	feet
Overflow Weir Slope Length =	10.54	N/A	feet
Grate Open Area / 100-yr Orifice Area =	11382.38	N/A	
Overflow Grate Open Area w/o Debris =	5869.19	N/A	ft²
Overflow Grate Open Area w/ Debris =	2934.59	N/A	ft²

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	3.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	6.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 2 Restrictor	Not Selected	
Outlet Orifice Area =	0.52	N/A	ft²
Outlet Orifice Centroid =	0.29	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.23	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	367.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Size Emergency Spillway to pass Developed 100-yr Peak Runoff Rate

Calculated Parameters for Spillway

Spillway Design Flow Depth=	0.99	feet
Stage at Top of Freeboard =	7.99	feet
Basin Area at Top of Freeboard =	6.67	acres
Basin Volume at Top of Freeboard =	36.21	acre-ft

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	7.879	23.271	16.082	22.795	30.462	44.522	57.083	71.969	112.726
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	16.082	22.795	30.462	44.522	57.083	71.969	112.726
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	2.8	28.0	80.3	215.9	314.9	444.4	766.4
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.09	0.25	0.66	0.96	1.36	2.34
Peak Inflow Q (cfs) =	N/A	N/A	237.7	333.0	440.1	680.2	868.8	1099.7	1700.2
Peak Outflow Q (cfs) =	3.3	7.3	6.7	7.2	91.4	353.5	574.2	861.5	1558.3
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.3	1.1	1.6	1.8	1.9	2.0
Structure Controlling Flow =	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	62	52	62	64	61	59	56	50
Time to Drain 99% of Inflow Volume (hours) =	**40**	66	55	66	69	68	67	65	63
Maximum Ponding Depth (ft) =	3.43	5.99	4.63	5.71	6.18	6.46	6.64	6.84	7.25
Area at Maximum Ponding Depth (acres) =	5.75	6.26	5.99	6.20	6.29	6.35	6.39	6.43	6.51
Maximum Volume Stored (acre-ft) =	7.915	23.288	14.961	21.481	24.418	26.252	27.335	28.616	31.269

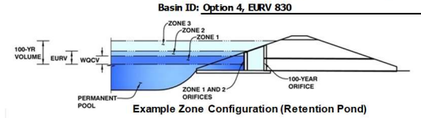
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Clear Workbook

Project: 23.1447.001 Greeley - Oklahoma Drainage MP

Basin ID: Option 4, EURV 830



Example Zone Configuration (Retention Pond)

Watershed Information

Extended Detention Basin (EDB)	EDB	
Watershed Area =	90.00	acres
Watershed Length =	2,406	ft
Watershed Length to Centroid =	1,738	ft
Watershed Slope =	0.031	ft/ft
Watershed Imperviousness =	67.80%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Run CUHP

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	1.991	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	5.915	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	4.073	acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	5.835	acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	7.895	acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	11.755	acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	15.181	acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	19.277	acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	30.442	acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	3.791	acre-feet		
Approximate 5-yr Detention Volume =	5.563	acre-feet		
Approximate 10-yr Detention Volume =	6.823	acre-feet		
Approximate 25-yr Detention Volume =	8.494	acre-feet		
Approximate 50-yr Detention Volume =	9.547	acre-feet		
Approximate 100-yr Detention Volume =	11.222	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV)	1.991	acre-feet
Zone 2 Volume (EURV - Zone 1)	3.924	acre-feet
Select Zone 3 Storage Volume (Optional)		acre-feet
Total Detention Basin Volume =	5.915	acre-feet
Initial Surcharge Volume (ISV) =	578	ft³
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.003	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Initial Surcharge Area (A_{ISV}) =	1,752	ft²
Surcharge Volume Length (L_{ISV}) =	41.9	ft
Surcharge Volume Width (W_{ISV}) =	41.9	ft
Depth of Basin Floor (H_{FLOOR}) =	0.72	ft
Length of Basin Floor (L_{FLOOR}) =	284.7	ft
Width of Basin Floor (W_{FLOOR}) =	161.9	ft
Area of Basin Floor (A_{FLOOR}) =	46,084	ft²
Volume of Basin Floor (V_{FLOOR}) =	13,637	ft³
Depth of Main Basin (H_{MAIN}) =	4.45	ft
Length of Main Basin (L_{MAIN}) =	320.3	ft
Width of Main Basin (W_{MAIN}) =	197.5	ft
Area of Main Basin (A_{MAIN}) =	63,250	ft²
Volume of Main Basin (V_{MAIN}) =	242,262	ft³
Calculated Total Basin Volume (V_{total}) =	**5.908**	acre-feet

Total detention volume is less than 100-year volume.

Depth Increment = 0.50 ft

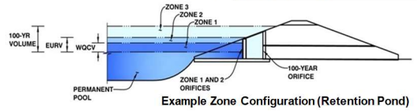
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft²)	Optional Override Area (ft²)	Area (acre)	Volume (ft³)	Volume (ac-ft)
Top of Micropool	0.00		41.9	41.9	1,752		0.040		
ISV	0.33		41.9	41.9	1,752		0.040	578	0.013
	0.50		41.9	41.9	1,752		0.040	876	0.020
	1.00		99.2	70.2	6,962		0.160	2,148	0.049
	1.50		267.9	153.5	41,122		0.944	12,998	0.298
Floor	1.55		284.7	161.9	46,084		1.058	15,177	0.348
	2.00		288.3	165.5	47,705		1.095	36,279	0.833
	2.50		292.3	169.5	49,536		1.137	60,587	1.391
	3.00		296.3	173.5	51,399		1.180	85,820	1.970
Zone 1 (WQCV)	3.02		296.5	173.6	51,474		1.182	86,848	1.994
	3.50		300.3	177.5	53,294		1.223	111,992	2.571
	4.00		304.3	181.5	55,221		1.268	139,119	3.194
	4.50		308.3	185.5	57,180		1.313	167,218	3.839
	5.00		312.3	189.5	59,171		1.358	196,305	4.507
	5.50		316.3	193.5	61,195		1.405	226,395	5.197
	6.00		320.3	197.5	63,250		1.452	257,505	5.911
Zone 2 (EURV)	6.01		320.4	197.5	63,291		1.453	258,137	5.926
	6.50		324.3	201.5	65,337		1.500	289,650	6.649
	7.00		328.3	205.5	67,456		1.549	322,047	7.412
	7.50		332.3	209.5	69,607		1.598	357,111	8.198
	8.00		336.3	213.5	71,790		1.648	392,459	9.010
	8.50		340.3	217.5	74,005		1.699	428,907	9.846
	9.00		344.3	221.5	76,253		1.751	466,470	10.709
	9.50		348.3	225.5	78,532		1.803	505,165	11.597
	10.00		352.3	229.5	80,843		1.856	545,007	12.512
	10.50		356.3	233.5	83,186		1.910	586,013	13.453
	11.00		360.3	237.5	85,561		1.964	628,198	14.421
	11.50		364.3	241.5	87,968		2.019	671,579	15.417
	12.00		368.3	245.5	90,407		2.075	716,172	16.441
	12.50		372.3	249.5	92,878		2.132	761,992	17.493
	13.00		376.3	253.5	95,382		2.190	809,056	18.573
	13.50		380.3	257.5	97,917		2.248	857,379	19.683
	14.00		384.3	261.5	100,484		2.307	906,978	20.821
	14.50		388.3	265.5	103,083		2.366	957,868	21.990
	15.00		392.3	269.5	105,714		2.427	1,010,066	23.188
	15.50		396.3	273.5	108,377		2.488	1,063,587	24.417
	16.00		400.3	277.5	111,072		2.550	1,118,448	25.676
	16.50		404.3	281.5	113,799		2.612	1,174,665	26.967
	17.00		408.3	285.5	116,559		2.676	1,232,253	28.289
	17.50		412.3	289.5	119,350		2.740	1,291,229	29.643
	18.00		416.3	293.5	122,173		2.805	1,351,608	31.029
	18.50		420.3	297.5	125,028		2.870	1,413,407	32.447
	19.00		424.3	301.5	127,915		2.937	1,476,641	33.899
	19.50		428.3	305.5	130,834		3.004	1,541,327	35.384
	20.00		432.3	309.5	133,785		3.071	1,607,481	36.903
	20.50		436.3	313.5	136,768		3.140	1,675,118	38.455
	21.00		440.3	317.5	139,784		3.209	1,744,255	40.043
	21.50		444.3	321.5	142,831		3.279	1,814,907	41.665
	22.00		448.3	325.5	145,910		3.350	1,887,091	43.322
	22.50		452.3	329.5	149,021		3.421	1,960,822	45.014
	23.00		456.3	333.5	152,164		3.493	2,036,117	46.743
	23.50		460.3	337.5	155,339		3.566	2,112,992	48.508
	24.00		464.3	341.5	158,546		3.640	2,191,462	50.309
	24.50		468.3	345.5	161,785		3.714	2,271,543	52.147
	25.00		472.3	349.5	165,057		3.789	2,353,253	54.023
	25.50		476.3	353.5	168,360		3.865	2,436,605	55.937
	26.00		480.3	357.5	171,695		3.942	2,521,618	57.888
	26.50		484.3	361.5	175,062		4.019	2,608,305	59.878
	27.00		488.3	365.5	178,461		4.097	2,696,685	61.907
	27.50		492.3	369.5	181,892		4.176	2,786,772	63.975
	28.00		496.3	373.5	185,355		4.255	2,878,583	66.083
	28.50		500.3	377.5	188,851		4.335	2,972,133	68.231
	29.00		504.3	381.5	192,378		4.416	3,067,438	70.419
	29.50		508.3	385.5	195,937		4.498	3,164,516	72.647
	30.00		512.3	389.5	199,528		4.581	3,263,381	74.917

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: 23.1447.001 Greeley - Oklahoma Drainage MP

Basin ID: Option 4, EURV 830



Example Zone Configuration (Retention Pond)

Clear Input Parameters (Including Tables)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type	
Zone 1 (WQCV)	3.02	1.991	Orifice Plate	Orifice Plate
Zone 2 (EURV)	6.01	3.924	Weir&Pipe (Restrict)	Weir and Pipe (w/ Restrictor Plate)
Zone 3			Not Utilized	Zone 3 Not Utilized
Total (all zones)		5.915		

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	N/A	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft²
Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	3.02	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	12.10	inches
Orifice Plate: Orifice Area per Row =	6.97	sq. inches (use rectangular openings)

Calculated Parameters for Plate

WQ Orifice Area per Row =	4.840E-02	ft²
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft²

Size Plate to match WQCV Drain Time

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.01	2.01					
Orifice Area (sq. inches)	6.97	6.97	6.97					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft²
Vertical Orifice Centroid =	N/A	N/A	feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.02	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	800.00	N/A	feet
Overflow Weir Grate Slope =	3.00	N/A	H:V
Horiz. Length of Weir Sides =	10.00	N/A	feet
Overflow Grate Type =	Type C Grate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 2 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	6.35	N/A	feet
Overflow Weir Slope Length =	10.54	N/A	feet
Grate Open Area / 100-yr Orifice Area =	12272.31	N/A	
Overflow Grate Open Area w/o Debris =	5869.19	N/A	ft²
Overflow Grate Open Area w/ Debris =	2934.59	N/A	ft²

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	16.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	6.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 2 Restrictor	Not Selected	
Outlet Orifice Area =	0.48	N/A	ft²
Outlet Orifice Centroid =	0.29	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.32	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.10	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	117.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Size Emergency Spillway to pass Developed 100-yr Peak Runoff Rate

Calculated Parameters for Spillway

Spillway Design Flow Depth=	0.98	feet
Stage at Top of Freeboard =	8.08	feet
Basin Area at Top of Freeboard =	1.66	acres
Basin Volume at Top of Freeboard =	9.14	acre-ft

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	1.991	5.915	4.073	5.835	7.895	11.755	15.181	19.277	30.442
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	4.073	5.835	7.895	11.755	15.181	19.277	30.442
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	1.0	10.6	29.5	76.5	111.1	155.2	266.0
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.12	0.33	0.85	1.23	1.72	2.96
Peak Inflow Q (cfs) =	N/A	N/A	72.5	103.5	139.7	214.5	275.9	352.0	546.5
Peak Outflow Q (cfs) =	1.0	6.6	5.8	6.3	21.4	114.7	194.4	298.5	552.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.6	0.7	1.5	1.7	1.9	2.1
Structure Controlling Flow =	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	42	41	43	43	40	37	34	27
Time to Drain 99% of Inflow Volume (hours) =	**40**	46	44	47	48	47	46	44	41
Maximum Ponding Depth (ft) =	3.02	6.01	4.10	5.33	6.22	6.55	6.75	6.97	7.41
Area at Maximum Ponding Depth (acres) =	1.18	1.45	1.28	1.39	1.47	1.50	1.52	1.54	1.59
Maximum Volume Stored (acre-ft) =	1.994	5.926	3.308	4.946	6.233	6.725	7.027	7.350	8.055

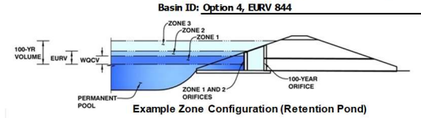
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Clear Workbook

Project: 23.1447.001 Greeley - Oklahoma Drainage MP

Basin ID: Option 4, EURV 844



Example Zone Configuration (Retention Pond)

Watershed Information

Extended Detention Basin (EDB)	EDB	
Watershed Area =	126.50	acres
Watershed Length =	2,939	ft
Watershed Length to Centroid =	1,428	ft
Watershed Slope =	0.031	ft/ft
Watershed Imperviousness =	76.20%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Run CUHP

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	3.226 acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	9.432 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	6.396 acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	9.013 acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	11.961 acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	17.299 acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	22.084 acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	27.727 acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	43.218 acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	6.083 acre-feet		
Approximate 5-yr Detention Volume =	8.736 acre-feet		
Approximate 10-yr Detention Volume =	10.760 acre-feet		
Approximate 25-yr Detention Volume =	13.343 acre-feet		
Approximate 50-yr Detention Volume =	14.954 acre-feet		
Approximate 100-yr Detention Volume =	17.253 acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV)	3.226	acre-feet
Zone 2 Volume (EURV - Zone 1)	6.206	acre-feet
Select Zone 3 Storage Volume (Optional)		acre-feet
Total Detention Basin Volume =	9.432	acre-feet
Initial Surcharge Volume (ISV) =	578	ft³
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.003	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Initial Surcharge Area (A_{ISV}) =	1,752	ft²
Surcharge Volume Length (L_{ISV}) =	41.9	ft
Surcharge Volume Width (W_{ISV}) =	41.9	ft
Depth of Basin Floor (H_{FLOOR}) =	1.01	ft
Length of Basin Floor (L_{FLOOR}) =	382.6	ft
Width of Basin Floor (W_{FLOOR}) =	210.2	ft
Area of Basin Floor (A_{FLOOR}) =	80,408	ft²
Volume of Basin Floor (V_{FLOOR}) =	31,656	ft³
Depth of Main Basin (H_{MAIN}) =	4.16	ft
Length of Main Basin (L_{MAIN}) =	415.8	ft
Width of Main Basin (W_{MAIN}) =	243.5	ft
Area of Main Basin (A_{MAIN}) =	101,242	ft²
Volume of Main Basin (V_{MAIN}) =	377,000	ft³
Calculated Total Basin Volume (V_{total}) =	**9.415**	acre-feet

Depth Increment = 0.50 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft²)	Optional Override Area (ft²)	Area (acre)	Volume (ft³)	Volume (ac-ft)
Top of Micropool	0.00		41.9	41.9	1,752		0.040		
ISV	0.33		41.9	41.9	1,752		0.040	578	0.013
	0.50		41.9	41.9	1,752		0.040	876	0.020
	1.00		99.2	70.2	6,962		0.160	2,148	0.049
	1.50		267.9	153.5	41,122		0.944	12,998	0.298
Floor	1.84		382.6	210.2	80,408		1.846	33,290	0.764
	2.00		383.8	211.5	81,168		1.863	46,216	1.061
	2.50		387.8	215.5	83,565		1.918	87,398	2.006
	3.00		391.8	219.5	85,994		1.974	129,786	2.979
Zone 1 (WQCV)	3.13		392.9	220.5	86,631		1.989	141,007	3.237
	3.50		395.8	223.5	88,456		2.031	173,398	3.981
	4.00		399.8	227.5	90,949		2.088	218,247	5.010
	4.50		403.8	231.5	93,474		2.146	264,352	6.069
	5.00		407.8	235.5	96,031		2.205	311,727	7.156
	5.50		411.8	239.5	98,621		2.264	360,388	8.273
	6.00		415.8	243.5	101,242		2.324	410,353	9.420
Zone 2 (EURV)	6.01		415.9	243.5	101,294		2.325	411,365	9.444
	6.50		419.8	247.5	103,895		2.385	461,636	10.598
	7.00		423.0	251.5	106,500		2.447	514,253	11.806
	7.50		427.8	255.5	109,297		2.509	568,221	13.045
	8.00		431.8	259.5	112,047		2.572	623,556	14.315
	8.50		435.8	263.5	114,828		2.636	680,273	15.617
	9.00		439.8	267.5	117,641		2.701	738,389	16.951
	9.50		443.8	271.5	120,486		2.766	797,919	18.318
	10.00		447.8	275.5	123,363		2.832	858,880	19.717
	10.50		451.8	279.5	126,273		2.899	921,288	21.150
	11.00		455.8	283.5	129,214		2.966	985,158	22.616
	11.50		459.8	287.5	132,187		3.035	1,050,507	24.116
	12.00		463.8	291.5	135,192		3.104	1,117,350	25.651
	12.50		467.8	295.5	138,229		3.173	1,185,705	27.220
	13.00		471.8	299.5	141,299		3.244	1,255,585	28.824
	13.50		475.8	303.5	144,400		3.315	1,327,009	30.464
	14.00		479.8	307.5	147,533		3.387	1,399,990	32.139
	14.50		483.8	311.5	150,698		3.460	1,474,547	33.851
	15.00		487.8	315.5	153,895		3.533	1,550,694	35.599
	15.50		491.8	319.5	157,125		3.607	1,628,448	37.384
	16.00		495.8	323.5	160,386		3.682	1,707,824	39.206
	16.50		499.8	327.5	163,679		3.758	1,788,839	41.066
	17.00		503.8	331.5	167,004		3.834	1,871,508	42.964
	17.50		507.8	335.5	170,362		3.911	1,955,849	44.900
	18.00		511.8	339.5	173,751		3.989	2,041,875	46.875
	18.50		515.8	343.5	177,172		4.067	2,129,605	48.889
	19.00		519.8	347.5	180,625		4.147	2,219,053	50.942
	19.50		523.8	351.5	184,110		4.227	2,310,235	53.036
	20.00		527.8	355.5	187,628		4.307	2,403,168	55.169
	20.50		531.8	359.5	191,177		4.389	2,497,868	57.343
	21.00		535.8	363.5	194,758		4.471	2,594,350	59.558
	21.50		539.8	367.5	198,371		4.554	2,692,631	61.814
	22.00		543.8	371.5	202,016		4.638	2,792,727	64.112
	22.50		547.8	375.5	205,694		4.722	2,894,653	66.452
	23.00		551.8	379.5	209,403		4.807	2,998,426	68.834
	23.50		555.8	383.5	213,144		4.893	3,104,061	71.259
	24.00		559.8	387.5	216,917		4.980	3,211,575	73.728
	24.50		563.8	391.5	220,722		5.067	3,320,984	76.239
	25.00		567.8	395.5	224,560		5.155	3,432,303	78.795
	25.50		571.8	399.5	228,429		5.244	3,545,549	81.395
	26.00		575.8	403.5	232,330		5.334	3,660,737	84.039
	26.50		579.8	407.5	236,263		5.424	3,777,884	86.728
	27.00		583.8	411.5	240,228		5.515	3,897,006	89.463
	27.50		587.8	415.5	244,226		5.607	4,018,118	92.243
	28.00		591.8	419.5	248,255		5.699	4,141,237	95.070
	28.50		595.8	423.5	252,316		5.792	4,266,378	97.943
	29.00		599.8	427.5	256,409		5.886	4,393,558	100.862
	29.50		603.8	431.5	260,535		5.981	4,522,793	103.829
	30.00		607.8	435.5	264,692		6.076	4,654,098	106.843

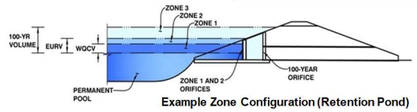
Total detention volume is less than 100-year volume.

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: 23.1447.001 Greeley - Oklahoma Drainage MP

Basin ID: Option 4, EURV 844



Example Zone Configuration (Retention Pond)

Clear Input Parameters (Including Tables)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type	
Zone 1 (WQCV)	3.13	3.226	Orifice Plate	Orifice Plate
Zone 2 (EURV)	6.01	6.206	Weir&Pipe (Restrict)	Weir and Pipe (w/ Restrictor Plate)
Zone 3			Not Utilized	Zone 3 Not Utilized
Total (all zones)		9.432		

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	N/A	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft²
Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	3.63	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	14.50	inches
Orifice Plate: Orifice Area per Row =	11.60	sq. inches (use rectangular openings)

Calculated Parameters for Plate

WQ Orifice Area per Row =	8.056E-02	ft²
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft²

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

Size Plate to match WQCV Drain Time

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.21	2.42					
Orifice Area (sq. inches)	11.60	11.60	11.60					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft²
Vertical Orifice Centroid =	N/A	N/A	feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.13	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	800.00	N/A	feet
Overflow Weir Grate Slope =	3.00	N/A	H:V
Horiz. Length of Weir Sides =	10.00	N/A	feet
Overflow Grate Type =	Type C Grate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 2 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	6.46	N/A	feet
Overflow Weir Slope Length =	10.54	N/A	feet
Grate Open Area / 100-yr Orifice Area =	11382.38	N/A	
Overflow Grate Open Area w/o Debris =	5869.19	N/A	ft²
Overflow Grate Open Area w/ Debris =	2934.59	N/A	ft²

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	3.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	6.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 2 Restrictor	Not Selected	
Outlet Orifice Area =	0.52	N/A	ft²
Outlet Orifice Centroid =	0.29	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.23	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.10	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	183.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Size Emergency Spillway to pass Developed 100-yr Peak Runoff Rate

Calculated Parameters for Spillway

Spillway Design Flow Depth=	0.98	feet
Stage at Top of Freeboard =	8.08	feet
Basin Area at Top of Freeboard =	2.58	acres
Basin Volume at Top of Freeboard =	14.52	acre-ft

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	3.226	9.432	6.396	9.013	11.961	17.299	22.084	27.727	43.218
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	6.396	9.013	11.961	17.299	22.084	27.727	43.218
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	1.6	16.9	46.2	119.1	172.4	241.0	412.1
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.13	0.36	0.94	1.36	1.90	3.26
Peak Inflow Q (cfs) =	N/A	N/A	126.7	175.8	229.8	339.1	430.4	547.8	840.3
Peak Outflow Q (cfs) =	1.5	7.3	6.5	7.1	28.9	156.4	272.4	435.5	823.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.4	0.6	1.3	1.6	1.8	2.0
Structure Controlling Flow =	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	46	43	46	47	45	42	40	34
Time to Drain 99% of Inflow Volume (hours) =	**40**	50	46	50	52	51	50	49	46
Maximum Ponding Depth (ft) =	3.13	6.01	4.25	5.38	6.21	6.52	6.71	6.94	7.38
Area at Maximum Ponding Depth (acres) =	1.99	2.33	2.12	2.25	2.35	2.39	2.41	2.44	2.49
Maximum Volume Stored (acre-ft) =	3.237	9.444	5.515	7.980	9.911	10.622	11.101	11.635	12.744

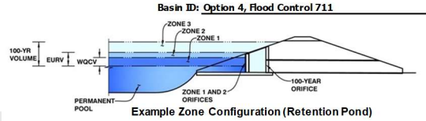
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Clear Workbook

Project: 23.1447.001 Greeley - Oklahoma Drainage MP

Basin ID: Option 4, Flood Control 711



Example Zone Configuration (Retention Pond)

Watershed Information — **Flood Control Only**

Flood Control Only	**No BMP**	
Watershed Area =	90.00	acres
Watershed Length =	3,900	ft
Watershed Length to Centroid =	1,738	ft
Watershed Slope =	0.031	ft/ft
Watershed Imperviousness =	30.20%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	N/A	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Run CUHP

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	1.141	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	2.470	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	1.598	acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	2.810	acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	4.602	acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	8.506	acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	11.792	acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	15.995	acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	27.074	acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	1.515	acre-feet		
Approximate 5-yr Detention Volume =	2.643	acre-feet		
Approximate 10-yr Detention Volume =	3.285	acre-feet		
Approximate 25-yr Detention Volume =	4.314	acre-feet		
Approximate 50-yr Detention Volume =	4.931	acre-feet		
Approximate 100-yr Detention Volume =	6.534	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (100-year)	6.534	acre-feet
Select Zone 2 Storage Volume (Optional)		acre-feet
Select Zone 3 Storage Volume (Optional)		acre-feet
Total Detention Basin Volume =	6.534	acre-feet
Initial Surcharge Volume (ISV) =	N/A	ft^3
Initial Surcharge Depth (ISD) =	N/A	ft
Total Available Detention Depth (H_{total}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.003	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Initial Surcharge Area (A_{ISV}) =	0	ft^2
Surcharge Volume Length (L_{ISV}) =	0.0	ft
Surcharge Volume Width (W_{ISV}) =	0.0	ft
Depth of Basin Floor (H_{FLOOR}) =	0.00	ft
Length of Basin Floor (L_{FLOOR}) =	271.7	ft
Width of Basin Floor (W_{FLOOR}) =	135.9	ft
Area of Basin Floor (A_{FLOOR}) =	36,922	ft^2
Volume of Basin Floor (V_{FLOOR}) =	0	ft^3
Depth of Main Basin (H_{MAIN}) =	6.00	ft
Length of Main Basin (L_{MAIN}) =	319.7	ft
Width of Main Basin (W_{MAIN}) =	183.9	ft
Area of Main Basin (A_{MAIN}) =	58,791	ft^2
Volume of Main Basin (V_{MAIN}) =	284,607	ft^3
Calculated Total Basin Volume (V_{total}) =	**6.534**	acre-feet

Depth Increment = 0.50 ft

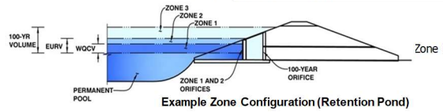
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Media Surface	0.00		271.7	135.9	36,922		0.848		
	0.50		275.7	139.9	38,568		0.885	18,871	0.433
	1.00		279.7	143.9	40,247		0.924	38,574	0.886
	1.50		283.7	147.9	41,957		0.963	59,123	1.357
	2.00		287.7	151.9	43,700		1.003	80,536	1.849
	2.50		291.7	155.9	45,474		1.044	102,828	2.361
	3.00		295.7	159.9	47,280		1.085	126,015	2.893
	3.50		299.7	163.9	49,119		1.128	150,114	3.446
	4.00		303.7	167.9	50,989		1.171	175,139	4.021
	4.50		307.7	171.9	52,892		1.214	201,108	4.617
	5.00		311.7	175.9	54,826		1.259	228,036	5.235
	5.50		315.7	179.9	56,793		1.304	255,940	5.876
Zone 1 (100-year)	6.00		319.7	183.9	58,791		1.350	284,834	6.539
	6.50		323.7	187.9	60,822		1.396	314,736	7.225
	7.00		327.7	191.9	62,884		1.444	345,661	7.935
	7.50		331.7	195.9	64,978		1.492	377,626	8.669
	8.00		335.7	199.9	67,105		1.541	410,645	9.427
	8.50		339.7	203.9	69,263		1.590	444,736	10.210
	9.00		343.7	207.9	71,454		1.640	479,914	11.017
	9.50		347.7	211.9	73,676		1.691	516,195	11.850
	10.00		351.7	215.9	75,931		1.743	553,595	12.709
	10.50		355.7	219.9	78,217		1.796	592,131	13.593
	11.00		359.7	223.9	80,536		1.849	631,818	14.505
	11.50		363.7	227.9	82,886		1.903	672,672	15.442
	12.00		367.7	231.9	85,268		1.957	714,709	16.407
	12.50		371.7	235.9	87,683		2.013	757,946	17.400
	13.00		375.7	239.9	90,129		2.069	802,398	18.421
	13.50		379.7	243.9	92,608		2.126	848,081	19.469
	14.00		383.7	247.9	95,118		2.184	895,011	20.547
	14.50		387.7	251.9	97,661		2.242	943,204	21.653
	15.00		391.7	255.9	100,235		2.301	992,677	22.789
	15.50		395.7	259.9	102,842		2.361	1,043,445	23.954
	16.00		399.7	263.9	105,480		2.421	1,095,524	25.150
	16.50		403.7	267.9	108,151		2.483	1,148,930	26.376
	17.00		407.7	271.9	110,853		2.545	1,203,680	27.633
	17.50		411.7	275.9	113,587		2.608	1,259,788	28.921
	18.00		415.7	279.9	116,354		2.671	1,317,272	30.240
	18.50		419.7	283.9	119,152		2.735	1,376,148	31.592
	19.00		423.7	287.9	121,983		2.800	1,436,430	32.976
	19.50		427.7	291.9	124,845		2.866	1,498,136	34.392
	20.00		431.7	295.9	127,740		2.932	1,561,281	35.842
	20.50		435.7	299.9	130,666		3.000	1,625,881	37.325
	21.00		439.7	303.9	133,625		3.068	1,691,952	38.842
	21.50		443.7	307.9	136,615		3.136	1,759,511	40.393
	22.00		447.7	311.9	139,637		3.206	1,828,573	41.978
	22.50		451.7	315.9	142,692		3.276	1,899,154	43.599
	23.00		455.7	319.9	145,778		3.347	1,971,270	45.254
	23.50		459.7	323.9	148,897		3.418	2,044,937	46.945
	24.00		463.7	327.9	152,047		3.491	2,120,172	48.672
	24.50		467.7	331.9	155,230		3.564	2,196,990	50.436
	25.00		471.7	335.9	158,444		3.637	2,275,407	52.236
	25.50		475.7	339.9	161,691		3.712	2,355,439	54.073
	26.00		479.7	343.9	164,969		3.787	2,437,103	55.948
	26.50		483.7	347.9	168,280		3.863	2,520,414	57.861
	27.00		487.7	351.9	171,622		3.940	2,605,388	59.811
	27.50		491.7	355.9	174,996		4.017	2,692,041	61.801
	28.00		495.7	359.9	178,403		4.096	2,780,390	63.829
	28.50		499.7	363.9	181,841		4.175	2,870,449	65.896
	29.00		503.7	367.9	185,312		4.254	2,962,236	68.004
	29.50		507.7	371.9	188,814		4.335	3,055,766	70.151
	30.00		511.7	375.9	192,349		4.416	3,151,056	72.338

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: 23.1447.001 Greeley - Oklahoma Drainage MP

Basin ID: Option 4, Flood Control 711



Example Zone Configuration (Retention Pond)

Clear Input Parameters (Including Tables)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type	
Zone 1 (100-year)	6.00	6.534	Rectangular Orifice	Vertical Orifice (Rectangular)
Zone 2				Select Zone 2 Outlet Type
Zone 3				Select Zone 3 Outlet Type
Total (all zones)		6.534		

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	N/A	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	N/A	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (optional)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 1 Rectangular	Not Selected		Calculated Parameters for Vertical Orifice	Zone 1 Rectangular	Not Selected	
Invert of Vertical Orifice =	0.00		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	30.00		ft^2
Depth at top of Zone using Vertical Orifice =	6.00		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	2.50		feet
Vertical Orifice Height =	60.00		inches				
Vertical Orifice Width =	72.00		inches				

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Not Selected	Not Selected		Calculated Parameters for Overflow Weir	Not Selected	Not Selected	
Overflow Weir Front Edge Height, Ho =			ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =			feet
Overflow Weir Front Edge Length =			feet	Overflow Weir Slope Length =			feet
Overflow Weir Grate Slope =			H:V	Grate Open Area / 100-yr Orifice Area =			
Horiz. Length of Weir Sides =			feet	Overflow Grate Open Area w/o Debris =			ft^2
Overflow Grate Type =	Select Grate Type	Select Grate Type		Overflow Grate Open Area w/ Debris =			ft^2
Debris Clogging % =			%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Not Selected	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =			ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =			ft^2
Circular Orifice Diameter =			inches	Outlet Orifice Centroid =			feet
				Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway	
Spillway Invert Stage=		ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	feet
Spillway Crest Length =		feet	Stage at Top of Freeboard =	feet
Spillway End Slopes =		H:V	Basin Area at Top of Freeboard =	acres
Freeboard above Max Water Surface =		feet	Basin Volume at Top of Freeboard =	acre-ft

Size Emergency Spillway to pass Developed 100-yr Peak Runoff Rate

Routed Hydrograph Results — *The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).*

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	1.141	2.470	1.598	2.810	4.602	8.506	11.792	15.995	27.074
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.598	2.810	4.602	8.506	11.792	16.052	27.074
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.8	8.6	24.1	64.2	93.3	131.2	225.3
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.10	0.27	0.71	1.04	1.46	2.50
Peak Inflow Q (cfs) =	N/A	N/A	16.2	29.4	48.3	95.8	131.0	172.2	291.6
Peak Outflow Q (cfs) =	17.5	60.7	8.1	17.0	30.7	69.9	100.5	138.0	241.4
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	2.0	1.3	1.1	1.1	1.1	1.1
Structure Controlling Flow =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	ertical Orifice
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	14	8	12	8	6	5	4	4	3
Time to Drain 99% of Inflow Volume (hours) =	**34**	19	27	18	13	9	7	7	5
Maximum Ponding Depth (ft) =	1.28	2.61	0.79	1.19	1.65	2.60	3.18	3.78	5.29
Area at Maximum Ponding Depth (acres) =	0.95	1.05	0.91	0.94	0.98	1.05	1.10	1.15	1.28
Maximum Volume Stored (acre-ft) =	1.147	2.476	0.693	1.053	1.503	2.455	3.079	3.765	5.604

R:\23.1447.001 Greeley - Oklahoma Drainage MP\200 Design\220 Drainage-WR\225 Calculations\Alternatives

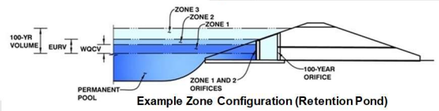
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Clear Workbook

Project: 23.1447.001 Greeley - Oklahoma Drainage MP

Basin ID: Option 4, Flood Control 823



Example Zone Configuration (Retention Pond)

Watershed Information — **Flood Control Only**

Flood Control Only	**No BMP**	
Watershed Area =	327.00	acres
Watershed Length =	4,753	ft
Watershed Length to Centroid =	2,751	ft
Watershed Slope =	0.012	ft/ft
Watershed Imperviousness =	72.98%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	N/A	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Run CUHP

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	7.879	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	23.271	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	16.082	acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	22.795	acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	30.462	acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	44.522	acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	57.083	acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	71.969	acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	112.726	acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	14.974	acre-feet		
Approximate 5-yr Detention Volume =	21.673	acre-feet		
Approximate 10-yr Detention Volume =	26.650	acre-feet		
Approximate 25-yr Detention Volume =	33.089	acre-feet		
Approximate 50-yr Detention Volume =	37.124	acre-feet		
Approximate 100-yr Detention Volume =	43.128	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (100-year)	43.128	acre-feet
Select Zone 2 Storage Volume (Optional)		acre-feet
Select Zone 3 Storage Volume (Optional)		acre-feet
Total Detention Basin Volume =	43.128	acre-feet
Initial Surcharge Volume (ISV) =	N/A	ft^3
Initial Surcharge Depth (ISD) =	N/A	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

Depth Increment = 0.50 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Media Surface	--	0.00	--	--	--	37,664	0.865		
	--	1.00	--	--	--	77,436	1.778	57,550	1.321
	--	2.00	--	--	--	133,078	3.055	162,807	3.738
	--	3.00	--	--	--	163,864	3.762	311,278	7.146
	--	4.00	--	--	--	190,605	4.376	488,512	11.215
	--	5.00	--	--	--	190,605	4.376	679,117	15.590
	--	6.00	--	--	--	190,605	4.376	869,722	19.966
	--	7.00	--	--	--	190,605	4.376	1,060,327	24.342
	--	8.00	--	--	--	190,605	4.376	1,250,932	28.717
	--	8.49	--	--	--	190,605	4.376	1,344,329	30.862
	--	9.00	--	--	--	190,605	4.376	1,441,537	33.093
	--	10.00	--	--	--	190,605	4.376	1,632,142	37.469
	--		--	--	--				
	--		--	--	--				
	--		--	--	--			

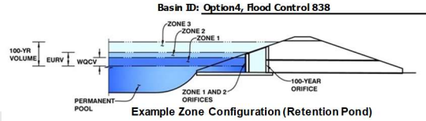
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Clear Workbook

Project: 23.1447.001 Greeley - Oklahoma Drainage MP

Basin ID: Option4, Flood Control 838



Example Zone Configuration (Retention Pond)

Watershed Information — Flood Control Only

Flood Control Only	**No BMP**	
Watershed Area =	126.50	acres
Watershed Length =	2,939	ft
Watershed Length to Centroid =	1,428	ft
Watershed Slope =	0.031	ft/ft
Watershed Imperviousness =	76.20%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	N/A	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Run CUHP

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	3.226	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	9.432	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	6.396	acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	9.013	acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	11.961	acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	17.299	acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	22.084	acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	27.727	acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	43.218	acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	6.083	acre-feet		
Approximate 5-yr Detention Volume =	8.736	acre-feet		
Approximate 10-yr Detention Volume =	10.760	acre-feet		
Approximate 25-yr Detention Volume =	13.343	acre-feet		
Approximate 50-yr Detention Volume =	14.954	acre-feet		
Approximate 100-yr Detention Volume =	17.253	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (100-year)	17.253	acre-feet
Select Zone 2 Storage Volume (Optional)		acre-feet
Select Zone 3 Storage Volume (Optional)		acre-feet
Total Detention Basin Volume =	17.253	acre-feet
Initial Surcharge Volume (ISV) =	N/A	ft^3
Initial Surcharge Depth (ISD) =	N/A	ft
Total Available Detention Depth (H_{total}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.003	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	
Initial Surcharge Area (A_{ISV}) =	0	ft^2
Surcharge Volume Length (L_{ISV}) =	0.0	ft
Surcharge Volume Width (W_{ISV}) =	0.0	ft
Depth of Basin Floor (H_{FLOOR}) =	0.00	ft
Length of Basin Floor (L_{FLOOR}) =	464.4	ft
Width of Basin Floor (W_{FLOOR}) =	232.2	ft
Area of Basin Floor (A_{FLOOR}) =	107,813	ft^2
Volume of Basin Floor (V_{FLOOR}) =	0	ft^3
Depth of Main Basin (H_{MAIN}) =	6.00	ft
Length of Main Basin (L_{MAIN}) =	512.4	ft
Width of Main Basin (W_{MAIN}) =	280.2	ft
Area of Main Basin (A_{MAIN}) =	143,551	ft^2
Volume of Main Basin (V_{MAIN}) =	751,538	ft^3
Calculated Total Basin Volume (V_{total}) =	**17.253**	acre-feet

Depth Increment = 0.50 ft

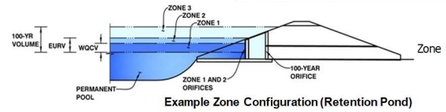
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Media Surface	0.00		464.4	232.2	107,813		2.475		
	0.50		468.4	236.2	110,615		2.539	54,606	1.254
	1.00		472.4	240.2	113,449		2.604	110,621	2.539
	1.50		476.4	244.2	116,315		2.670	168,060	3.858
	2.00		480.4	248.2	119,214		2.737	226,941	5.210
	2.50		484.4	252.2	122,144		2.804	287,279	6.595
	3.00		488.4	256.2	125,106		2.872	349,090	8.014
	3.50		492.4	260.2	128,100		2.941	412,391	9.467
	4.00		496.4	264.2	131,126		3.010	477,196	10.955
	4.50		500.4	268.2	134,184		3.080	543,522	12.478
	5.00		504.4	272.2	137,274		3.151	611,385	14.035
	5.50		508.4	276.2	140,397		3.223	680,802	15.629
Zone 1 (100-year)	6.00		512.4	280.2	143,551		3.295	751,787	17.259
	6.50		516.4	284.2	146,737		3.369	824,358	18.925
	7.00		520.4	288.2	149,955		3.442	898,529	20.627
	7.50		524.4	292.2	153,205		3.517	974,318	22.367
	8.00		528.4	296.2	156,487		3.592	1,051,740	24.145
	8.50		532.4	300.2	159,801		3.669	1,130,811	25.960
	9.00		536.4	304.2	163,147		3.745	1,211,546	27.813
	9.50		540.4	308.2	166,526		3.823	1,293,963	29.705
	10.00		544.4	312.2	169,936		3.901	1,378,077	31.636
	10.50		548.4	316.2	173,378		3.980	1,463,904	33.607
	11.00		552.4	320.2	176,852		4.060	1,551,461	35.617
	11.50		556.4	324.2	180,358		4.140	1,640,762	37.667
	12.00		560.4	328.2	183,896		4.222	1,731,824	39.757
	12.50		564.4	332.2	187,466		4.304	1,824,663	41.889
	13.00		568.4	336.2	191,069		4.386	1,919,296	44.061
	13.50		572.4	340.2	194,703		4.470	2,015,737	46.275
	14.00		576.4	344.2	198,369		4.554	2,114,004	48.531
	14.50		580.4	348.2	202,067		4.639	2,214,111	50.829
	15.00		584.4	352.2	205,797		4.724	2,316,076	53.170
	15.50		588.4	356.2	209,559		4.811	2,419,914	55.554
	16.00		592.4	360.2	213,353		4.898	2,525,641	57.981
	16.50		596.4	364.2	217,179		4.986	2,633,272	60.452
	17.00		600.4	368.2	221,038		5.074	2,742,825	62.967
	17.50		604.4	372.2	224,928		5.164	2,854,315	65.526
	18.00		608.4	376.2	228,850		5.254	2,967,758	68.130
	18.50		612.4	380.2	232,804		5.344	3,083,171	70.780
	19.00		616.4	384.2	236,790		5.436	3,200,568	73.475
	19.50		620.4	388.2	240,808		5.528	3,319,966	76.216
	20.00		624.4	392.2	244,858		5.621	3,441,381	79.003
	20.50		628.4	396.2	248,941		5.715	3,564,830	81.837
	21.00		632.4	400.2	253,055		5.809	3,690,327	84.718
	21.50		636.4	404.2	257,201		5.905	3,817,890	87.647
	22.00		640.4	408.2	261,379		6.000	3,947,533	90.623
	22.50		644.4	412.2	265,589		6.097	4,079,274	93.647
	23.00		648.4	416.2	269,831		6.194	4,213,128	96.720
	23.50		652.4	420.2	274,105		6.293	4,349,111	99.842
	24.00		656.4	424.2	278,411		6.391	4,487,238	103.013
	24.50		660.4	428.2	282,750		6.491	4,627,527	106.233
	25.00		664.4	432.2	287,120		6.591	4,769,993	109.504
	25.50		668.4	436.2	291,522		6.692	4,914,652	112.825
	26.00		672.4	440.2	295,956		6.794	5,061,521	116.197
	26.50		676.4	444.2	300,422		6.897	5,210,614	119.619
	27.00		680.4	448.2	304,920		7.000	5,361,948	123.093
	27.50		684.4	452.2	309,450		7.104	5,515,539	126.619
	28.00		688.4	456.2	314,013		7.209	5,671,404	130.198
	28.50		692.4	460.2	318,607		7.314	5,829,557	133.828
	29.00		696.4	464.2	323,233		7.420	5,990,016	137.512
	29.50		700.4	468.2	327,891		7.527	6,152,795	141.249
	30.00		704.4	472.2	332,581		7.635	6,317,912	145.039

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: 23.1447.001 Greeley - Oklahoma Drainage MP

Basin ID: Option4, Flood Control 838



Example Zone Configuration (Retention Pond)

Clear Input Parameters (Including Tables)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type	
Zone 1 (100-year)	6.00	17.253	Rectangular Orifice	Vertical Orifice (Rectangular)
Zone 2				Select Zone 2 Outlet Type
Zone 3				Select Zone 3 Outlet Type
Total (all zones)		17.253		

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	N/A	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	N/A	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (optional)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 1 Rectangular	Not Selected		Calculated Parameters for Vertical Orifice	Zone 1 Rectangular	Not Selected	
Invert of Vertical Orifice =	0.00		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	29.17		ft^2
Depth at top of Zone using Vertical Orifice =	6.00		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	2.50		feet
Vertical Orifice Height =	60.00		inches				
Vertical Orifice Width =	70.00		inches				

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Not Selected	Not Selected		Calculated Parameters for Overflow Weir	Not Selected	Not Selected	
Overflow Weir Front Edge Height, Ho =	0.00		ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =			feet
Overflow Weir Front Edge Length =			feet	Overflow Weir Slope Length =			feet
Overflow Weir Grate Slope =			H:V	Grate Open Area / 100-yr Orifice Area =			
Horiz. Length of Weir Sides =			feet	Overflow Grate Open Area w/o Debris =			ft^2
Overflow Grate Type =	Select Grate Type	Select Grate Type		Overflow Grate Open Area w/ Debris =			ft^2
Debris Clogging % =			%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Not Selected	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =			ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =			ft^2
Circular Orifice Diameter =			inches	Outlet Orifice Centroid =			feet
				Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway	
Spillway Invert Stage=		ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	feet
Spillway Crest Length =		feet	Stage at Top of Freeboard =	feet
Spillway End Slopes =		H:V	Basin Area at Top of Freeboard =	acres
Freeboard above Max Water Surface =		feet	Basin Volume at Top of Freeboard =	acre-ft

Size Emergency Spillway to pass Developed 100-yr Peak Runoff Rate

Routed Hydrograph Results — *The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).*

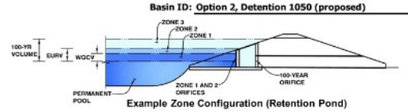
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	3.226	9.432	6.396	9.013	11.961	17.299	22.084	27.727	43.218
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	6.396	9.013	11.961	17.299	22.084	49.811	43.218
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	1.6	16.9	46.2	119.1	172.4	241.0	412.1
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.13	0.36	0.94	1.36	1.90	3.26
Peak Inflow Q (cfs) =	N/A	N/A	126.7	175.8	229.8	339.1	430.4	511.0	840.3
Peak Outflow Q (cfs) =	17.8	108.2	25.5	41.5	60.6	116.5	161.5	293.9	308.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	2.5	1.3	1.0	0.9	1.2	0.7
Structure Controlling Flow =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	ertical Orifice
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	41	18	24	19	15	12	10	8	7
Time to Drain 99% of Inflow Volume (hours) =	**100**	44	59	45	36	27	23	15	14
Maximum Ponding Depth (ft) =	1.27	3.49	1.51	1.98	2.44	3.50	4.19	6.88	7.34
Area at Maximum Ponding Depth (acres) =	2.64	2.94	2.67	2.73	2.80	2.94	3.04	3.42	3.49
Maximum Volume Stored (acre-ft) =	3.247	9.438	3.885	5.155	6.427	9.467	11.529	20.181	21.772

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley - Oklahoma Master Basin Study

Basin ID: Option 2, Detention 1050 (proposed)



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	No BMP	
Watershed Area =	1500.00	acres
Watershed Length =	11,400	ft
Watershed Length to Centroid =	5,700	ft
Watershed Slope =	0.011	ft/ft
Watershed Imperviousness =	36.36%	percent
Percentage Hydrologic Soil Group A =	7.0%	percent
Percentage Hydrologic Soil Group B =	39.5%	percent
Percentage Hydrologic Soil Groups C/D =	53.5%	percent
Target WQCV Drain Time =	N/A	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Flood Control Only

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	21.253	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	53.386	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.86 in.) =	32.894	acre-feet	0.86	inches
5-yr Runoff Volume (P1 = 1.13 in.) =	50.479	acre-feet	1.13	inches
10-yr Runoff Volume (P1 = 1.41 in.) =	77.736	acre-feet	1.41	inches
25-yr Runoff Volume (P1 = 1.86 in.) =	140.322	acre-feet	1.86	inches
50-yr Runoff Volume (P1 = 2.27 in.) =	191.323	acre-feet	2.27	inches
100-yr Runoff Volume (P1 = 2.73 in.) =	256.581	acre-feet	2.73	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	310.388	acre-feet	3.14	inches
Approximate 2-yr Detention Volume =	30.489	acre-feet		
Approximate 5-yr Detention Volume =	48.016	acre-feet		
Approximate 10-yr Detention Volume =	63.914	acre-feet		
Approximate 25-yr Detention Volume =	82.930	acre-feet		
Approximate 50-yr Detention Volume =	94.621	acre-feet		
Approximate 100-yr Detention Volume =	119.626	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (100-year) =	119.626	acre-feet
Select Zone 2 Storage Volume (Optional) =		acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	119.626	acre-feet
Initial Surcharge Volume (ISV) =	N/A	ft^3
Initial Surcharge Depth (ISD) =	N/A	ft
Total Available Detention Depth (H_{total}) =	8.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.003	ft/ft
Slopes of Main Basin Sides (S_{main}) =	3	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Initial Surcharge Area (A_{ISV}) =	0	ft^2
Surcharge Volume Length (L_{ISV}) =	0.0	ft
Surcharge Volume Width (W_{ISV}) =	0.0	ft
Depth of Basin Floor (H_{FLOOR}) =	0.00	ft
Length of Basin Floor (L_{FLOOR}) =	1,105.3	ft
Width of Basin Floor (W_{FLOOR}) =	552.7	ft
Area of Basin Floor (A_{FLOOR}) =	610,850	ft^2
Volume of Basin Floor (V_{FLOOR}) =	0	ft^3
Depth of Main Basin (H_{MAIN}) =	8.00	ft
Length of Main Basin (L_{MAIN}) =	1,153.3	ft
Width of Main Basin (W_{MAIN}) =	600.7	ft
Area of Main Basin (A_{MAIN}) =	692,736	ft^2
Volume of Main Basin (V_{MAIN}) =	5,210,914	ft^3
Calculated Total Basin Volume (V_{total}) =	**119.626**	acre-feet

Depth Increment = 1.00 ft

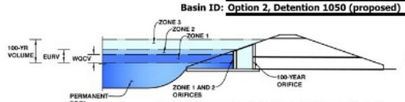
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Media Surface	0.00		1,105.3	552.7	610,850		14.023		
	1.00		1,111.3	558.7	620,834		14.252	615,836	14.138
	2.00		1,117.3	564.7	630,890		14.483	1,241,692	28.505
	3.00		1,123.3	570.7	641,018		14.716	1,877,640	43.105
	4.00		1,129.3	576.7	651,217		14.950	2,523,751	57.937
	5.00		1,135.3	582.7	661,489		15.186	3,180,099	73.005
	6.00		1,141.3	588.7	671,833		15.423	3,846,754	88.309
	7.00		1,147.3	594.7	682,249		15.662	4,523,788	103.852
Zone 1 (100-year)	8.00		1,153.3	600.7	692,736		15.903	5,211,275	119.634
	9.00		1,159.3	606.7	703,296		16.145	5,909,285	135.659
	10.00		1,165.3	612.7	713,928		16.390	6,617,891	151.926
	11.00		1,171.3	618.7	724,632		16.635	7,337,165	168.438
	12.00		1,177.3	624.7	735,407		16.883	8,067,178	185.197
	13.00		1,183.3	630.7	746,255		17.132	8,808,003	202.204
	14.00		1,189.3	636.7	757,175		17.382	9,559,712	219.461
	15.00		1,195.3	642.7	768,167		17.635	10,322,377	236.969
	16.00		1,201.3	648.7	779,230		17.889	11,096,070	254.731
	17.00		1,207.3	654.7	790,366		18.144	11,880,862	272.747
	18.00		1,213.3	660.7	801,574		18.402	12,676,826	291.020
	19.00		1,219.3	666.7	812,854		18.661	13,484,034	309.551
	20.00		1,225.3	672.7	824,205		18.921	14,302,557	328.342
	21.00		1,231.3	678.7	835,629		19.183	15,132,468	347.394
	22.00		1,237.3	684.7	847,125		19.447	15,973,839	366.709
	23.00		1,243.3	690.7	858,693		19.713	16,826,742	386.289
	24.00		1,249.3	696.7	870,332		19.980	17,691,249	406.135
	25.00		1,255.3	702.7	882,044		20.249	18,567,431	426.250
	26.00		1,261.3	708.7	893,828		20.519	19,455,361	446.634
	27.00		1,267.3	714.7	905,684		20.792	20,355,111	467.289
	28.00		1,273.3	720.7	917,611		21.065	21,266,752	488.217
	29.00		1,279.3	726.7	929,611		21.341	22,190,357	509.421
	30.00		1,285.3	732.7	941,683		21.618	23,125,998	530.900

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley - Oklahoma Master Basin Study

Basin ID: Option 2, Detention 1050 (proposed)



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (100-year)	8.00	119.626	Rectangular Orifice
Zone 2			Weir&Pipe (Rect.)
Zone 3			
Total (all zones)		119.626	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	N/A	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	N/A	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	N/A	inches
Orifice Plate: Orifice Area per Row =	N/A	sq. inches

Calculated Parameters for Plate

WQ Orifice Area per Row =	N/A	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (optional)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 1 Rectangular	Not Selected	
Invert of Vertical Orifice =	0.00		ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	8.00		ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Height =	36.00		inches
Vertical Orifice Width =	36.00		inches

Calculated Parameters for Vertical Orif

	Zone 1 Rectangular	Not Selected
Vertical Orifice Area =	9.00	
Vertical Orifice Centroid =	1.50	

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	5.60		ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	14.00		feet
Overflow Weir Grate Slope =	0.00		H:V
Horiz. Length of Weir Sides =	14.00		feet
Overflow Grate Type =	Type C Grate		
Debris Clogging % =	0%		%

Calculated Parameters for Overflow W

	Zone 2 Weir	Not Selected
Height of Grate Upper Edge, H_t =	5.60	
Overflow Weir Slope Length =	14.00	
Grate Open Area / 100-yr Orifice Area =		
Overflow Grate Open Area w/o Debris =	136.42	
Overflow Grate Open Area w/ Debris =	136.42	

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Rectangular	Not Selected	
Depth to Invert of Outlet Pipe =			ft (distance below basin bottom at Stage = 0 ft)
Rectangular Orifice Width =			inches
Rectangular Orifice Height =			inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Pl

	Zone 2 Rectangular	Not Selected
Outlet Orifice Area =		
Outlet Orifice Centroid =		
Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	9.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	100.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth=	3.37	feet
Stage at Top of Freeboard =	13.37	feet
Basin Area at Top of Freeboard =	17.22	acres
Basin Volume at Top of Freeboard =	208.56	acre-ft

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF)

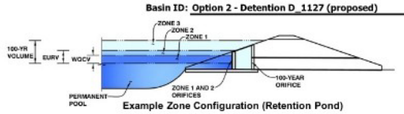
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.86	1.13	1.41	1.86	2.27	2.73
CUHP Runoff Volume (acre-ft) =	21.253	53.386	32.894	50.479	77.736	140.322	191.323	256.581
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	32.894	50.479	77.736	140.322	191.323	309.666
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	8.4	44.6	198.7	674.3	1007.1	1468.9
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A						
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.03	0.13	0.45	0.67	0.98
Peak Inflow Q (cfs) =	N/A	N/A	267.8	417.1	663.5	1325.9	1795.9	2062.0
Peak Outflow Q (cfs) =	15.0	64.0	25.9	52.0	74.7	366.2	739.3	1216.7
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.2	0.4	0.5	0.7	0.8
Structure Controlling Flow =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	-0.7	-0.8	-0.9
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	>120	>120	>120	>120	>120	77	60	43
Time to Drain 99% of Inflow Volume (hours) =	**>120**	>120	>120	>120	>120	>120	>120	101
Maximum Ponding Depth (ft) =	1.50	3.70	2.02	2.97	4.47	6.89	7.90	8.93
Area at Maximum Ponding Depth (acres) =	14.37	14.88	14.49	14.71	15.06	15.64	15.88	16.13
Maximum Volume Stored (acre-ft) =	21.293	53.463	28.650	42.516	64.990	102.130	118.045	134.529

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley Oklahoma Basin

Basin ID: Option 2 - Detention D_1127 (proposed)



Example Zone Configuration (Retention Pond)

Watershed Information — Flood Control Only

Selected BMP Type =	No BMP	
Watershed Area =	834.49	acres
Watershed Length =	11,616	ft
Watershed Length to Centroid =	5,808	ft
Watershed Slope =	0.011	ft/ft
Watershed Imperviousness =	41.11%	percent
Percentage Hydrologic Soil Group A =	68.7%	percent
Percentage Hydrologic Soil Group B =	9.1%	percent
Percentage Hydrologic Soil Groups C/D =	22.2%	percent
Target WQCV Drain Time =	N/A	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	12.710	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	36.104	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 0.95 in.) =	22.338	acre-feet	0.95 inches
5-yr Runoff Volume (P1 = 1.35 in.) =	35.283	acre-feet	1.35 inches
10-yr Runoff Volume (P1 = 1.63 in.) =	46.461	acre-feet	1.63 inches
25-yr Runoff Volume (P1 = 1.69 in.) =	54.677	acre-feet	inches
50-yr Runoff Volume (P1 = 2.28 in.) =	90.285	acre-feet	2.28 inches
100-yr Runoff Volume (P1 = 2.58 in.) =	114.756	acre-feet	2.58 inches
500-yr Runoff Volume (P1 = 3.14 in.) =	153.272	acre-feet	inches
Approximate 2-yr Detention Volume =	19.978	acre-feet	
Approximate 5-yr Detention Volume =	31.236	acre-feet	
Approximate 10-yr Detention Volume =	39.458	acre-feet	
Approximate 25-yr Detention Volume =	42.533	acre-feet	
Approximate 50-yr Detention Volume =	56.089	acre-feet	
Approximate 100-yr Detention Volume =	65.645	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (100-year) =	65.645	acre-feet
Select Zone 2 Storage Volume (Optional) =		acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	65.645	acre-feet

Depth Increment = ft

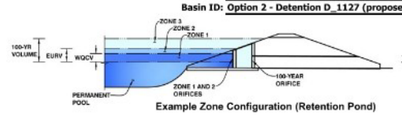
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft²)	Optional Override Area (ft²)	Area (acre)	Volume (ft³)	Volume (ac-ft)
Media Surface	--	0.00	--	--	--	200,000	4.591		
4833	--	1.00	--	--	--	210,000	4.821	205,000	4.706
4836	--	4.00	--	--	--	220,000	5.051	850,000	19.513
4842	--	10.00	--	--	--	240,000	5.510	2,230,000	51.194
4847	--	15.00	--	--	--	250,000	5.739	3,455,000	79.316
4850	--	18.00	--	--	--	260,000	5.969	4,220,000	96.878

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley Oklahoma Basin

Basin ID: Option 2 - Detention D_1127 (proposed)



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (100-year)	12.60	65.645	Rectangular Orifice
Zone 2			Weir&Pipe (Rect.)
Zone 3			
Total (all zones)		65.645	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	
Underdrain Orifice Diameter =	N/A	inches	

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft²
Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	N/A	ft (relative to basin bottom at Stage = 0 ft)	
Depth at top of Zone using Orifice Plate =	N/A	ft (relative to basin bottom at Stage = 0 ft)	
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	

Calculated Parameters for Plate

WQ Orifice Area per Row =	N/A	ft²
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft²

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (optional)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 1 Rectangular	Not Selected	
Invert of Vertical Orifice =	0.00		ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	12.60		ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Height =	24.00		inches
Vertical Orifice Width =	24.00		inches

Calculated Parameters for Vertical Orifice

	Zone 1 Rectangular	Not Selected	
Vertical Orifice Area =	4.00		ft²
Vertical Orifice Centroid =	1.00		feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	7.50		ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	10.00		feet
Overflow Weir Grate Slope =	0.00		H:V
Horiz. Length of Weir Sides =	10.00		feet
Overflow Grate Type =	Type C Grate		
Debris Clogging % =	0%		%

Calculated Parameters for Overflow Weir

	Zone 2 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	7.50		feet
Overflow Weir Slope Length =	10.00		feet
Grate Open Area / 100-yr Orifice Area =			
Overflow Grate Open Area w/o Debris =	69.60		ft²
Overflow Grate Open Area w/ Debris =	69.60		ft²

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Rectangular	Not Selected	
Depth to Invert of Outlet Pipe =			ft (distance below basin bottom at Stage = 0 ft)
Rectangular Orifice Width =			inches
Rectangular Orifice Height =			inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 2 Rectangular	Not Selected	
Outlet Orifice Area =			ft²
Outlet Orifice Centroid =			feet
Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=		ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =		feet
Spillway End Slopes =		H:V
Freeboard above Max Water Surface =		feet

Calculated Parameters for Spillway

Spillway Design Flow Depth=		feet
Stage at Top of Freeboard =		feet
Basin Area at Top of Freeboard =		acres
Basin Volume at Top of Freeboard =		acre-ft

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

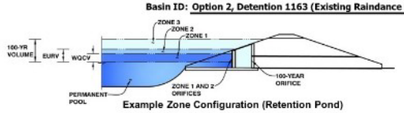
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.95	1.35	1.63	1.69	2.28	2.58	3.14
CUHP Runoff Volume (acre-ft) =	12.710	36.104	22.338	35.283	46.461	54.677	90.285	114.756	153.272
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	22.338	35.283	46.461	54.677	90.285	108.611	153.272
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	2.2	6.2	32.3	91.9	278.3	427.6	648.9
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.01	0.04	0.11	0.33	0.51	0.78
Peak Inflow Q (cfs) =	N/A	N/A	159.5	258.4	345.0	452.7	775.7	411.1	1337.4
Peak Outflow Q (cfs) =	24.5	47.9	30.2	40.9	48.4	112.4	410.8	286.8	875.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	6.6	1.5	1.2	1.5	0.7	1.3
Structure Controlling Flow =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	-0.7	-0.8	-0.8	-0.9
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	90	44	61	46	40	36	27	26	20
Time to Drain 99% of Inflow Volume (hours) =	**>120**	102	>120	105	87	78	55	50	38
Maximum Ponding Depth (ft) =	2.64	7.21	3.45	5.52	7.32	8.11	9.46	8.98	11.74
Area at Maximum Ponding Depth (acres) =	4.95	5.30	5.01	5.17	5.30	5.36	5.47	5.43	5.59
Maximum Volume Stored (acre-ft) =	12.715	36.120	16.747	27.227	36.703	40.864	48.230	45.614	60.794

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley - Oklahoma Master Basin Study

Basin ID: Option 2, Detention 1163 (Existing Raindance Pond F)



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	172.60	acres
Watershed Length =	4,311	ft
Watershed Length to Centroid =	2,285	ft
Watershed Slope =	0.015	ft/ft
Watershed Imperviousness =	7.00%	percent
Percentage Hydrologic Soil Group A =	50.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	50.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.706	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.890	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.95 in.) =	0.433	acre-feet	0.95	inches
5-yr Runoff Volume (P1 = 1.35 in.) =	1.269	acre-feet	1.35	inches
10-yr Runoff Volume (P1 = 1.63 in.) =	3.427	acre-feet	1.63	inches
25-yr Runoff Volume (P1 = 1.69 in.) =	5.625	acre-feet		inches
50-yr Runoff Volume (P1 = 2.28 in.) =	12.689	acre-feet	2.28	inches
100-yr Runoff Volume (P1 = 2.58 in.) =	18.119	acre-feet	2.58	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	25.682	acre-feet		inches
Approximate 2-yr Detention Volume =	0.499	acre-feet		
Approximate 5-yr Detention Volume =	1.270	acre-feet		
Approximate 10-yr Detention Volume =	1.837	acre-feet		
Approximate 25-yr Detention Volume =	2.065	acre-feet		
Approximate 50-yr Detention Volume =	2.807	acre-feet		
Approximate 100-yr Detention Volume =	4.442	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.706	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.184	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	3.552	acre-feet
Total Detention Basin Volume =	4.442	acre-feet

Depth Increment = ft

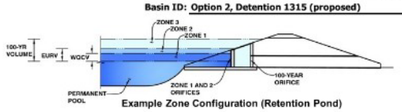
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	3,300	0.076		
4944	--	1.00	--	--	--	32,700	0.751	18,000	0.413
4945	--	2.00	--	--	--	71,400	1.639	70,050	1.608
4949.9	--	6.90	--	--	--	252,000	5.785	862,379	19.798
4952	--	9.00	--	--	--	260,000	5.969	1,399,979	32.139
	--		--	--	--				
	--		--	--	--				
	--		--	--	--			

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley - Oklahoma Master Basin Study

Basin ID: Option 2, Detention 1315 (proposed)



Example Zone Configuration (Retention Pond)

Watershed Information — Flood Control Only

Selected BMP Type =	No BMP	
Watershed Area =	500.00	acres
Watershed Length =	3,700	ft
Watershed Length to Centroid =	1,600	ft
Watershed Slope =	0.012	ft/ft
Watershed Imperviousness =	25.00%	percent
Percentage Hydrologic Soil Group A =	0.4%	percent
Percentage Hydrologic Soil Group B =	38.7%	percent
Percentage Hydrologic Soil Groups C/D =	61.0%	percent
Target WQCV Drain Time =	N/A	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

Note: L / W Ratio < 1
L / W Ratio = 0.63

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	5.618 acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	11.753 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.86 in.) =	6.957 acre-feet	0.86	inches
5-yr Runoff Volume (P1 = 1.13 in.) =	12.367 acre-feet	1.13	inches
10-yr Runoff Volume (P1 = 1.41 in.) =	21.107 acre-feet	1.41	inches
25-yr Runoff Volume (P1 = 1.86 in.) =	42.286 acre-feet	1.86	inches
50-yr Runoff Volume (P1 = 2.27 in.) =	59.053 acre-feet	2.27	inches
100-yr Runoff Volume (P1 = 2.73 in.) =	81.119 acre-feet	2.73	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	98.805 acre-feet	3.14	inches
Approximate 2-yr Detention Volume =	6.690 acre-feet		
Approximate 5-yr Detention Volume =	11.436 acre-feet		
Approximate 10-yr Detention Volume =	15.786 acre-feet		
Approximate 25-yr Detention Volume =	21.161 acre-feet		
Approximate 50-yr Detention Volume =	24.123 acre-feet		
Approximate 100-yr Detention Volume =	31.971 acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (100-year) =	31.971	acre-feet
Select Zone 2 Storage Volume (Optional) =		acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	31.971	acre-feet
Initial Surcharge Volume (ISV) =	N/A	ft^3
Initial Surcharge Depth (ISD) =	N/A	ft
Total Available Detention Depth (H_{total}) =	8.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.003	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	
Initial Surcharge Area (A_{ISV}) =	0	ft^2
Surcharge Volume Length (L_{ISV}) =	0.0	ft
Surcharge Volume Width (W_{ISV}) =	0.0	ft
Depth of Basin Floor (H_{FLOOR}) =	0.00	ft
Length of Basin Floor (L_{FLOOR}) =	541.8	ft
Width of Basin Floor (W_{FLOOR}) =	270.9	ft
Area of Basin Floor (A_{FLOOR}) =	146,784	ft^2
Volume of Basin Floor (V_{FLOOR}) =	0	ft^3
Depth of Main Basin (H_{MAIN}) =	8.00	ft
Length of Main Basin (L_{MAIN}) =	605.8	ft
Width of Main Basin (W_{MAIN}) =	334.9	ft
Area of Main Basin (A_{MAIN}) =	202,895	ft^2
Volume of Main Basin (V_{MAIN}) =	1,392,676	ft^3
Calculated Total Basin Volume (V_{total}) =	**31.971**	acre-feet

Depth Increment = 1.00 ft

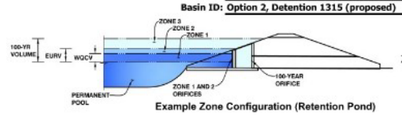
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Media Surface	0.00		541.8	270.9	146,784		3.370		
	1.00		549.8	278.9	153,350		3.520	150,057	3.445
	2.00		557.8	286.9	160,044		3.674	306,743	7.042
	3.00		565.8	294.9	166,866		3.831	470,187	10.794
	4.00		573.8	302.9	173,816		3.990	640,517	14.704
	5.00		581.8	310.9	180,894		4.153	817,861	18.776
	6.00		589.8	318.9	188,099		4.318	1,002,347	23.011
	7.00		597.8	326.9	195,433		4.487	1,194,103	27.413
Zone 1 (100-year)	8.00		605.8	334.9	202,895		4.658	1,393,256	31.985
	9.00		613.8	342.9	210,485		4.832	1,599,936	36.729
	10.00		621.8	350.9	218,203		5.009	1,814,269	41.650
	11.00		629.8	358.9	226,049		5.189	2,036,384	46.749
	12.00		637.8	366.9	234,022		5.372	2,266,408	52.030
	13.00		645.8	374.9	242,124		5.558	2,504,471	57.495
	14.00		653.8	382.9	250,354		5.747	2,750,700	63.147
	15.00		661.8	390.9	258,712		5.939	3,005,222	68.990
	16.00		669.8	398.9	267,198		6.134	3,268,166	75.027
	17.00		677.8	406.9	275,812		6.332	3,539,660	81.259
	18.00		685.8	414.9	284,553		6.532	3,819,832	87.691
	19.00		693.8	422.9	293,423		6.736	4,108,810	94.325
	20.00		701.8	430.9	302,421		6.943	4,406,721	101.164
	21.00		709.8	438.9	311,547		7.152	4,713,694	108.212
	22.00		717.8	446.9	320,801		7.365	5,029,858	115.470
	23.00		725.8	454.9	330,183		7.580	5,355,339	122.942
	24.00		733.8	462.9	339,692		7.798	5,690,266	130.631
	25.00		741.8	470.9	349,330		8.020	6,034,766	138.539
	26.00		749.8	478.9	359,096		8.244	6,388,969	146.671
	27.00		757.8	486.9	368,990		8.471	6,753,001	155.028
	28.00		765.8	494.9	379,012		8.701	7,126,991	163.613
	29.00		773.8	502.9	389,162		8.934	7,511,067	172.430
	30.00		781.8	510.9	399,439		9.170	7,905,357	181.482

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley - Oklahoma Master Basin Study

Basin ID: Option 2, Detention 1315 (proposed)



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (100-year)	8.00	31.971	Rectangular Orifice
Zone 2			Weir&Pipe (Rect.)
Zone 3			
Total (all zones)		31.971	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	N/A	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	N/A	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	N/A	inches
Orifice Plate: Orifice Area per Row =	N/A	sq. inches

Calculated Parameters for Plate

WQ Orifice Area per Row =	N/A	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (optional)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 1 Rectangular	Not Selected	
Invert of Vertical Orifice =	0.00		ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	8.00		ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Height =	24.00		inches
Vertical Orifice Width =	24.00		inches

Calculated Parameters for Vertical Orifice

	Zone 1 Rectangular	Not Selected	
Vertical Orifice Area =	4.00		ft^2
Vertical Orifice Centroid =	1.00		feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	5.00		ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	12.00		feet
Overflow Weir Grate Slope =	0.00		H:V
Horiz. Length of Weir Sides =	12.00		feet
Overflow Grate Type =	Type C Grate		
Debris Clogging % =	0%		%

Calculated Parameters for Overflow Weir

	Zone 2 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	5.00		feet
Overflow Weir Slope Length =	12.00		feet
Grate Open Area / 100-yr Orifice Area =			
Overflow Grate Open Area w/o Debris =	100.22		ft^2
Overflow Grate Open Area w/ Debris =	100.22		ft^2

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Rectangular	Not Selected	
Depth to Invert of Outlet Pipe =			ft (distance below basin bottom at Stage = 0 ft)
Rectangular Orifice Width =			inches
Rectangular Orifice Height =			inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 2 Rectangular	Not Selected	
Outlet Orifice Area =			ft^2
Outlet Orifice Centroid =			feet
Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	9.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	100.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth=	2.25	feet
Stage at Top of Freeboard =	12.25	feet
Basin Area at Top of Freeboard =	5.42	acres
Basin Volume at Top of Freeboard =	53.38	acre-ft

Routed Hydrograph Results — *The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).*

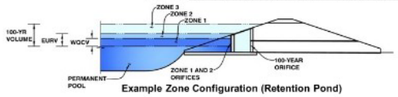
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.86	1.13	1.41	1.86	2.27	2.73	3.14
CUHP Runoff Volume (acre-ft) =	5.618	11.753	6.957	12.367	21.107	42.286	59.053	81.119	98.805
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	6.957	12.367	21.107	42.286	59.053	172.288	98.805
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	6.3	48.8	161.2	459.0	664.8	925.6	1135.9
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.10	0.32	0.92	1.33	1.85	2.27
Peak Inflow Q (cfs) =	N/A	N/A	91.4	165.0	288.2	594.1	817.0	1301.3	1313.0
Peak Outflow Q (cfs) =	12.8	28.7	12.7	24.8	35.8	288.3	504.7	1057.9	979.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.5	0.2	0.6	0.8	1.1	0.9
Structure Controlling Flow =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	-0.4	-0.5	-0.5	-0.5
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	99	56	84	54	38	23	19	13	13
Time to Drain 99% of Inflow Volume (hours) =	**>120**	>120	>120	>120	89	53	41	23	28
Maximum Ponding Depth (ft) =	1.61	3.25	1.59	2.66	4.46	6.35	7.06	8.81	8.51
Area at Maximum Ponding Depth (acres) =	3.61	3.87	3.61	3.78	4.06	4.38	4.50	4.80	4.74
Maximum Volume Stored (acre-ft) =	5.621	11.757	5.512	9.463	16.516	24.532	27.682	35.767	34.335

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley - Oklahoma Master Basin Study

Basin ID: Option 2, Detention 1340 (Existing, Source: Oklahoma Lake (Weld County, CO) Dam Safety Inspection, dated December 20, 2024, prepared by Reno Gazette Journal.)



Example Zone Configuration (Retention Pond)

Watershed Information — Flood Control Only

Selected BMP Type =	No BMP	
Watershed Area =	919.00	acres
Watershed Length =	9,000	ft
Watershed Length to Centroid =	2,300	ft
Watershed Slope =	0.011	ft/ft
Watershed Imperviousness =	22.98%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	39.0%	percent
Percentage Hydrologic Soil Groups C/D =	61.0%	percent
Target WQCV Drain Time =	N/A	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	9.760	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	19.727	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.86 in.) =	11.515	acre-feet	0.86	inches
5-yr Runoff Volume (P1 = 1.13 in.) =	21.200	acre-feet	1.13	inches
10-yr Runoff Volume (P1 = 1.41 in.) =	37.096	acre-feet	1.41	inches
25-yr Runoff Volume (P1 = 1.86 in.) =	76.152	acre-feet	1.86	inches
50-yr Runoff Volume (P1 = 2.27 in.) =	106.935	acre-feet	2.27	inches
100-yr Runoff Volume (P1 = 2.73 in.) =	147.644	acre-feet	2.73	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	180.165	acre-feet	3.14	inches
Approximate 2-yr Detention Volume =	11.140	acre-feet		
Approximate 5-yr Detention Volume =	19.437	acre-feet		
Approximate 10-yr Detention Volume =	27.168	acre-feet		
Approximate 25-yr Detention Volume =	36.756	acre-feet		
Approximate 50-yr Detention Volume =	41.905	acre-feet		
Approximate 100-yr Detention Volume =	56.068	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (100-year) =	56.068	acre-feet
Select Zone 2 Storage Volume (Optional) =		acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	56.068	acre-feet

Depth Increment = 0.50 ft

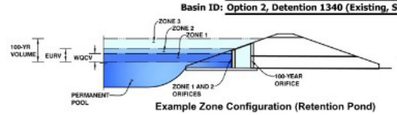
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft²)	Optional Override Area (ft²)	Area (acre)	Volume (ft³)	Volume (ac-ft)
Media Surface	--	0.00	--	--	--	137,520	3.157		
	--	1.00	--	--	--	171,900	3.946	154,710	3.552
	--	2.00	--	--	--	309,420	7.103	395,370	9.076
	--	3.00	--	--	--	450,000	10.331	775,079	17.793
	--	4.00	--	--	--	500,000	11.478	1,250,079	28.698
	--	5.00	--	--	--	856,500	19.663	1,928,329	44.268
	--	6.00	--	--	--	1,231,680	28.275	2,972,418	68.237
	--	7.00	--	--	--	1,674,620	38.444	4,425,567	101.597
	--	8.00	--	--	--	2,285,280	52.463	6,405,517	147.050
	--	9.00	--	--	--	2,703,780	62.070	8,900,046	204.317
	--	10.00	--	--	--	3,310,000	75.987	11,906,936	273.346
	--	11.00	--	--	--	4,235,640	97.237	15,679,755	359.958
	--	12.00	--	--	--	4,305,840	98.848	19,950,495	458.000
	--	12.33	--	--	--	5,000,000	114.784	21,485,957	493.250
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DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley - Oklahoma Master Basin Study

Basin ID: Option 2, Detention 1340 (Existing, Source: Oklahoma Lake (Weld County, CO) Dam Safety Inspection, dated December 20, 2024, prepared by Reno Gazette Journal



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (100-year)	5.54	56.068	Circular Orifice
Zone 2			
Zone 3			
Total (all zones)		56.068	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	N/A	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft²
Depth at top of Zone using Orifice Plate =	N/A	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft²

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (optional)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 1 Circular	Not Selected		Calculated Parameters for Vertical Orifice	Zone 1 Circular	Not Selected	
Invert of Vertical Orifice =	0.00		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.79		ft²
Depth at top of Zone using Vertical Orifice =	5.54		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.50		feet
Vertical Orifice Diameter =	12.00		inches				

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Not Selected	Not Selected		Calculated Parameters for Overflow Weir	Not Selected	Not Selected	
Overflow Weir Front Edge Height, Ho =	6.00		ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	6.00		feet
Overflow Weir Front Edge Length =	4.50		feet	Overflow Weir Slope Length =	4.50		feet
Overflow Weir Grate Slope =	0.00		H:V	Grate Open Area / 100-yr Orifice Area =			
Horiz. Length of Weir Sides =	4.50		feet	Overflow Grate Open Area w/o Debris =	14.09		ft²
Overflow Grate Type =	Type C Grate			Overflow Grate Open Area w/ Debris =	14.09		ft²
Debris Clogging % =	0%		%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Not Selected	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =			ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =			ft²
Circular Orifice Diameter =			inches	Outlet Orifice Centroid =			feet
				Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway	
Spillway Invert Stage=	12.33	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	4.25 feet
Spillway Crest Length =	4.00	feet	Stage at Top of Freeboard =	16.58 feet
Spillway End Slopes =	15.00	H:V	Basin Area at Top of Freeboard =	114.78 acres
Freeboard above Max Water Surface =		feet	Basin Volume at Top of Freeboard =	493.25 acre-ft

Routed Hydrograph Results — *The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).*

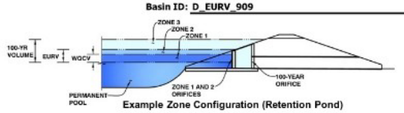
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.86	1.13	1.41	1.86	2.27	2.73	3.14
CUHP Runoff Volume (acre-ft) =	9.760	19.727	11.515	21.200	37.096	76.152	106.935	147.644	180.165
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	11.515	21.200	37.096	76.152	106.935	147.644	180.165
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	7.9	60.7	201.9	602.1	872.4	1241.8	1524.8
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.07	0.22	0.66	0.95	1.35	1.66
Peak Inflow Q (cfs) =	N/A	N/A	109.0	201.0	359.7	778.5	1072.2	1451.2	1756.8
Peak Outflow Q (cfs) =	4.8	6.2	4.9	6.2	7.6	13.8	62.8	114.6	130.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.1	0.0	0.0	0.1	0.1	0.1
Structure Controlling Flow =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	-0.6	-0.7	-0.7	-0.7
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	>120	99	>120	98	101	>120	>120	>120	>120
Time to Drain 99% of Inflow Volume (hours) =	**>120**	>120	>120	>120	>120	>120	>120	>120	>120
Maximum Ponding Depth (ft) =	2.10	3.19	2.19	3.20	4.49	6.19	6.94	7.71	8.26
Area at Maximum Ponding Depth (acres) =	7.43	10.55	7.72	10.55	15.49	30.11	37.83	48.40	54.86
Maximum Volume Stored (acre-ft) =	9.803	19.777	10.484	19.777	35.305	73.492	99.309	132.426	160.466

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley Oklahoma Basin - Option 4 LID

Basin ID: D_EURV_909



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	446.26	acres
Watershed Length =	7,920	ft
Watershed Length to Centroid =	3,960	ft
Watershed Slope =	0.016	ft/ft
Watershed Imperviousness =	64.74%	percent
Percentage Hydrologic Soil Group A =	11.5%	percent
Percentage Hydrologic Soil Group B =	35.5%	percent
Percentage Hydrologic Soil Groups C/D =	53.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	9.414		acre-feet
Excess Urban Runoff Volume (EURV) =	30.100		acre-feet
2-yr Runoff Volume (P1 = 0.95 in.) =	21.752	0.95	inches
5-yr Runoff Volume (P1 = 1.35 in.) =	34.616	1.35	inches
10-yr Runoff Volume (P1 = 1.63 in.) =	44.534	1.63	inches
25-yr Runoff Volume (P1 = 1.69 in.) =	48.402		inches
50-yr Runoff Volume (P1 = 2.28 in.) =	70.940	2.28	inches
100-yr Runoff Volume (P1 = 2.58 in.) =	83.733	2.58	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	105.947		inches
Approximate 2-yr Detention Volume =	19.631		acre-feet
Approximate 5-yr Detention Volume =	30.493		acre-feet
Approximate 10-yr Detention Volume =	37.715		acre-feet
Approximate 25-yr Detention Volume =	37.130		acre-feet
Approximate 50-yr Detention Volume =	46.401		acre-feet
Approximate 100-yr Detention Volume =	51.072		acre-feet

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	9.414	acre-feet
Zone 2 Volume (EURV - Zone 1) =	20.687	acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	30.100	acre-feet
Initial Surcharge Volume (ISV) =	1,230	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{TOTAL}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.003	ft/ft
Slopes of Main Basin Sides (S_{MAIN}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Initial Surcharge Area (A_{ISV}) =	3,728	ft^2
Surcharge Volume Length (L_{ISV}) =	61.1	ft
Surcharge Volume Width (W_{ISV}) =	61.1	ft
Depth of Basin Floor (H_{FLOOR}) =	2.15	ft
Length of Basin Floor (L_{FLOOR}) =	786.3	ft
Width of Basin Floor (W_{FLOOR}) =	419.4	ft
Area of Basin Floor (A_{FLOOR}) =	329,775	ft^2
Volume of Basin Floor (V_{FLOOR}) =	264,138	ft^3
Depth of Main Basin (H_{MAIN}) =	3.02	ft
Length of Main Basin (L_{MAIN}) =	810.5	ft
Width of Main Basin (W_{MAIN}) =	443.5	ft
Area of Main Basin (A_{MAIN}) =	359,489	ft^2
Volume of Main Basin (V_{MAIN}) =	1,040,465	ft^3
Calculated Total Basin Volume (V_{total}) =	**30.021**	acre-feet

Total detention volume is less than 100-year volume.

Depth Increment = 0.50 ft

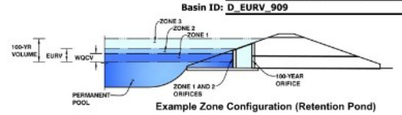
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		61.1	61.1	3,728		0.086		
ISV	0.33		61.1	61.1	3,728		0.086	1,230	0.028
	0.50		61.1	61.1	3,728		0.086	1,864	0.043
	1.00		118.4	89.4	10,584		0.243	4,264	0.098
	1.50		287.1	172.7	49,583		1.138	18,135	0.416
	2.00		455.7	256.1	116,694		2.679	58,533	1.344
	2.50		624.4	339.4	211,915		4.865	139,514	3.203
Floor	2.98		786.3	419.4	329,775		7.571	268,483	6.164
	3.00		786.5	419.5	329,968		7.575	275,081	6.315
Zone 1 (WQCV)	3.41		789.8	422.8	333,934		7.666	411,180	9.439
	3.50		790.5	423.5	334,808		7.686	441,273	10.130
	4.00		794.5	427.5	339,680		7.798	609,894	14.001
	4.50		798.5	431.5	344,584		7.911	780,958	17.928
	5.00		802.5	435.5	349,520		8.024	954,483	21.912
	5.50		806.5	439.5	354,488		8.138	1,130,484	25.952
	6.00		810.5	443.5	359,489		8.253	1,308,977	30.050
Zone 2 (EURV)	6.01		810.6	443.6	359,589		8.255	1,312,572	30.133
	6.50		814.5	447.5	364,521		8.368	1,489,978	34.205
	7.00		818.5	451.5	369,585		8.484	1,673,503	38.418
	7.50		822.5	455.5	374,681		8.601	1,859,568	42.690
	8.00		826.5	459.5	379,809		8.719	2,048,189	47.020
	8.50		830.5	463.5	384,969		8.838	2,239,382	51.409
	9.00		834.5	467.5	390,161		8.957	2,433,164	55.858
	9.50		838.5	471.5	395,385		9.077	2,629,549	60.366
	10.00		842.5	475.5	400,642		9.197	2,828,554	64.935
	10.50		846.5	479.5	405,930		9.319	3,030,196	69.564
	11.00		850.5	483.5	411,250		9.441	3,234,489	74.254
	11.50		854.5	487.5	416,602		9.564	3,441,451	79.005
	12.00		858.5	491.5	421,986		9.687	3,651,096	83.818
	12.50		862.5	495.5	427,402		9.812	3,863,442	88.692
	13.00		866.5	499.5	432,850		9.937	4,078,504	93.630
	13.50		870.5	503.5	438,330		10.063	4,296,298	98.629
	14.00		874.5	507.5	443,843		10.189	4,516,840	103.692
	14.50		878.5	511.5	449,387		10.316	4,740,146	108.819
	15.00		882.5	515.5	454,963		10.445	4,966,232	114.009
	15.50		886.5	519.5	460,571		10.573	5,195,114	119.263
	16.00		890.5	523.5	466,211		10.703	5,426,808	124.582
	16.50		894.5	527.5	471,883		10.833	5,661,330	129.966
	17.00		898.5	531.5	477,587		10.964	5,898,696	135.415
	17.50		902.5	535.5	483,323		11.096	6,138,923	140.930
	18.00		906.5	539.5	489,092		11.228	6,382,025	146.511
	18.50		910.5	543.5	494,892		11.361	6,628,019	152.158
	19.00		914.5	547.5	500,724		11.495	6,876,922	157.872
	19.50		918.5	551.5	506,588		11.630	7,128,749	163.654
	20.00		922.5	555.5	512,484		11.765	7,383,515	169.502
	20.50		926.5	559.5	518,412		11.901	7,641,238	175.419
	21.00		930.5	563.5	524,372		12.038	7,901,933	181.403
	21.50		934.5	567.5	530,364		12.175	8,165,615	187.457
	22.00		938.5	571.5	536,388		12.314	8,432,302	193.579
	22.50		942.5	575.5	542,445		12.453	8,702,009	199.771
	23.00		946.5	579.5	548,533		12.593	8,974,752	206.032
	23.50		950.5	583.5	554,653		12.733	9,250,547	212.363
	24.00		954.5	587.5	560,805		12.874	9,529,411	218.765
	24.50		958.5	591.5	566,989		13.016	9,811,358	225.238
	25.00		962.5	595.5	573,205		13.159	10,096,405	231.782
	25.50		966.5	599.5	579,453		13.302	10,384,568	238.397
	26.00		970.5	603.5	585,733		13.447	10,675,864	245.084
	26.50		974.5	607.5	592,046		13.591	10,970,307	251.844
	27.00		978.5	611.5	598,390		13.737	11,267,915	258.676
	27.50		982.5	615.5	604,766		13.884	11,568,702	265.581
	28.00		986.5	619.5	611,174		14.031	11,872,686	272.559
	28.50		990.5	623.5	617,614		14.178	12,179,882	279.612
	29.00		994.5	627.5	624,086		14.327	12,490,305	286.738
	29.50		998.5	631.5	630,590		14.476	12,803,973	293.939
	30.00		1,002.5	635.5	637,126		14.626	13,120,901	301.214

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley Oklahoma Basin - Option 4 LID

Basin ID: D_EURV_909



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.41	9.414	Orifice Plate
Zone 2 (EURV)	6.01	20.687	Weir&Pipe (Restrict)
Zone 3			
Total (all zones)		30.100	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	1.840E-01	ft^2
Depth at top of Zone using Orifice Plate =	3.41	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	13.60	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	26.50	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.14	2.27					
Orifice Area (sq. inches)	26.50	26.50	26.50					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected		Calculated Parameters for Vertical Orifice		
				Not Selected	Not Selected	
Invert of Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =		ft^2
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =		feet
Vertical Orifice Diameter =			inches			

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected		Calculated Parameters for Overflow Weir		
				Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.41		ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.41	feet
Overflow Weir Front Edge Length =	4.00		feet	Overflow Weir Slope Length =	4.00	feet
Overflow Weir Grate Slope =	0.00		H:V	Grate Open Area / 100-yr Orifice Area =	17.52	
Horiz. Length of Weir Sides =	4.00		feet	Overflow Grate Open Area w/o Debris =	11.14	ft^2
Overflow Grate Type =	Type C Grate			Overflow Grate Open Area w/ Debris =	5.57	ft^2
Debris Clogging % =	50%		%			

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate		
				Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	3.00		ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.64	ft^2
Outlet Pipe Diameter =	18.00		inches	Outlet Orifice Centroid =	0.34	feet
Restrictor Plate Height Above Pipe Invert =	7.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.35	N/A radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=	6.02	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	3.25	feet
Spillway Crest Length =	50.00	feet	Stage at Top of Freeboard =	10.27	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	9.26	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	67.43	acre-ft

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

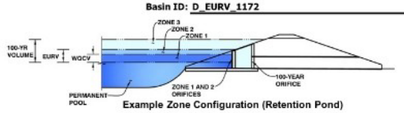
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.95	1.35	1.63	1.69	2.28	2.58	3.14
CUHP Runoff Volume (acre-ft) =	9.414	30.100	21.752	34.616	44.534	48.402	70.940	83.733	105.947
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	21.752	34.616	44.534	48.402	70.940	83.733	105.947
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	3.3	53.2	105.2	162.8	311.1	411.7	559.8
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.12	0.24	0.36	0.70	0.92	1.25
Peak Inflow Q (cfs) =	N/A	N/A	257.3	414.2	525.4	609.2	895.7	1062.6	1336.0
Peak Outflow Q (cfs) =	3.9	9.0	8.4	25.5	108.1	146.6	367.0	527.0	777.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.5	1.0	0.9	1.2	1.3	1.4
Structure Controlling Flow =	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Spillway	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	0.28	0.30	0.3	0.3	0.3	0.3	0.3	0.3
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	66	56	69	68	68	64	62	59
Time to Drain 99% of Inflow Volume (hours) =	**40**	70	60	74	74	74	72	71	70
Maximum Ponding Depth (ft) =	3.41	6.01	4.79	6.25	6.75	6.93	7.69	8.12	8.69
Area at Maximum Ponding Depth (acres) =	7.67	8.26	7.97	8.31	8.43	8.47	8.64	8.75	8.88
Maximum Volume Stored (acre-ft) =	9.439	30.133	20.152	32.037	36.304	37.740	44.242	47.980	53.093

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley Oklahoma Basin - Option 4 LID

Basin ID: D_EURV_1172



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	60.32	acres
Watershed Length =	3,046	ft
Watershed Length to Centroid =	1,068	ft
Watershed Slope =	0.025	ft/ft
Watershed Imperviousness =	40.36%	percent
Percentage Hydrologic Soil Group A =	59.6%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	40.4%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.909	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	2.490	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.95 in.) =	1.608	acre-feet	0.95	inches
5-yr Runoff Volume (P1 = 1.35 in.) =	2.539	acre-feet	1.35	inches
10-yr Runoff Volume (P1 = 1.63 in.) =	3.516	acre-feet	1.63	inches
25-yr Runoff Volume (P1 = 1.69 in.) =	4.124	acre-feet		inches
50-yr Runoff Volume (P1 = 2.28 in.) =	6.771	acre-feet	2.28	inches
100-yr Runoff Volume (P1 = 2.58 in.) =	8.583	acre-feet	2.58	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	11.364	acre-feet		inches
Approximate 2-yr Detention Volume =	1.438	acre-feet		
Approximate 5-yr Detention Volume =	2.316	acre-feet		
Approximate 10-yr Detention Volume =	2.852	acre-feet		
Approximate 25-yr Detention Volume =	3.037	acre-feet		
Approximate 50-yr Detention Volume =	3.976	acre-feet		
Approximate 100-yr Detention Volume =	4.683	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.909	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.582	acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	2.490	acre-feet
Initial Surcharge Volume (ISV) =	119	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{TOTAL}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.003	ft/ft
Slopes of Main Basin Sides (S_{MAIN}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Initial Surcharge Area (A_{ISV}) =	360	ft^2
Surcharge Volume Length (L_{ISV}) =	19.0	ft
Surcharge Volume Width (W_{ISV}) =	19.0	ft
Depth of Basin Floor (H_{FLOOR}) =	0.46	ft
Length of Basin Floor (L_{FLOOR}) =	174.1	ft
Width of Basin Floor (W_{FLOOR}) =	95.6	ft
Area of Basin Floor (A_{FLOOR}) =	16,655	ft^2
Volume of Basin Floor (V_{FLOOR}) =	2,984	ft^3
Depth of Main Basin (H_{MAIN}) =	4.71	ft
Length of Main Basin (L_{MAIN}) =	211.8	ft
Width of Main Basin (W_{MAIN}) =	133.3	ft
Area of Main Basin (A_{MAIN}) =	28,240	ft^2
Volume of Main Basin (V_{MAIN}) =	104,533	ft^3
Calculated Total Basin Volume (V_{total}) =	**2.475**	acre-feet

Total detention volume is less than 100-year volume.

Depth Increment = 0.50 ft

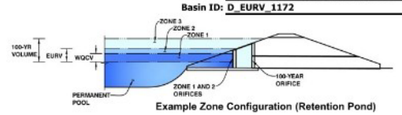
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		19.0	19.0	360		0.008		
ISV	0.33		19.0	19.0	360		0.008	119	0.003
	0.50		19.0	19.0	360		0.008	180	0.004
	1.00		76.3	47.3	3,610		0.083	590	0.014
Floor	1.29		174.1	95.6	16,655		0.382	3,300	0.076
	1.50		175.8	97.3	17,111		0.393	6,845	0.157
	2.00		179.8	101.3	18,219		0.418	15,676	0.360
	2.50		183.8	105.3	19,360		0.444	25,070	0.576
	3.00		187.8	109.3	20,532		0.471	35,041	0.804
Zone 1 (WQCV)	3.22		189.6	111.1	21,058		0.483	39,616	0.909
	3.50		191.8	113.3	21,737		0.499	45,607	1.047
	4.00		195.8	117.3	22,973		0.527	56,784	1.304
	4.50		199.8	121.3	24,242		0.557	68,586	1.575
	5.00		203.8	125.3	25,543		0.586	81,031	1.860
	5.50		207.8	129.3	26,875		0.617	94,134	2.161
	6.00		211.8	133.3	28,240		0.648	107,912	2.477
Zone 2 (EURV)	6.03		212.1	133.6	28,323		0.650	108,760	2.497
	6.50		215.8	137.3	29,636		0.680	122,379	2.809
	7.00		219.8	141.3	31,065		0.713	137,553	3.158
	7.50		223.8	145.3	32,525		0.747	153,449	3.523
	8.00		227.8	149.3	34,018		0.781	170,084	3.905
	8.50		231.8	153.3	35,543		0.816	187,473	4.304
	9.00		235.8	157.3	37,099		0.852	205,632	4.721
	9.50		239.8	161.3	38,688		0.888	224,577	5.156
	10.00		243.8	165.3	40,308		0.925	244,325	5.609
	10.50		247.8	169.3	41,961		0.963	264,891	6.081
	11.00		251.8	173.3	43,645		1.002	286,291	6.572
	11.50		255.8	177.3	45,362		1.041	308,541	7.083
	12.00		259.8	181.3	47,110		1.082	331,658	7.614
	12.50		263.8	185.3	48,891		1.122	355,657	8.165
	13.00		267.8	189.3	50,704		1.164	380,555	8.736
	13.50		271.8	193.3	52,548		1.206	406,366	9.329
	14.00		275.8	197.3	54,425		1.249	433,108	9.943
	14.50		279.8	201.3	56,333		1.293	460,796	10.578
	15.00		283.8	205.3	58,274		1.338	489,447	11.236
	15.50		287.8	209.3	60,246		1.383	519,076	11.916
	16.00		291.8	213.3	62,251		1.429	549,699	12.619
	16.50		295.8	217.3	64,288		1.476	581,332	13.346
	17.00		299.8	221.3	66,356		1.523	613,991	14.095
	17.50		303.8	225.3	68,457		1.572	647,693	14.869
	18.00		307.8	229.3	70,589		1.621	682,453	15.667
	18.50		311.8	233.3	72,754		1.670	718,288	16.490
	19.00		315.8	237.3	74,950		1.721	755,213	17.337
	19.50		319.8	241.3	77,179		1.772	793,244	18.210
	20.00		323.8	245.3	79,440		1.824	832,397	19.109
	20.50		327.8	249.3	81,732		1.876	872,688	20.034
	21.00		331.8	253.3	84,057		1.930	914,134	20.986
	21.50		335.8	257.3	86,413		1.984	956,750	21.964
	22.00		339.8	261.3	88,802		2.039	1,000,553	22.970
	22.50		343.8	265.3	91,222		2.094	1,045,558	24.003
	23.00		347.8	269.3	93,675		2.150	1,091,781	25.064
	23.50		351.8	273.3	96,159		2.208	1,139,238	26.153
	24.00		355.8	277.3	98,676		2.265	1,187,945	27.271
	24.50		359.8	281.3	101,225		2.324	1,237,919	28.419
	25.00		363.8	285.3	103,805		2.383	1,289,175	29.595
	25.50		367.8	289.3	106,418		2.443	1,341,730	30.802
	26.00		371.8	293.3	109,062		2.504	1,395,598	32.039
	26.50		375.8	297.3	111,739		2.565	1,450,797	33.306
	27.00		379.8	301.3	114,447		2.627	1,507,342	34.604
	27.50		383.8	305.3	117,188		2.690	1,565,250	35.933
	28.00		387.8	309.3	119,961		2.754	1,624,536	37.294
	28.50		391.8	313.3	122,765		2.818	1,685,216	38.687
	29.00		395.8	317.3	125,602		2.883	1,747,306	40.113
	29.50		399.8	321.3	128,470		2.949	1,810,823	41.571
	30.00		403.8	325.3	131,371		3.016	1,875,782	43.062

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley Oklahoma Basin - Option 4 LID

Basin ID: D_EURV_1172



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.22	0.909	Orifice Plate
Zone 2 (EURV)	6.03	1.582	Weir&Pipe (Restrict)
Zone 3			
Total (all zones)		2.490	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	2.222E-02	ft^2
Depth at top of Zone using Orifice Plate =	3.22	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	12.90	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	3.20	sq. inches (diameter = 2 inches)	Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.07	2.15					
Orifice Area (sq. inches)	3.20	3.20	3.20					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected		Calculated Parameters for Vertical Orifice		
				Not Selected	Not Selected	
Invert of Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =		ft^2
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =		feet
Vertical Orifice Diameter =			inches			

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected		Calculated Parameters for Overflow Weir		
				Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.22		ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.22	feet
Overflow Weir Front Edge Length =	4.00		feet	Overflow Weir Slope Length =	4.00	feet
Overflow Weir Grate Slope =	0.00		H:V	Grate Open Area / 100-yr Orifice Area =	451.28	
Horiz. Length of Weir Sides =	4.00		feet	Overflow Grate Open Area w/o Debris =	11.14	ft^2
Overflow Grate Type =	Type C Grate			Overflow Grate Open Area w/ Debris =	5.57	ft^2
Debris Clogging % =	50%		%			

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate		
				Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	18.00		ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.02	ft^2
Outlet Pipe Diameter =	6.00		inches	Outlet Orifice Centroid =	0.05	feet
Restrictor Plate Height Above Pipe Invert =	1.10		inches	Half-Central Angle of Restrictor Plate on Pipe =	0.88	N/A radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=	6.10	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	1.40	feet
Spillway Crest Length =	20.00	feet	Stage at Top of Freeboard =	8.50	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.82	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	4.30	acre-ft

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

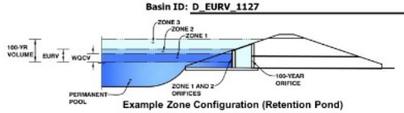
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.95	1.35	1.63	1.69	2.28	2.58	3.14
CUHP Runoff Volume (acre-ft) =	0.909	2.490	1.608	2.539	3.516	4.124	6.771	8.583	11.364
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.608	2.539	3.516	4.124	6.771	8.583	11.364
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.4	1.0	8.8	17.9	45.1	62.8	90.0
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.02	0.15	0.30	0.75	1.04	1.49
Peak Inflow Q (cfs) =	N/A	N/A	19.7	32.0	46.0	58.8	98.5	122.5	161.6
Peak Outflow Q (cfs) =	0.5	0.6	0.6	0.6	12.1	21.9	65.5	95.1	139.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.6	1.4	1.2	1.5	1.5	1.5
Structure Controlling Flow =	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	-0.01	0.00	0.0	0.0	0.0	0.0	0.0	0.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	68	52	70	71	70	65	62	58
Time to Drain 99% of Inflow Volume (hours) =	**40**	72	55	74	76	76	74	72	70
Maximum Ponding Depth (ft) =	3.22	6.02	4.37	5.91	6.42	6.58	7.06	7.30	7.61
Area at Maximum Ponding Depth (acres) =	0.48	0.65	0.55	0.64	0.68	0.68	0.72	0.73	0.75
Maximum Volume Stored (acre-ft) =	0.909	2.490	1.497	2.419	2.755	2.857	3.194	3.375	3.605

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley Oklahoma Basin - Option 4 LID

Basin ID: D_EURV_1127



Example Zone Configuration (Retention Pond)

Watershed Information — **Area > 1 sq.mi. for WQ Facility**

Selected BMP Type =	EDB	
Watershed Area =	834.49	acres
Watershed Length =	11,616	ft
Watershed Length to Centroid =	5,808	ft
Watershed Slope =	0.011	ft/ft
Watershed Imperviousness =	41.11%	percent
Percentage Hydrologic Soil Group A =	68.7%	percent
Percentage Hydrologic Soil Group B =	9.1%	percent
Percentage Hydrologic Soil Groups C/D =	22.2%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	12.710	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	36.104	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 0.95 in.) =	22.338	acre-feet	0.95 inches
5-yr Runoff Volume (P1 = 1.35 in.) =	35.283	acre-feet	1.35 inches
10-yr Runoff Volume (P1 = 1.63 in.) =	46.461	acre-feet	1.63 inches
25-yr Runoff Volume (P1 = 1.69 in.) =	54.677	acre-feet	inches
50-yr Runoff Volume (P1 = 2.28 in.) =	90.285	acre-feet	2.28 inches
100-yr Runoff Volume (P1 = 2.58 in.) =	114.756	acre-feet	2.58 inches
500-yr Runoff Volume (P1 = 3.14 in.) =	153.272	acre-feet	inches
Approximate 2-yr Detention Volume =	19.978	acre-feet	
Approximate 5-yr Detention Volume =	31.236	acre-feet	
Approximate 10-yr Detention Volume =	39.458	acre-feet	
Approximate 25-yr Detention Volume =	42.533	acre-feet	
Approximate 50-yr Detention Volume =	56.089	acre-feet	
Approximate 100-yr Detention Volume =	65.645	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	12.710	acre-feet
Zone 2 Volume (EURV - Zone 1) =	23.394	acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	36.104	acre-feet
Initial Surcharge Volume (ISV) =	578	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{TOTAL}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.003	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Initial Surcharge Area (A_{ISV}) =	1,752	ft^2
Surcharge Volume Length (L_{ISV}) =	41.9	ft
Surcharge Volume Width (W_{ISV}) =	41.9	ft
Depth of Basin Floor (H_{FLOOR}) =	2.61	ft
Length of Basin Floor (L_{FLOOR}) =	922.3	ft
Width of Basin Floor (W_{FLOOR}) =	476.9	ft
Area of Basin Floor (A_{FLOOR}) =	439,796	ft^2
Volume of Basin Floor (V_{FLOOR}) =	408,292	ft^3
Depth of Main Basin (H_{MAIN}) =	2.56	ft
Length of Main Basin (L_{MAIN}) =	942.8	ft
Width of Main Basin (W_{MAIN}) =	497.3	ft
Area of Main Basin (A_{MAIN}) =	468,869	ft^2
Volume of Main Basin (V_{MAIN}) =	1,162,893	ft^3
Calculated Total Basin Volume (V_{total}) =	**36.103**	acre-feet

Total detention volume is less than 100-year volume.

Depth Increment = 0.50 ft

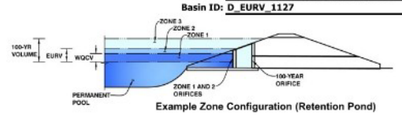
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		41.9	41.9	1,752		0.040		
ISV	0.33		41.9	41.9	1,752		0.040	578	0.013
	0.50		41.9	41.9	1,752		0.040	876	0.020
	1.00		99.2	70.2	6,962		0.160	2,148	0.049
	1.50		267.9	153.5	41,122		0.944	12,998	0.298
	2.00		436.5	236.9	103,393		2.374	47,956	1.101
	2.50		605.2	320.2	193,775		4.448	121,076	2.780
	3.00		773.9	403.5	312,268		7.169	246,416	5.657
Floor	3.44		922.3	476.9	439,796		10.096	411,071	9.437
	3.50		922.8	477.3	440,467		10.112	437,479	10.043
Zone 1 (WQCV)	3.77		924.9	479.5	443,496		10.181	556,814	12.783
	4.00		926.8	481.3	446,084		10.241	659,116	15.131
	4.50		930.8	485.3	451,732		10.370	883,568	20.284
	5.00		934.8	489.3	457,413		10.501	1,110,853	25.502
	5.50		938.8	493.3	463,125		10.632	1,340,986	30.785
Zone 2 (EURV)	6.00		942.8	497.3	468,869		10.764	1,573,984	36.134
	6.50		946.8	501.3	474,646		10.896	1,809,861	41.549
	7.00		950.8	505.3	480,454		11.030	2,048,635	47.030
	7.50		954.8	509.3	486,295		11.164	2,290,321	52.579
	8.00		958.8	513.3	492,167		11.299	2,534,935	58.194
	8.50		962.8	517.3	498,071		11.434	2,782,493	63.877
	9.00		966.8	521.3	504,008		11.570	3,033,011	69.628
	9.50		970.8	525.3	509,976		11.707	3,286,506	75.448
	10.00		974.8	529.3	515,977		11.845	3,542,993	81.336
	10.50		978.8	533.3	522,009		11.984	3,802,488	87.293
	11.00		982.8	537.3	528,073		12.123	4,065,007	93.320
	11.50		986.8	541.3	534,170		12.263	4,330,567	99.416
	12.00		990.8	545.3	540,298		12.404	4,599,183	105.583
	12.50		994.8	549.3	546,459		12.545	4,870,871	111.820
	13.00		998.8	553.3	552,651		12.687	5,145,647	118.128
	13.50		1,002.8	557.3	558,876		12.830	5,423,527	124.507
	14.00		1,006.8	561.3	565,132		12.974	5,704,528	130.958
	14.50		1,010.8	565.3	571,420		13.118	5,988,664	137.481
	15.00		1,014.8	569.3	577,741		13.263	6,275,953	144.076
	15.50		1,018.8	573.3	584,093		13.409	6,566,410	150.744
	16.00		1,022.8	577.3	590,478		13.555	6,860,052	157.485
	16.50		1,026.8	581.3	596,894		13.703	7,156,893	164.300
	17.00		1,030.8	585.3	603,342		13.851	7,456,951	171.188
	17.50		1,034.8	589.3	609,823		14.000	7,760,241	178.151
	18.00		1,038.8	593.3	616,335		14.149	8,066,779	185.188
	18.50		1,042.8	597.3	622,880		14.299	8,376,582	192.300
	19.00		1,046.8	601.3	629,456		14.450	8,689,664	199.487
	19.50		1,050.8	605.3	636,064		14.602	9,006,043	206.750
	20.00		1,054.8	609.3	642,705		14.754	9,325,734	214.089
	20.50		1,058.8	613.3	649,377		14.908	9,648,753	221.505
	21.00		1,062.8	617.3	656,082		15.062	9,975,117	228.997
	21.50		1,066.8	621.3	662,818		15.216	10,304,840	236.567
	22.00		1,070.8	625.3	669,586		15.372	10,637,940	244.213
	22.50		1,074.8	629.3	676,387		15.528	10,974,432	251.938
	23.00		1,078.8	633.3	683,219		15.685	11,314,332	259.741
	23.50		1,082.8	637.3	690,084		15.842	11,657,657	267.623
	24.00		1,086.8	641.3	696,980		16.000	12,004,421	275.584
	24.50		1,090.8	645.3	703,909		16.160	12,354,642	283.624
	25.00		1,094.8	649.3	710,869		16.319	12,708,335	291.743
	25.50		1,098.8	653.3	717,861		16.480	13,065,516	299.943
	26.00		1,102.8	657.3	724,886		16.641	13,426,202	308.223
	26.50		1,106.8	661.3	731,942		16.803	13,790,407	316.584
	27.00		1,110.8	665.3	739,031		16.966	14,158,149	325.026
	27.50		1,114.8	669.3	746,151		17.129	14,529,443	333.550
	28.00		1,118.8	673.3	753,303		17.293	14,904,306	342.156
	28.50		1,122.8	677.3	760,488		17.458	15,282,752	350.844
	29.00		1,126.8	681.3	767,704		17.624	15,664,799	359.614
	29.50		1,130.8	685.3	774,953		17.790	16,050,462	368.468
	30.00		1,134.8	689.3	782,233		17.958	16,439,757	377.405

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley Oklahoma Basin - Option 4 LID

Basin ID: D_EURV_1127



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.77	12.710	Orifice Plate
Zone 2 (EURV)	6.00	23.394	Rectangular Orifice
Zone 3			
Total (all zones)		36.104	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	2.639E-01	ft^2
Depth at top of Zone using Orifice Plate =	3.77	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	18.00	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	38.00	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.50	3.00					
Orifice Area (sq. inches)	38.00	38.00	38.00					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangular	Not Selected		Calculated Parameters for Vertical Orifice	Zone 2 Rectangular	Not Selected	
Invert of Vertical Orifice =	3.77		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.50		ft^2
Depth at top of Zone using Vertical Orifice =	6.00		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.25		feet
Vertical Orifice Height =	6.00		inches				
Vertical Orifice Width =	12.00		inches				

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Not Selected	Not Selected		Calculated Parameters for Overflow Weir	Not Selected	Not Selected	
Overflow Weir Front Edge Height, Ho =			ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =			feet
Overflow Weir Front Edge Length =			feet	Overflow Weir Slope Length =			feet
Overflow Weir Grate Slope =			H:V	Grate Open Area / 100-yr Orifice Area =			
Horiz. Length of Weir Sides =			feet	Overflow Grate Open Area w/o Debris =			ft^2
Overflow Grate Type =				Overflow Grate Open Area w/ Debris =			ft^2
Debris Clogging % =			%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Not Selected	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =			ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =			ft^2
Circular Orifice Diameter =			inches	Outlet Orifice Centroid =			feet
				Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=	6.50	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	2.04	feet
Spillway Crest Length =	40.00	feet	Stage at Top of Freeboard =	9.54	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	11.72	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	75.92	acre-ft

Routed Hydrograph Results — *The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).*

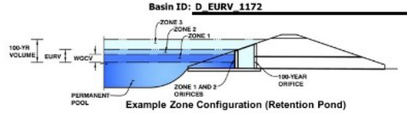
	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =									
One-Hour Rainfall Depth (in) =	N/A	N/A	0.95	1.35	1.63	1.69	2.28	2.58	3.14
CUHP Runoff Volume (acre-ft) =	12.710	36.104	22.338	35.283	46.461	54.677	90.285	114.756	153.272
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	22.338	35.283	46.461	54.677	90.285	114.756	153.272
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	2.2	6.2	32.3	91.9	278.3	427.6	648.9
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.01	0.04	0.11	0.33	0.51	0.78
Peak Inflow Q (cfs) =	N/A	N/A	159.5	258.4	345.0	452.7	775.7	997.7	1337.4
Peak Outflow Q (cfs) =	5.5	11.4	8.1	10.8	18.6	64.9	290.0	469.7	765.4
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.7	0.6	0.7	1.0	1.1	1.2
Structure Controlling Flow =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	68	54	68	77	77	74	71	67
Time to Drain 99% of Inflow Volume (hours) =	**40**	71	57	72	82	82	81	80	79
Maximum Ponding Depth (ft) =	3.77	6.00	4.51	5.67	6.64	7.05	8.11	8.68	9.44
Area at Maximum Ponding Depth (acres) =	10.18	10.76	10.37	10.68	10.93	11.04	11.33	11.48	11.69
Maximum Volume Stored (acre-ft) =	12.783	36.134	20.284	32.596	42.967	47.582	59.325	65.940	74.746

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley Oklahoma Basin - Option 4 LID

Basin ID: D_EURV_1172



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	49.41	acres
Watershed Length =	3,736	ft
Watershed Length to Centroid =	2,451	ft
Watershed Slope =	0.026	ft/ft
Watershed Imperviousness =	9.72%	percent
Percentage Hydrologic Soil Group A =	96.9%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	3.1%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.269	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.352	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.95 in.) =	0.074	acre-feet	0.95	inches
5-yr Runoff Volume (P1 = 1.35 in.) =	0.237	acre-feet	1.35	inches
10-yr Runoff Volume (P1 = 1.63 in.) =	0.350	acre-feet	1.63	inches
25-yr Runoff Volume (P1 = 1.69 in.) =	0.463	acre-feet		inches
50-yr Runoff Volume (P1 = 2.28 in.) =	1.942	acre-feet	2.28	inches
100-yr Runoff Volume (P1 = 2.58 in.) =	3.021	acre-feet	2.58	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	5.005	acre-feet		inches
Approximate 2-yr Detention Volume =	0.170	acre-feet		
Approximate 5-yr Detention Volume =	0.273	acre-feet		
Approximate 10-yr Detention Volume =	0.372	acre-feet		
Approximate 25-yr Detention Volume =	0.454	acre-feet		
Approximate 50-yr Detention Volume =	0.725	acre-feet		
Approximate 100-yr Detention Volume =	1.191	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.269	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.082	acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	0.352	acre-feet
Initial Surcharge Volume (ISV) =	35	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{TOTAL}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.003	ft/ft
Slopes of Main Basin Sides (S_{MAIN}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Initial Surcharge Area (A_{ISV}) =	107	ft^2
Surcharge Volume Length (L_{ISV}) =	10.3	ft
Surcharge Volume Width (W_{ISV}) =	10.3	ft
Depth of Basin Floor (H_{FLOOR}) =	0.09	ft
Length of Basin Floor (L_{FLOOR}) =	40.7	ft
Width of Basin Floor (W_{FLOOR}) =	25.3	ft
Area of Basin Floor (A_{FLOOR}) =	1,030	ft^2
Volume of Basin Floor (V_{FLOOR}) =	44	ft^3
Depth of Main Basin (H_{MAIN}) =	5.08	ft
Length of Main Basin (L_{MAIN}) =	81.3	ft
Width of Main Basin (W_{MAIN}) =	66.0	ft
Area of Main Basin (A_{MAIN}) =	5,365	ft^2
Volume of Main Basin (V_{MAIN}) =	14,811	ft^3
Calculated Total Basin Volume (V_{total}) =	**0.343**	acre-feet

Total detention volume is less than 100-year volume.

Depth Increment = 0.50 ft

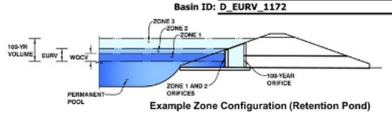
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		10.3	10.3	107		0.002		
ISV	0.33		10.3	10.3	107		0.002	35	0.001
	0.50		10.3	10.3	107		0.002	53	0.001
Floor	0.92		40.7	25.3	1,030		0.024	133	0.003
	1.00		41.3	26.0	1,073		0.025	217	0.005
	1.50		45.3	30.0	1,358		0.031	824	0.019
	2.00		49.3	34.0	1,676		0.038	1,581	0.036
	2.50		53.3	38.0	2,025		0.046	2,504	0.057
	3.00		57.3	42.0	2,406		0.055	3,611	0.083
	3.50		61.3	46.0	2,819		0.065	4,916	0.113
	4.00		65.3	50.0	3,264		0.075	6,435	0.148
	4.50		69.3	54.0	3,741		0.086	8,185	0.188
	5.00		73.3	58.0	4,251		0.098	10,182	0.234
Zone 1 (WQCV)	5.35		76.1	60.8	4,626		0.106	11,735	0.269
	5.50		77.3	62.0	4,792		0.110	12,441	0.286
	6.00		81.3	66.0	5,365		0.123	14,979	0.344
Zone 2 (EURV)	6.07		81.9	66.5	5,448		0.125	15,357	0.353
	6.50		85.3	70.0	5,970		0.137	17,811	0.409
	7.00		89.3	74.0	6,607		0.152	20,954	0.481
	7.50		93.3	78.0	7,276		0.167	24,424	0.561
	8.00		97.3	82.0	7,978		0.183	28,236	0.648
	8.50		101.3	86.0	8,711		0.200	32,407	0.744
	9.00		105.3	90.0	9,476		0.218	36,952	0.848
	9.50		109.3	94.0	10,273		0.236	41,888	0.962
	10.00		113.3	98.0	11,102		0.255	47,231	1.084
	10.50		117.3	102.0	11,964		0.275	52,996	1.217
	11.00		121.3	106.0	12,857		0.295	59,200	1.359
	11.50		125.3	110.0	13,782		0.316	65,858	1.512
	12.00		129.3	114.0	14,739		0.338	72,987	1.676
	12.50		133.3	118.0	15,728		0.361	80,602	1.850
	13.00		137.3	122.0	16,749		0.385	88,720	2.037
	13.50		141.3	126.0	17,803		0.409	97,357	2.235
	14.00		145.3	130.0	18,888		0.434	106,528	2.446
	14.50		149.3	134.0	20,005		0.459	116,250	2.669
	15.00		153.3	138.0	21,154		0.486	126,539	2.905
	15.50		157.3	142.0	22,335		0.513	137,410	3.154
	16.00		161.3	146.0	23,548		0.541	148,879	3.418
	16.50		165.3	150.0	24,794		0.569	160,963	3.695
	17.00		169.3	154.0	26,071		0.599	173,678	3.987
	17.50		173.3	158.0	27,380		0.629	187,040	4.294
	18.00		177.3	162.0	28,721		0.659	201,064	4.616
	18.50		181.3	166.0	30,094		0.691	215,766	4.953
	19.00		185.3	170.0	31,500		0.723	231,163	5.307
	19.50		189.3	174.0	32,937		0.756	247,271	5.677
	20.00		193.3	178.0	34,406		0.790	264,105	6.063
	20.50		197.3	182.0	35,907		0.824	281,682	6.467
	21.00		201.3	186.0	37,440		0.860	300,018	6.887
	21.50		205.3	190.0	39,005		0.895	319,128	7.326
	22.00		209.3	194.0	40,603		0.932	339,028	7.783
	22.50		213.3	198.0	42,232		0.970	359,736	8.258
	23.00		217.3	202.0	43,893		1.008	381,266	8.753
	23.50		221.3	206.0	45,586		1.047	403,634	9.266
	24.00		225.3	210.0	47,311		1.086	426,857	9.799
	24.50		229.3	214.0	49,068		1.126	450,951	10.352
	25.00		233.3	218.0	50,858		1.168	475,931	10.926
	25.50		237.3	222.0	52,679		1.209	501,814	11.520
	26.00		241.3	226.0	54,532		1.252	528,615	12.135
	26.50		245.3	230.0	56,417		1.295	556,351	12.772
	27.00		249.3	234.0	58,334		1.339	585,038	13.431
	27.50		253.3	238.0	60,284		1.384	614,691	14.111
	28.00		257.3	242.0	62,265		1.429	645,327	14.815
	28.50		261.3	246.0	64,278		1.476	676,961	15.541
	29.00		265.3	250.0	66,323		1.523	709,610	16.290
	29.50		269.3	254.0	68,400		1.570	743,289	17.064
	30.00		273.3	258.0	70,509		1.619	778,015	17.861

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley Oklahoma Basin - Option 4 LID

Basin ID: D_EURV_1172



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	5.35	0.269	Orifice Plate
Zone 2 (EURV)	6.07	0.082	Weir&Pipe (Restrict)
Zone 3			
Total (all zones)		0.352	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A ft²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	5.556E-03 ft²
Depth at top of Zone using Orifice Plate =	5.35	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A feet
Orifice Plate: Orifice Vertical Spacing =	21.40	inches	Elliptical Slot Centroid =	N/A feet
Orifice Plate: Orifice Area per Row =	0.80	sq. inches (diameter = 1 inch)	Elliptical Slot Area =	N/A ft²

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.78	3.57					
Orifice Area (sq. inches)	0.80	0.80	0.80					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =			ft^2
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =			feet
Vertical Orifice Diameter =			inches				

Calculated Parameters for Vertical Orifice

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected			Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	5.35		ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	5.35		feet
Overflow Weir Front Edge Length =	4.00		feet	Overflow Weir Slope Length =	4.00		feet
Overflow Weir Grate Slope =	0.00		H:V	Grate Open Area / 100-yr Orifice Area =	288.33		
Horiz. Length of Weir Sides =	4.00		feet	Overflow Grate Open Area w/o Debris =	11.14		ft^2
Overflow Grate Type =	Type C Grate			Overflow Grate Open Area w/ Debris =	5.57		ft^2
Debris Clogging % =	50%		%				

Calculated Parameters for Overflow Weir

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Restrictor	Not Selected			Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	3.00		ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.04		ft^2
Outlet Pipe Diameter =	18.00		inches	Outlet Orifice Centroid =	0.05		feet
Restrictor Plate Height Above Pipe Invert =	1.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	0.48	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.10	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.49 feet
Spillway Crest Length =	20.00	feet	Stage at Top of Freeboard =	7.59 feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.17 acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	0.58 acre-ft

Calculated Parameters for Spillway

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

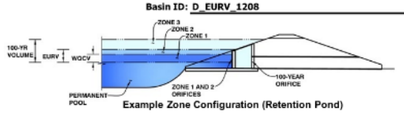
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.95	1.35	1.63	1.69	2.28	2.58	3.14
CUHP Runoff Volume (acre-ft) =	0.269	0.352	0.074	0.237	0.350	0.463	1.942	3.021	5.005
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.074	0.237	0.350	0.463	1.942	3.021	5.005
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.0	0.3	0.5	0.7	11.4	19.0	32.3
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.01	0.01	0.01	0.23	0.38	0.65
Peak Inflow Q (cfs) =	N/A	N/A	0.4	1.6	2.4	3.3	14.6	22.6	36.1
Peak Outflow Q (cfs) =	0.1	0.6	0.1	0.1	0.5	0.6	14.7	22.5	36.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.4	1.1	0.8	1.3	1.2	1.1
Structure Controlling Flow =	Overflow Weir 1	Outlet Plate 1	Plate	Plate	Outlet Plate 1	Outlet Plate 1	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	0.04	N/A	N/A	0.0	0.0	0.0	0.0	0.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	39	21	38	42	42	31	26	18
Time to Drain 99% of Inflow Volume (hours) =	**41**	43	22	40	45	46	41	37	33
Maximum Ponding Depth (ft) =	5.35	6.07	2.46	4.64	5.41	6.00	6.47	6.59	6.76
Area at Maximum Ponding Depth (acres) =	0.11	0.13	0.05	0.09	0.11	0.12	0.14	0.14	0.14
Maximum Volume Stored (acre-ft) =	0.269	0.353	0.056	0.200	0.276	0.343	0.403	0.420	0.444

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley Oklahoma Basin - Option 4 LID

Basin ID: D_EURV_1208



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	63.08	acres
Watershed Length =	3,086	ft
Watershed Length to Centroid =	1,279	ft
Watershed Slope =	0.029	ft/ft
Watershed Imperviousness =	31.75%	percent
Percentage Hydrologic Soil Group A =	90.3%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	9.7%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.824	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	2.014	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.95 in.) =	1.055	acre-feet	0.95	inches
5-yr Runoff Volume (P1 = 1.35 in.) =	1.760	acre-feet	1.35	inches
10-yr Runoff Volume (P1 = 1.63 in.) =	2.272	acre-feet	1.63	inches
25-yr Runoff Volume (P1 = 1.69 in.) =	2.655	acre-feet		inches
50-yr Runoff Volume (P1 = 2.28 in.) =	5.030	acre-feet	2.28	inches
100-yr Runoff Volume (P1 = 2.58 in.) =	6.631	acre-feet	2.58	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	9.421	acre-feet		inches
Approximate 2-yr Detention Volume =	1.046	acre-feet		
Approximate 5-yr Detention Volume =	1.614	acre-feet		
Approximate 10-yr Detention Volume =	2.061	acre-feet		
Approximate 25-yr Detention Volume =	2.320	acre-feet		
Approximate 50-yr Detention Volume =	3.166	acre-feet		
Approximate 100-yr Detention Volume =	3.860	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.824	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.189	acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	2.014	acre-feet
Initial Surcharge Volume (ISV) =	108	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{Total}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.003	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Total detention volume is less than 100-year volume.

Initial Surcharge Area (A_{ISV}) =	326	ft^2
Surcharge Volume Length (L_{ISV}) =	18.1	ft
Surcharge Volume Width (W_{ISV}) =	18.1	ft
Depth of Basin Floor (H_{FLOOR}) =	0.40	ft
Length of Basin Floor (L_{FLOOR}) =	153.0	ft
Width of Basin Floor (W_{FLOOR}) =	84.7	ft
Area of Basin Floor (A_{FLOOR}) =	12,964	ft^2
Volume of Basin Floor (V_{FLOOR}) =	2,046	ft^3
Depth of Main Basin (H_{MAIN}) =	4.77	ft
Length of Main Basin (L_{MAIN}) =	191.2	ft
Width of Main Basin (W_{MAIN}) =	122.9	ft
Area of Main Basin (A_{MAIN}) =	23,493	ft^2
Volume of Main Basin (V_{MAIN}) =	85,715	ft^3
Calculated Total Basin Volume (V_{total}) =	**2.021**	acre-feet

Depth Increment = 0.50 ft

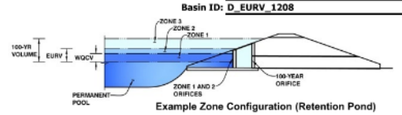
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		18.1	18.1	326		0.007		
ISV	0.33		18.1	18.1	326		0.007	108	0.002
	0.50		18.1	18.1	326		0.007	163	0.004
	1.00		75.4	46.4	3,499		0.080	550	0.013
Floor	1.23		153.0	84.7	12,964		0.298	2,329	0.053
	1.50		155.2	86.9	13,483		0.310	5,900	0.135
	2.00		159.2	90.9	14,467		0.332	12,886	0.296
	2.50		163.2	94.9	15,483		0.355	20,372	0.468
	3.00		167.2	98.9	16,531		0.380	28,374	0.651
Zone 1 (WQCV)	3.45		170.8	102.5	17,502		0.402	36,030	0.827
	3.50		171.2	102.9	17,611		0.404	36,908	0.847
	4.00		175.2	106.9	18,724		0.430	45,991	1.056
	4.50		179.2	110.9	19,868		0.456	55,637	1.277
	5.00		183.2	114.9	21,044		0.483	65,864	1.512
	5.50		187.2	118.9	22,252		0.511	76,687	1.760
Zone 2 (EURV)	5.99		191.1	122.8	23,467		0.539	87,887	2.018
	6.00		191.2	122.9	23,493		0.539	88,122	2.023
	6.50		195.2	126.9	24,765		0.569	100,185	2.300
	7.00		199.2	130.9	26,069		0.598	112,892	2.592
	7.50		203.2	134.9	27,405		0.629	126,259	2.899
	8.00		207.2	138.9	28,773		0.661	140,302	3.221
	8.50		211.2	142.9	30,174		0.693	155,038	3.559
	9.00		215.2	146.9	31,606		0.726	170,481	3.914
	9.50		219.2	150.9	33,070		0.759	186,649	4.285
	10.00		223.2	154.9	34,566		0.794	203,557	4.673
	10.50		227.2	158.9	36,095		0.829	221,220	5.079
	11.00		231.2	162.9	37,655		0.864	239,656	5.502
	11.50		235.2	166.9	39,247		0.901	258,881	5.943
	12.00		239.2	170.9	40,871		0.938	278,909	6.403
	12.50		243.2	174.9	42,527		0.976	299,757	6.881
	13.00		247.2	178.9	44,216		1.015	321,442	7.379
	13.50		251.2	182.9	45,936		1.055	343,978	7.897
	14.00		255.2	186.9	47,688		1.095	367,383	8.434
	14.50		259.2	190.9	49,472		1.136	391,671	8.992
	15.00		263.2	194.9	51,289		1.177	416,860	9.570
	15.50		267.2	198.9	53,137		1.220	442,965	10.169
	16.00		271.2	202.9	55,017		1.263	470,002	10.790
	16.50		275.2	206.9	56,929		1.307	497,988	11.432
	17.00		279.2	210.9	58,873		1.352	526,937	12.097
	17.50		283.2	214.9	60,850		1.397	556,866	12.784
	18.00		287.2	218.9	62,858		1.443	587,792	13.494
	18.50		291.2	222.9	64,898		1.490	619,729	14.227
	19.00		295.2	226.9	66,970		1.537	652,695	14.984
	19.50		299.2	230.9	69,074		1.586	686,705	15.765
	20.00		303.2	234.9	71,211		1.635	721,775	16.570
	20.50		307.2	238.9	73,379		1.685	757,921	17.399
	21.00		311.2	242.9	75,579		1.735	795,159	18.254
	21.50		315.2	246.9	77,811		1.786	833,506	19.135
	22.00		319.2	250.9	80,076		1.838	872,976	20.041
	22.50		323.2	254.9	82,372		1.891	913,587	20.973
	23.00		327.2	258.9	84,700		1.944	955,353	21.932
	23.50		331.2	262.9	87,060		1.999	998,292	22.918
	24.00		335.2	266.9	89,452		2.054	1,042,419	23.931
	24.50		339.2	270.9	91,877		2.109	1,087,750	24.971
	25.00		343.2	274.9	94,333		2.166	1,134,301	26.040
	25.50		347.2	278.9	96,821		2.223	1,182,088	27.137
	26.00		351.2	282.9	99,341		2.281	1,231,127	28.263
	26.50		355.2	286.9	101,894		2.339	1,281,435	29.418
	27.00		359.2	290.9	104,478		2.398	1,333,026	30.602
	27.50		363.2	294.9	107,094		2.459	1,385,918	31.816
	28.00		367.2	298.9	109,742		2.519	1,440,125	33.061
	28.50		371.2	302.9	112,422		2.581	1,495,665	34.336
	29.00		375.2	306.9	115,135		2.643	1,552,553	35.642
	29.50		379.2	310.9	117,879		2.706	1,610,805	36.979
	30.00		383.2	314.9	120,655		2.770	1,670,437	38.348

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley Oklahoma Basin - Option 4 LID

Basin ID: D_EURV_1208



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.45	0.824	Orifice Plate
Zone 2 (EURV)	5.99	1.189	Weir&Pipe (Restrict)
Zone 3			
Total (all zones)		2.014	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	2.014E-02	ft^2
Depth at top of Zone using Orifice Plate =	3.45	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	13.80	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	2.90	sq. inches (diameter = 1-15/16 inches)	Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.15	2.30					
Orifice Area (sq. inches)	2.90	2.90	2.90					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected		Calculated Parameters for Vertical Orifice		
				Not Selected	Not Selected	
Invert of Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =		ft^2
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =		feet
Vertical Orifice Diameter =			inches			

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected		Calculated Parameters for Overflow Weir		
				Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.45		ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.45	feet
Overflow Weir Front Edge Length =	4.00		feet	Overflow Weir Slope Length =	4.00	feet
Overflow Weir Grate Slope =	0.00		H:V	Grate Open Area / 100-yr Orifice Area =	288.33	
Horiz. Length of Weir Sides =	4.00		feet	Overflow Grate Open Area w/o Debris =	11.14	ft^2
Overflow Grate Type =	Type C Grate			Overflow Grate Open Area w/ Debris =	5.57	ft^2
Debris Clogging % =	50%		%			

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate		
				Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	3.00		ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.04	ft^2
Outlet Pipe Diameter =	18.00		inches	Outlet Orifice Centroid =	0.05	feet
Restrictor Plate Height Above Pipe Invert =	1.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	0.48	N/A radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=	6.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	1.11	feet
Spillway Crest Length =	20.00	feet	Stage at Top of Freeboard =	8.11	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.67	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	3.29	acre-ft

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

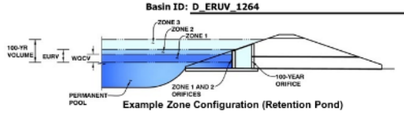
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.95	1.35	1.63	1.69	2.28	2.58	3.14
CUHP Runoff Volume (acre-ft) =	0.824	2.014	1.055	1.760	2.272	2.655	5.030	6.631	9.421
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.055	1.760	2.272	2.655	5.030	6.631	9.421
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.2	0.7	1.1	3.7	28.3	44.4	71.6
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.01	0.02	0.06	0.45	0.70	1.14
Peak Inflow Q (cfs) =	N/A	N/A	10.5	18.5	24.3	30.7	63.7	83.1	117.5
Peak Outflow Q (cfs) =	0.4	0.6	0.5	0.5	2.4	8.1	40.1	64.7	103.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.8	2.2	2.2	1.4	1.5	1.4
Structure Controlling Flow =	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	-0.01	0.00	0.0	0.0	0.0	0.0	0.0	0.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	63	44	59	66	65	60	57	52
Time to Drain 99% of Inflow Volume (hours) =	**41**	67	47	62	71	70	68	66	64
Maximum Ponding Depth (ft) =	3.45	5.99	3.78	5.27	6.10	6.25	6.71	6.95	7.26
Area at Maximum Ponding Depth (acres) =	0.40	0.54	0.42	0.50	0.54	0.55	0.58	0.60	0.61
Maximum Volume Stored (acre-ft) =	0.827	2.018	0.958	1.639	2.072	2.154	2.415	2.562	2.749

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley Oklahoma Basin - Option 4 LID

Basin ID: D_ERUV_1264



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	39.53	acres
Watershed Length =	2,783	ft
Watershed Length to Centroid =	1,135	ft
Watershed Slope =	0.028	ft/ft
Watershed Imperviousness =	10.13%	percent
Percentage Hydrologic Soil Group A =	47.1%	percent
Percentage Hydrologic Soil Group B =	52.4%	percent
Percentage Hydrologic Soil Groups C/D =	0.5%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.223	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	0.338	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 0.95 in.) =	0.140	acre-feet	0.95 inches
5-yr Runoff Volume (P1 = 1.35 in.) =	0.310	acre-feet	1.35 inches
10-yr Runoff Volume (P1 = 1.63 in.) =	0.777	acre-feet	1.63 inches
25-yr Runoff Volume (P1 = 1.69 in.) =	1.282	acre-feet	inches
50-yr Runoff Volume (P1 = 2.28 in.) =	2.839	acre-feet	2.28 inches
100-yr Runoff Volume (P1 = 2.58 in.) =	4.079	acre-feet	2.58 inches
500-yr Runoff Volume (P1 = 3.14 in.) =	5.814	acre-feet	inches
Approximate 2-yr Detention Volume =	0.168	acre-feet	
Approximate 5-yr Detention Volume =	0.284	acre-feet	
Approximate 10-yr Detention Volume =	0.524	acre-feet	
Approximate 25-yr Detention Volume =	0.657	acre-feet	
Approximate 50-yr Detention Volume =	0.886	acre-feet	
Approximate 100-yr Detention Volume =	1.248	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.223	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.115	acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	0.338	acre-feet
Initial Surcharge Volume (ISV) =	29	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{Total}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.003	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Initial Surcharge Area (A_{ISV}) =	88	ft^2
Surcharge Volume Length (L_{ISV}) =	9.4	ft
Surcharge Volume Width (W_{ISV}) =	9.4	ft
Depth of Basin Floor (H_{FLOOR}) =	0.09	ft
Length of Basin Floor (L_{FLOOR}) =	39.8	ft
Width of Basin Floor (W_{FLOOR}) =	24.4	ft
Area of Basin Floor (A_{FLOOR}) =	970	ft^2
Volume of Basin Floor (V_{FLOOR}) =	41	ft^3
Depth of Main Basin (H_{MAIN}) =	5.08	ft
Length of Main Basin (L_{MAIN}) =	80.4	ft
Width of Main Basin (W_{MAIN}) =	65.0	ft
Area of Main Basin (A_{MAIN}) =	5,229	ft^2
Volume of Main Basin (V_{MAIN}) =	14,312	ft^3
Calculated Total Basin Volume (V_{total}) =	**0.331**	acre-feet

Total detention volume is less than 100-year volume.

Depth Increment = 0.50 ft

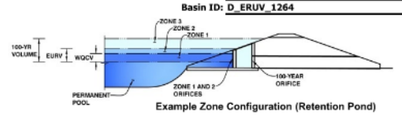
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		9.4	9.4	88		0.002		
ISV	0.33		9.4	9.4	88		0.002	29	0.001
	0.50		9.4	9.4	88		0.002	44	0.001
Floor	0.92		39.8	24.4	970		0.022	114	0.003
	1.00		40.4	25.0	1,012		0.023	193	0.004
	1.50		44.4	29.0	1,289		0.030	767	0.018
	2.00		48.4	33.0	1,599		0.037	1,488	0.034
	2.50		52.4	37.0	1,941		0.045	2,372	0.054
	3.00		56.4	41.0	2,315		0.053	3,435	0.079
	3.50		60.4	45.0	2,721		0.062	4,692	0.108
	4.00		64.4	49.0	3,158		0.073	6,160	0.141
	4.50		68.4	53.0	3,628		0.083	7,856	0.180
Zone 1 (WQCV)	4.99		72.3	57.0	4,119		0.095	9,752	0.224
	5.00		72.4	57.0	4,130		0.095	9,794	0.225
	5.50		76.4	61.0	4,664		0.107	11,991	0.275
	6.00		80.4	65.0	5,229		0.120	14,463	0.332
Zone 2 (EURV)	6.06		80.9	65.5	5,299		0.122	14,779	0.339
	6.50		84.4	69.0	5,827		0.134	17,225	0.395
	7.00		88.4	73.0	6,457		0.148	20,295	0.466
	7.50		92.4	77.0	7,119		0.163	23,688	0.544
	8.00		96.4	81.0	7,812		0.179	27,419	0.629
	8.50		100.4	85.0	8,538		0.196	31,505	0.723
	9.00		104.4	89.0	9,296		0.213	35,963	0.826
	9.50		108.4	93.0	10,086		0.232	40,807	0.937
	10.00		112.4	97.0	10,907		0.250	46,054	1.057
	10.50		116.4	101.0	11,761		0.270	51,720	1.187
	11.00		120.4	105.0	12,647		0.290	57,820	1.327
	11.50		124.4	109.0	13,565		0.311	64,372	1.478
	12.00		128.4	113.0	14,515		0.333	71,390	1.639
	12.50		132.4	117.0	15,496		0.356	78,892	1.811
	13.00		136.4	121.0	16,510		0.379	86,892	1.995
	13.50		140.4	125.0	17,556		0.403	95,407	2.190
	14.00		144.4	129.0	18,634		0.428	104,453	2.398
	14.50		148.4	133.0	19,743		0.453	114,046	2.618
	15.00		152.4	137.0	20,885		0.479	124,202	2.851
	15.50		156.4	141.0	22,059		0.506	134,937	3.098
	16.00		160.4	145.0	23,265		0.534	146,266	3.358
	16.50		164.4	149.0	24,502		0.562	158,207	3.632
	17.00		168.4	153.0	25,772		0.592	170,774	3.920
	17.50		172.4	157.0	27,074		0.622	183,984	4.224
	18.00		176.4	161.0	28,408		0.652	197,853	4.542
	18.50		180.4	165.0	29,774		0.684	212,397	4.876
	19.00		184.4	169.0	31,171		0.716	227,632	5.226
	19.50		188.4	173.0	32,601		0.748	243,574	5.592
	20.00		192.4	177.0	34,063		0.782	260,239	5.974
	20.50		196.4	181.0	35,557		0.816	277,642	6.374
	21.00		200.4	185.0	37,082		0.851	295,801	6.791
	21.50		204.4	189.0	38,640		0.887	314,730	7.225
	22.00		208.4	193.0	40,230		0.924	334,446	7.678
	22.50		212.4	197.0	41,852		0.961	354,965	8.149
	23.00		216.4	201.0	43,505		0.999	376,303	8.639
	23.50		220.4	205.0	45,191		1.037	398,476	9.148
	24.00		224.4	209.0	46,909		1.077	421,500	9.676
	24.50		228.4	213.0	48,659		1.117	445,390	10.225
	25.00		232.4	217.0	50,441		1.158	470,164	10.793
	25.50		236.4	221.0	52,254		1.200	495,836	11.383
	26.00		240.4	225.0	54,100		1.242	522,423	11.993
	26.50		244.4	229.0	55,978		1.285	549,941	12.625
	27.00		248.4	233.0	57,888		1.329	578,406	13.278
	27.50		252.4	237.0	59,829		1.373	607,834	13.954
	28.00		256.4	241.0	61,803		1.419	638,241	14.652
	28.50		260.4	245.0	63,809		1.465	669,643	15.373
	29.00		264.4	249.0	65,847		1.512	702,055	16.117
	29.50		268.4	253.0	67,916		1.559	735,495	16.885
	30.00		272.4	257.0	70,018		1.607	769,977	17.676

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley Oklahoma Basin - Option 4 LID

Basin ID: D_ERUV_1264



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	4.99	0.223	Orifice Plate
Zone 2 (EURV)	6.06	0.115	Weir&Pipe (Restrict)
Zone 3			
Total (all zones)		0.338	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	
Underdrain Orifice Diameter =	N/A	inches	

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	
Depth at top of Zone using Orifice Plate =	4.99	ft (relative to basin bottom at Stage = 0 ft)	
Orifice Plate: Orifice Vertical Spacing =	20.00	inches	
Orifice Plate: Orifice Area per Row =	0.65	sq. inches (diameter = 7/8 inch)	

Calculated Parameters for Plate

WQ Orifice Area per Row =	4.514E-03	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.66	3.33					
Orifice Area (sq. inches)	0.65	0.65	0.65					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
Invert of Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =			inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =			ft^2
Vertical Orifice Centroid =			feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.99		ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	4.00		feet
Overflow Weir Grate Slope =	0.00		H:V
Horiz. Length of Weir Sides =	4.00		feet
Overflow Grate Type =	Type C Grate		
Debris Clogging % =	50%		%

Calculated Parameters for Overflow Weir

	Zone 2 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	4.99		feet
Overflow Weir Slope Length =	4.00		feet
Grate Open Area / 100-yr Orifice Area =	808.56		
Overflow Grate Open Area w/o Debris =	11.14		ft^2
Overflow Grate Open Area w/ Debris =	5.57		ft^2

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	3.00		ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00		inches
Restrictor Plate Height Above Pipe Invert =	0.50		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 2 Restrictor	Not Selected	
Outlet Orifice Area =	0.01		ft^2
Outlet Orifice Centroid =	0.02		feet
Half-Central Angle of Restrictor Plate on Pipe =	0.33	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.10	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	20.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth=	0.71	feet
Stage at Top of Freeboard =	7.81	feet
Basin Area at Top of Freeboard =	0.17	acres
Basin Volume at Top of Freeboard =	0.60	acre-ft

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

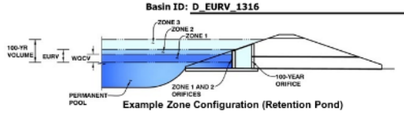
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.95	1.35	1.63	1.69	2.28	2.58	3.14
CUHP Runoff Volume (acre-ft) =	0.223	0.338	0.140	0.310	0.777	1.282	2.839	4.079	5.814
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.140	0.310	0.777	1.282	2.839	4.079	5.814
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.3	0.6	5.3	10.9	26.6	37.2	53.0
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.02	0.13	0.28	0.67	0.94	1.34
Peak Inflow Q (cfs) =	N/A	N/A	1.4	3.1	8.0	13.8	29.7	40.1	56.0
Peak Outflow Q (cfs) =	0.1	0.2	0.1	0.2	5.4	12.1	34.8	45.0	62.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.3	1.0	1.1	1.3	1.2	1.2
Structure Controlling Flow =	Overflow Weir 1	Outlet Plate 1	Plate	Outlet Plate 1	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	0.01	N/A	0.0	0.0	0.0	0.0	0.0	0.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	40	46	33	46	44	39	29	23	17
Time to Drain 99% of Inflow Volume (hours) =	**43**	50	35	49	51	48	42	39	35
Maximum Ponding Depth (ft) =	4.99	6.05	3.73	5.50	6.29	6.43	6.75	6.86	7.03
Area at Maximum Ponding Depth (acres) =	0.09	0.12	0.07	0.11	0.13	0.13	0.14	0.14	0.15
Maximum Volume Stored (acre-ft) =	0.224	0.338	0.122	0.275	0.368	0.385	0.428	0.445	0.470

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley Oklahoma Basin - Option 4 LID

Basin ID: D_EURV_1316



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	127.02	acres
Watershed Length =	3,070	ft
Watershed Length to Centroid =	1,540	ft
Watershed Slope =	0.041	ft/ft
Watershed Imperviousness =	10.62%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	60.9%	percent
Percentage Hydrologic Soil Groups C/D =	39.1%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.746	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	1.217	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.95 in.) =	0.732	acre-feet	0.95	inches
5-yr Runoff Volume (P1 = 1.35 in.) =	3.029	acre-feet	1.35	inches
10-yr Runoff Volume (P1 = 1.63 in.) =	5.363	acre-feet	1.63	inches
25-yr Runoff Volume (P1 = 1.69 in.) =	7.036	acre-feet		inches
50-yr Runoff Volume (P1 = 2.28 in.) =	12.886	acre-feet	2.28	inches
100-yr Runoff Volume (P1 = 2.58 in.) =	16.784	acre-feet	2.58	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	22.819	acre-feet		inches
Approximate 2-yr Detention Volume =	0.683	acre-feet		
Approximate 5-yr Detention Volume =	1.448	acre-feet		
Approximate 10-yr Detention Volume =	2.486	acre-feet		
Approximate 25-yr Detention Volume =	2.947	acre-feet		
Approximate 50-yr Detention Volume =	3.689	acre-feet		
Approximate 100-yr Detention Volume =	4.933	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.746	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.470	acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	1.217	acre-feet
Initial Surcharge Volume (ISV) =	98	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{TOTAL}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.003	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Total detention volume is less than 100-year volume.

Initial Surcharge Area (A_{ISV}) =	296	ft^2
Surcharge Volume Length (L_{ISV}) =	17.2	ft
Surcharge Volume Width (W_{ISV}) =	17.2	ft
Depth of Basin Floor (H_{FLOOR}) =	0.27	ft
Length of Basin Floor (L_{FLOOR}) =	108.3	ft
Width of Basin Floor (W_{FLOOR}) =	62.2	ft
Area of Basin Floor (A_{FLOOR}) =	6,733	ft^2
Volume of Basin Floor (V_{FLOOR}) =	760	ft^3
Depth of Main Basin (H_{MAIN}) =	4.90	ft
Length of Main Basin (L_{MAIN}) =	147.5	ft
Width of Main Basin (W_{MAIN}) =	101.4	ft
Area of Main Basin (A_{MAIN}) =	14,952	ft^2
Volume of Main Basin (V_{MAIN}) =	51,809	ft^3
Calculated Total Basin Volume (V_{total}) =	**1.212**	acre-feet

Depth Increment = 0.50 ft

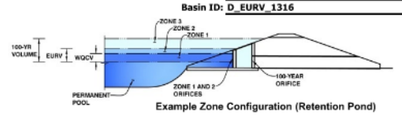
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		17.2	17.2	296		0.007		
ISV	0.33		17.2	17.2	296		0.007	98	0.002
	0.50		17.2	17.2	296		0.007	148	0.003
	1.00		74.5	45.5	3,393		0.078	513	0.012
Floor	1.10		108.3	62.2	6,733		0.155	1,010	0.023
	1.50		111.5	65.4	7,289		0.167	3,814	0.088
	2.00		115.5	69.4	8,013		0.184	7,638	0.175
	2.50		119.5	73.4	8,768		0.201	11,832	0.272
	3.00		123.5	77.4	9,556		0.219	16,411	0.377
	3.50		127.5	81.4	10,375		0.238	21,392	0.491
	4.00		131.5	85.4	11,226		0.258	26,792	0.615
Zone 1 (WQCV)	4.50		135.5	89.4	12,110		0.278	32,624	0.749
	5.00		139.5	93.4	13,025		0.299	38,907	0.893
	5.50		143.5	97.4	13,973		0.321	45,655	1.048
	6.00		147.5	101.4	14,952		0.343	52,885	1.214
Zone 2 (EURV)	6.01		147.6	101.5	14,972		0.344	53,034	1.218
	6.50		151.5	105.4	15,964		0.366	60,613	1.391
	7.00		155.5	109.4	17,007		0.390	68,854	1.581
	7.50		159.5	113.4	18,083		0.415	77,625	1.782
	8.00		163.5	117.4	19,190		0.441	86,942	1.996
	8.50		167.5	121.4	20,329		0.467	96,820	2.223
	9.00		171.5	125.4	21,501		0.494	107,277	2.463
	9.50		175.5	129.4	22,704		0.521	118,327	2.716
	10.00		179.5	133.4	23,940		0.550	129,986	2.984
	10.50		183.5	137.4	25,207		0.579	142,272	3.266
	11.00		187.5	141.4	26,507		0.609	155,199	3.563
	11.50		191.5	145.4	27,838		0.639	168,784	3.875
	12.00		195.5	149.4	29,202		0.670	183,042	4.202
	12.50		199.5	153.4	30,597		0.702	197,991	4.545
	13.00		203.5	157.4	32,025		0.735	213,645	4.905
	13.50		207.5	161.4	33,484		0.769	230,021	5.281
	14.00		211.5	165.4	34,975		0.803	247,134	5.673
	14.50		215.5	169.4	36,499		0.838	265,001	6.084
	15.00		219.5	173.4	38,054		0.874	283,638	6.511
	15.50		223.5	177.4	39,642		0.910	303,061	6.957
	16.00		227.5	181.4	41,261		0.947	323,285	7.422
	16.50		231.5	185.4	42,913		0.985	344,328	7.905
	17.00		235.5	189.4	44,596		1.024	366,203	8.407
	17.50		239.5	193.4	46,312		1.063	388,929	8.929
	18.00		243.5	197.4	48,059		1.103	412,520	9.470
	18.50		247.5	201.4	49,838		1.144	436,993	10.032
	19.00		251.5	205.4	51,650		1.186	462,364	10.614
	19.50		255.5	209.4	53,493		1.228	488,649	11.218
	20.00		259.5	213.4	55,369		1.271	515,863	11.843
	20.50		263.5	217.4	57,276		1.315	544,023	12.489
	21.00		267.5	221.4	59,216		1.359	573,144	13.158
	21.50		271.5	225.4	61,187		1.405	603,244	13.849
	22.00		275.5	229.4	63,191		1.451	634,337	14.562
	22.50		279.5	233.4	65,226		1.497	666,440	15.299
	23.00		283.5	237.4	67,293		1.545	699,568	16.060
	23.50		287.5	241.4	69,393		1.593	733,738	16.844
	24.00		291.5	245.4	71,524		1.642	768,966	17.653
	24.50		295.5	249.4	73,688		1.692	805,268	18.486
	25.00		299.5	253.4	75,883		1.742	842,660	19.345
	25.50		303.5	257.4	78,111		1.793	881,157	20.229
	26.00		307.5	261.4	80,370		1.845	920,776	21.138
	26.50		311.5	265.4	82,662		1.898	961,532	22.074
	27.00		315.5	269.4	84,985		1.951	1,003,443	23.036
	27.50		319.5	273.4	87,341		2.005	1,046,523	24.025
	28.00		323.5	277.4	89,728		2.060	1,090,788	25.041
	28.50		327.5	281.4	92,147		2.115	1,136,256	26.085
	29.00		331.5	285.4	94,599		2.172	1,182,941	27.157
	29.50		335.5	289.4	97,082		2.229	1,230,860	28.257
	30.00		339.5	293.4	99,598		2.286	1,280,029	29.385

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley Oklahoma Basin - Option 4 LID

Basin ID: D_EURV_1316



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	4.50	0.746	Orifice Plate
Zone 2 (EURV)	6.01	0.470	Weir&Pipe (Restrict)
Zone 3			
Total (all zones)		1.217	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	1.736E-02 ft^2
Depth at top of Zone using Orifice Plate =	4.50	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A feet
Orifice Plate: Orifice Vertical Spacing =	18.00	inches	Elliptical Slot Centroid =	N/A feet
Orifice Plate: Orifice Area per Row =	2.50	sq. inches (diameter = 1-3/4 inches)	Elliptical Slot Area =	N/A ft^2

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.50	3.00					
Orifice Area (sq. inches)	2.50	2.50	2.50					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected			Not Selected	Not Selected
Invert of Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =		ft^2
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =		feet
Vertical Orifice Diameter =			inches			

Calculated Parameters for Vertical Orifice

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected			Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.50		ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	4.50		feet
Overflow Weir Front Edge Length =	4.00		feet	Overflow Weir Slope Length =	4.00		feet
Overflow Weir Grate Slope =	0.00		H:V	Grate Open Area / 100-yr Orifice Area =	288.33		
Horiz. Length of Weir Sides =	4.00		feet	Overflow Grate Open Area w/o Debris =	11.14		ft^2
Overflow Grate Type =	Type C Grate			Overflow Grate Open Area w/ Debris =	5.57		ft^2
Debris Clogging % =	50%		%				

Calculated Parameters for Overflow Weir

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Restrictor	Not Selected			Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	3.00		ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.04		ft^2
Outlet Pipe Diameter =	18.00		inches	Outlet Orifice Centroid =	0.05		feet
Restrictor Plate Height Above Pipe Invert =	1.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	0.48	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.50	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	1.20 feet
Spillway Crest Length =	50.00	feet	Stage at Top of Freeboard =	8.70 feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.48 acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	2.32 acre-ft

Calculated Parameters for Spillway

Routed Hydrograph Results *The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).*

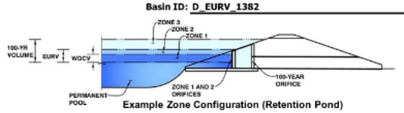
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.95	1.35	1.63	1.69	2.28	2.58	3.14
CUHP Runoff Volume (acre-ft) =	0.746	1.217	0.732	3.029	5.363	7.036	12.886	16.784	22.819
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.732	3.029	5.363	7.036	12.886	16.784	22.819
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	1.9	34.4	61.7	89.2	161.4	206.0	276.3
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.27	0.49	0.70	1.27	1.62	2.18
Peak Inflow Q (cfs) =	N/A	N/A	10.1	44.8	73.2	98.0	171.5	214.6	284.4
Peak Outflow Q (cfs) =	0.4	0.6	0.4	29.5	71.2	101.4	178.7	248.8	317.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.9	1.2	1.1	1.1	1.2	1.1
Structure Controlling Flow =	Plate	Outlet Plate 1	Plate	Spillway	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	0.00	N/A	0.0	0.0	0.0	0.0	0.0	0.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	40	48	40	48	43	39	30	25	20
Time to Drain 99% of Inflow Volume (hours) =	**42**	52	42	56	53	51	45	42	39
Maximum Ponding Depth (ft) =	4.49	6.01	4.21	6.83	7.09	7.24	7.57	7.82	8.05
Area at Maximum Ponding Depth (acres) =	0.28	0.34	0.27	0.38	0.39	0.40	0.42	0.43	0.44
Maximum Volume Stored (acre-ft) =	0.746	1.218	0.667	1.511	1.616	1.676	1.811	1.917	2.014

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley Oklahoma Basin - Option 4 LID

Basin ID: D_EURV_1382



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	91.62	acres
Watershed Length =	4,649	ft
Watershed Length to Centroid =	3,113	ft
Watershed Slope =	0.014	ft/ft
Watershed Imperviousness =	10.39%	percent
Percentage Hydrologic Soil Group A =	6.6%	percent
Percentage Hydrologic Soil Group B =	93.2%	percent
Percentage Hydrologic Soil Groups C/D =	0.2%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.528	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.885	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.95 in.) =	0.459	acre-feet	0.95	inches
5-yr Runoff Volume (P1 = 1.35 in.) =	1.732	acre-feet	1.35	inches
10-yr Runoff Volume (P1 = 1.63 in.) =	3.112	acre-feet	1.63	inches
25-yr Runoff Volume (P1 = 1.69 in.) =	4.452	acre-feet		inches
50-yr Runoff Volume (P1 = 2.28 in.) =	8.577	acre-feet	2.28	inches
100-yr Runoff Volume (P1 = 2.58 in.) =	11.404	acre-feet	2.58	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	15.614	acre-feet		inches
Approximate 2-yr Detention Volume =	0.451	acre-feet		
Approximate 5-yr Detention Volume =	0.792	acre-feet		
Approximate 10-yr Detention Volume =	1.645	acre-feet		
Approximate 25-yr Detention Volume =	2.069	acre-feet		
Approximate 50-yr Detention Volume =	2.618	acre-feet		
Approximate 100-yr Detention Volume =	3.441	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.528	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.356	acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	0.885	acre-feet
Initial Surcharge Volume (ISV) =	69	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{Total}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.003	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Initial Surcharge Area (A_{ISV}) =	209	ft^2
Surcharge Volume Length (L_{ISV}) =	14.5	ft
Surcharge Volume Width (W_{ISV}) =	14.5	ft
Depth of Basin Floor (H_{FLOOR}) =	0.22	ft
Length of Basin Floor (L_{FLOOR}) =	88.7	ft
Width of Basin Floor (W_{FLOOR}) =	51.1	ft
Area of Basin Floor (A_{FLOOR}) =	4,534	ft^2
Volume of Basin Floor (V_{FLOOR}) =	419	ft^3
Depth of Main Basin (H_{MAIN}) =	4.95	ft
Length of Main Basin (L_{MAIN}) =	128.3	ft
Width of Main Basin (W_{MAIN}) =	90.7	ft
Area of Main Basin (A_{MAIN}) =	11,639	ft^2
Volume of Main Basin (V_{MAIN}) =	38,673	ft^3
Calculated Total Basin Volume (V_{total}) =	**0.901**	acre-feet

Total detention volume is less than 100-year volume.

Depth Increment = 0.50 ft

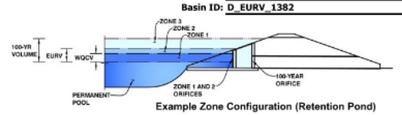
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		14.5	14.5	209		0.005		
ISV	0.33		14.5	14.5	209		0.005	69	0.002
	0.50		14.5	14.5	209		0.005	105	0.002
	1.00		71.8	42.8	3,074		0.071	407	0.009
Floor	1.05		88.7	51.1	4,534		0.104	596	0.014
	1.50		92.3	54.7	5,051		0.116	2,751	0.063
	2.00		96.3	58.7	5,655		0.130	5,426	0.125
	2.50		100.3	62.7	6,291		0.144	8,412	0.193
	3.00		104.3	66.7	6,959		0.160	11,723	0.269
	3.50		108.3	70.7	7,659		0.176	15,376	0.353
	4.00		112.3	74.7	8,391		0.193	19,387	0.445
Zone 1 (WQCV)	4.42		115.6	78.1	9,031		0.207	23,045	0.529
	4.50		116.3	78.7	9,155		0.210	23,772	0.546
	5.00		120.3	82.7	9,951		0.228	28,547	0.655
	5.50		124.3	86.7	10,779		0.247	33,728	0.774
Zone 2 (EURV)	5.94		127.8	90.3	11,534		0.265	38,637	0.887
	6.00		128.3	90.7	11,639		0.267	39,332	0.903
	6.50		132.3	94.7	12,531		0.288	45,373	1.042
	7.00		136.3	98.7	13,455		0.309	51,868	1.191
	7.50		140.3	102.7	14,411		0.331	58,834	1.351
	8.00		144.3	106.7	15,399		0.354	66,285	1.522
	8.50		148.3	110.7	16,419		0.377	74,238	1.704
	9.00		152.3	114.7	17,471		0.401	82,710	1.899
	9.50		156.3	118.7	18,556		0.426	91,715	2.105
	10.00		160.3	122.7	19,672		0.452	101,271	2.325
	10.50		164.3	126.7	20,820		0.478	111,392	2.557
	11.00		168.3	130.7	22,000		0.505	122,096	2.803
	11.50		172.3	134.7	23,212		0.533	133,397	3.062
	12.00		176.3	138.7	24,456		0.561	145,313	3.336
	12.50		180.3	142.7	25,732		0.591	157,858	3.624
	13.00		184.3	146.7	27,040		0.621	171,050	3.927
	13.50		188.3	150.7	28,380		0.652	184,903	4.245
	14.00		192.3	154.7	29,752		0.683	199,435	4.578
	14.50		196.3	158.7	31,156		0.715	214,661	4.928
	15.00		200.3	162.7	32,592		0.748	230,596	5.294
	15.50		204.3	166.7	34,060		0.782	247,258	5.676
	16.00		208.3	170.7	35,560		0.816	264,662	6.076
	16.50		212.3	174.7	37,092		0.852	282,824	6.493
	17.00		216.3	178.7	38,656		0.887	301,760	6.927
	17.50		220.3	182.7	40,252		0.924	321,485	7.380
	18.00		224.3	186.7	41,880		0.961	342,017	7.852
	18.50		228.3	190.7	43,540		1.000	363,371	8.342
	19.00		232.3	194.7	45,232		1.038	385,563	8.851
	19.50		236.3	198.7	46,957		1.078	408,609	9.380
	20.00		240.3	202.7	48,713		1.118	432,525	9.929
	20.50		244.3	206.7	50,501		1.159	457,327	10.499
	21.00		248.3	210.7	52,321		1.201	483,031	11.089
	21.50		252.3	214.7	54,173		1.244	509,653	11.700
	22.00		256.3	218.7	56,057		1.287	537,209	12.333
	22.50		260.3	222.7	57,973		1.331	565,715	12.987
	23.00		264.3	226.7	59,921		1.376	595,187	13.664
	23.50		268.3	230.7	61,901		1.421	625,641	14.363
	24.00		272.3	234.7	63,913		1.467	657,093	15.085
	24.50		276.3	238.7	65,957		1.514	689,559	15.830
	25.00		280.3	242.7	68,033		1.562	723,056	16.599
	25.50		284.3	246.7	70,141		1.610	757,598	17.392
	26.00		288.3	250.7	72,281		1.659	793,202	18.209
	26.50		292.3	254.7	74,453		1.709	829,884	19.052
	27.00		296.3	258.7	76,657		1.760	867,661	19.919
	27.50		300.3	262.7	78,893		1.811	906,547	20.811
	28.00		304.3	266.7	81,161		1.863	946,559	21.730
	28.50		308.3	270.7	83,461		1.916	987,714	22.675
	29.00		312.3	274.7	85,793		1.970	1,030,026	23.646
	29.50		316.3	278.7	88,158		2.024	1,073,513	24.644
	30.00		320.3	282.7	90,554		2.079	1,118,189	25.670

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley Oklahoma Basin - Option 4 LID

Basin ID: D_EURV_1382



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	4.42	0.528	Orifice Plate
Zone 2 (EURV)	5.94	0.356	Weir&Pipe (Restrict)
Zone 3			
Total (all zones)		0.885	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	1.250E-02 ft^2
Depth at top of Zone using Orifice Plate =	4.42	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A feet
Orifice Plate: Orifice Vertical Spacing =	17.70	inches	Elliptical Slot Centroid =	N/A feet
Orifice Plate: Orifice Area per Row =	1.80	sq. inches (diameter = 1-1/2 inches)	Elliptical Slot Area =	N/A ft^2

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.47	2.95					
Orifice Area (sq. inches)	1.80	1.80	1.80					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected			Not Selected	Not Selected
Invert of Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =		ft^2
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =		feet
Vertical Orifice Diameter =			inches			

Calculated Parameters for Vertical Orifice

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected			Zone 2 Weir	Not Selected
Overflow Weir Front Edge Height, Ho =	4.42		ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	4.42	feet
Overflow Weir Front Edge Length =	4.00		feet	Overflow Weir Slope Length =	4.00	feet
Overflow Weir Grate Slope =	0.00		H:V	Grate Open Area / 100-yr Orifice Area =	288.33	
Horiz. Length of Weir Sides =	4.00		feet	Overflow Grate Open Area w/o Debris =	11.14	ft^2
Overflow Grate Type =	Type C Grate			Overflow Grate Open Area w/ Debris =	5.57	ft^2
Debris Clogging % =	50%		%			

Calculated Parameters for Overflow Weir

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Restrictor	Not Selected			Zone 2 Restrictor	Not Selected
Depth to Invert of Outlet Pipe =	3.00		ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.04	ft^2
Outlet Pipe Diameter =	18.00		inches	Outlet Orifice Centroid =	0.05	feet
Restrictor Plate Height Above Pipe Invert =	1.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	0.48	N/A radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	1.04 feet
Spillway Crest Length =	20.00	feet	Stage at Top of Freeboard =	8.04 feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.36 acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	1.54 acre-ft

Calculated Parameters for Spillway

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

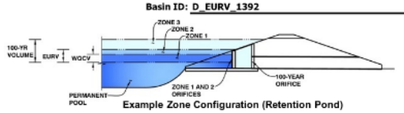
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.95	1.35	1.63	1.69	2.28	2.58	3.14
CUHP Runoff Volume (acre-ft) =	0.528	0.885	0.459	1.732	3.112	4.452	8.577	11.404	15.614
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.459	1.732	3.112	4.452	8.577	11.403	15.613
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.5	7.6	16.2	26.5	52.2	70.2	95.6
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.08	0.18	0.29	0.57	0.77	1.04
Peak Inflow Q (cfs) =	N/A	N/A	3.0	11.4	20.4	30.5	56.7	74.7	100.4
Peak Outflow Q (cfs) =	0.3	0.6	0.3	6.4	16.8	28.9	56.6	74.6	100.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.8	1.0	1.1	1.1	1.1	1.0
Structure Controlling Flow =	Overflow Weir 1	Outlet Plate 1	Plate	Spillway	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	0.02	N/A	0.0	0.0	0.0	0.0	0.0	0.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	45	38	46	41	37	27	23	17
Time to Drain 99% of Inflow Volume (hours) =	**41**	48	40	52	50	48	42	39	35
Maximum Ponding Depth (ft) =	4.42	5.94	3.67	6.21	6.40	6.57	6.88	7.04	7.24
Area at Maximum Ponding Depth (acres) =	0.21	0.26	0.18	0.28	0.28	0.29	0.30	0.31	0.32
Maximum Volume Stored (acre-ft) =	0.529	0.887	0.383	0.957	1.013	1.062	1.151	1.200	1.266

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley Oklahoma Basin - Option 4 LID

Basin ID: D_EURV_1392



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	432.77	acres
Watershed Length =	7,920	ft
Watershed Length to Centroid =	3,960	ft
Watershed Slope =	0.016	ft/ft
Watershed Imperviousness =	35.93%	percent
Percentage Hydrologic Soil Group A =	1.2%	percent
Percentage Hydrologic Soil Group B =	23.8%	percent
Percentage Hydrologic Soil Groups C/D =	75.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	6.089	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	14.794	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 0.95 in.) =	11.035	acre-feet	0.95 inches
5-yr Runoff Volume (P1 = 1.35 in.) =	22.262	acre-feet	1.35 inches
10-yr Runoff Volume (P1 = 1.63 in.) =	31.606	acre-feet	1.63 inches
25-yr Runoff Volume (P1 = 1.69 in.) =	35.811	acre-feet	inches
50-yr Runoff Volume (P1 = 2.28 in.) =	57.141	acre-feet	2.28 inches
100-yr Runoff Volume (P1 = 2.58 in.) =	70.091	acre-feet	2.58 inches
500-yr Runoff Volume (P1 = 3.14 in.) =	91.291	acre-feet	inches
Approximate 2-yr Detention Volume =	9.779	acre-feet	
Approximate 5-yr Detention Volume =	17.135	acre-feet	
Approximate 10-yr Detention Volume =	21.330	acre-feet	
Approximate 25-yr Detention Volume =	21.580	acre-feet	
Approximate 50-yr Detention Volume =	27.069	acre-feet	
Approximate 100-yr Detention Volume =	32.423	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	6.089	acre-feet
Zone 2 Volume (EURV - Zone 1) =	8.705	acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	14.794	acre-feet
Initial Surcharge Volume (ISV) =	796	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{TOTAL}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.003	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Initial Surcharge Area (A_{ISV}) =	2,411	ft^2
Surcharge Volume Length (L_{ISV}) =	49.1	ft
Surcharge Volume Width (W_{ISV}) =	49.1	ft
Depth of Basin Floor (H_{FLOOR}) =	1.34	ft
Length of Basin Floor (L_{FLOOR}) =	501.1	ft
Width of Basin Floor (W_{FLOOR}) =	272.4	ft
Area of Basin Floor (A_{FLOOR}) =	136,527	ft^2
Volume of Basin Floor (V_{FLOOR}) =	70,163	ft^3
Depth of Main Basin (H_{MAIN}) =	3.83	ft
Length of Main Basin (L_{MAIN}) =	531.8	ft
Width of Main Basin (W_{MAIN}) =	303.1	ft
Area of Main Basin (A_{MAIN}) =	161,168	ft^2
Volume of Main Basin (V_{MAIN}) =	569,434	ft^3
Calculated Total Basin Volume (V_{total}) =	**14.729**	acre-feet

Total detention volume is less than 100-year volume.

Depth Increment = 0.50 ft

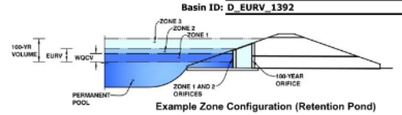
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		49.1	49.1	2,411		0.055		
ISV	0.33		49.1	49.1	2,411		0.055	796	0.018
	0.50		49.1	49.1	2,411		0.055	1,206	0.028
	1.00		106.5	77.4	8,243		0.189	2,861	0.066
	1.50		275.1	160.8	44,231		1.015	14,808	0.340
	2.00		443.8	244.1	108,330		2.487	51,777	1.189
Floor	2.17		501.1	272.4	136,527		3.134	72,544	1.665
	2.50		503.8	275.1	138,576		3.181	117,936	2.707
	3.00		507.8	279.1	141,708		3.253	188,005	4.316
	3.50		511.8	283.1	144,871		3.326	259,649	5.961
Zone 1 (WQCV)	3.54		512.1	283.4	145,126		3.332	265,449	6.094
	4.00		515.8	287.1	148,067		3.399	332,882	7.642
	4.50		519.8	291.1	151,294		3.473	407,721	9.360
	5.00		523.8	295.1	154,553		3.548	484,181	11.115
	5.50		527.8	299.1	157,845		3.624	562,279	12.908
	6.00		531.8	303.1	161,168		3.700	642,031	14.739
Zone 2 (EURV)	6.02		531.9	303.2	161,302		3.703	645,256	14.813
	6.50		535.8	307.1	164,524		3.777	723,453	16.608
	7.00		539.8	311.1	167,911		3.855	806,560	18.516
	7.50		543.8	315.1	171,330		3.933	891,369	20.463
	8.00		547.8	319.1	174,782		4.012	977,896	22.449
	8.50		551.8	323.1	178,265		4.092	1,066,156	24.476
	9.00		555.8	327.1	181,780		4.173	1,156,166	26.542
	9.50		559.8	331.1	185,328		4.255	1,247,942	28.649
	10.00		563.8	335.1	188,907		4.337	1,341,499	30.797
	10.50		567.8	339.1	192,519		4.420	1,436,854	32.986
	11.00		571.8	343.1	196,162		4.503	1,534,023	35.216
	11.50		575.8	347.1	199,837		4.588	1,633,022	37.489
	12.00		579.8	351.1	203,545		4.673	1,733,866	39.804
	12.50		583.8	355.1	207,284		4.759	1,836,572	42.162
	13.00		587.8	359.1	211,056		4.845	1,941,156	44.563
	13.50		591.8	363.1	214,859		4.932	2,047,633	47.007
	14.00		595.8	367.1	218,694		5.021	2,156,020	49.495
	14.50		599.8	371.1	222,562		5.109	2,266,333	52.028
	15.00		603.8	375.1	226,461		5.199	2,378,587	54.605
	15.50		607.8	379.1	230,393		5.289	2,492,799	57.227
	16.00		611.8	383.1	234,356		5.380	2,608,985	59.894
	16.50		615.8	387.1	238,351		5.472	2,727,161	62.607
	17.00		619.8	391.1	242,379		5.564	2,847,342	65.366
	17.50		623.8	395.1	246,438		5.657	2,969,545	68.171
	18.00		627.8	399.1	250,530		5.751	3,093,785	71.024
	18.50		631.8	403.1	254,653		5.846	3,220,080	73.923
	19.00		635.8	407.1	258,808		5.941	3,348,444	76.870
	19.50		639.8	411.1	262,996		6.038	3,478,894	79.864
	20.00		643.8	415.1	267,215		6.134	3,611,445	82.907
	20.50		647.8	419.1	271,467		6.232	3,746,114	85.999
	21.00		651.8	423.1	275,750		6.330	3,882,917	89.140
	21.50		655.8	427.1	280,065		6.429	4,021,869	92.329
	22.00		659.8	431.1	284,413		6.529	4,162,988	95.569
	22.50		663.8	435.1	288,792		6.630	4,306,288	98.859
	23.00		667.8	439.1	293,204		6.731	4,451,785	102.199
	23.50		671.8	443.1	297,647		6.833	4,599,496	105.590
	24.00		675.8	447.1	302,122		6.936	4,749,437	109.032
	24.50		679.8	451.1	306,630		7.039	4,901,624	112.526
	25.00		683.8	455.1	311,169		7.143	5,056,073	116.071
	25.50		687.8	459.1	315,741		7.248	5,212,799	119.669
	26.00		691.8	463.1	320,344		7.354	5,371,819	123.320
	26.50		695.8	467.1	324,979		7.460	5,533,148	127.024
	27.00		699.8	471.1	329,647		7.568	5,696,803	130.781
	27.50		703.8	475.1	334,346		7.676	5,862,800	134.591
	28.00		707.8	479.1	339,078		7.784	6,031,155	138.456
	28.50		711.8	483.1	343,841		7.894	6,201,883	142.376
	29.00		715.8	487.1	348,636		8.004	6,375,001	146.350
	29.50		719.8	491.1	353,464		8.114	6,550,525	150.379
	30.00		723.8	495.1	358,323		8.226	6,728,470	154.464

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley Oklahoma Basin - Option 4 LID

Basin ID: D_EURV_1392



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.54	6.089	Orifice Plate
Zone 2 (EURV)	6.02	8.705	Weir&Pipe (Restrict)
Zone 3			
Total (all zones)		14.794	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	1.285E-01	ft^2
Depth at top of Zone using Orifice Plate =	3.54	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	14.20	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	18.50	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.18	2.36					
Orifice Area (sq. inches)	18.50	18.50	18.50					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected		Calculated Parameters for Vertical Orifice		
				Not Selected	Not Selected	
Invert of Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =		ft^2
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =		feet
Vertical Orifice Diameter =			inches			

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected		Calculated Parameters for Overflow Weir		
				Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.54		ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.54	feet
Overflow Weir Front Edge Length =	4.00		feet	Overflow Weir Slope Length =	4.00	feet
Overflow Weir Grate Slope =	0.00		H:V	Grate Open Area / 100-yr Orifice Area =	46.08	
Horiz. Length of Weir Sides =	4.00		feet	Overflow Grate Open Area w/o Debris =	11.14	ft^2
Overflow Grate Type =	Type C Grate			Overflow Grate Open Area w/ Debris =	5.57	ft^2
Debris Clogging % =	50%		%			

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate		
				Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	3.00		ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.24	ft^2
Outlet Pipe Diameter =	18.00		inches	Outlet Orifice Centroid =	0.17	feet
Restrictor Plate Height Above Pipe Invert =	3.50		inches	Half-Central Angle of Restrictor Plate on Pipe =	0.91	N/A radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=	6.03	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	2.45	feet
Spillway Crest Length =	50.00	feet	Stage at Top of Freeboard =	9.48	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	4.25	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	28.56	acre-ft

Routed Hydrograph Results *The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).*

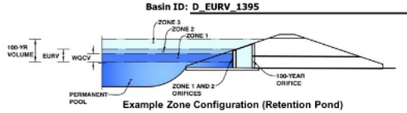
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.95	1.35	1.63	1.69	2.28	2.58	3.14
CUHP Runoff Volume (acre-ft) =	6.089	14.794	11.035	22.262	31.606	35.811	57.141	70.091	91.291
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	11.035	22.262	31.606	35.811	57.141	70.091	91.291
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	3.6	69.6	124.3	177.1	320.6	418.6	563.4
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.16	0.29	0.41	0.74	0.97	1.30
Peak Inflow Q (cfs) =	N/A	N/A	94.8	202.6	279.7	346.0	547.5	669.5	866.2
Peak Outflow Q (cfs) =	2.8	3.5	3.2	64.9	147.7	196.7	404.4	551.7	757.7
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.9	1.2	1.1	1.3	1.3	1.3
Structure Controlling Flow =	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Spillway	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	-0.05	-0.02	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	68	57	71	69	68	63	60	55
Time to Drain 99% of Inflow Volume (hours) =	**41**	72	60	76	75	74	72	71	69
Maximum Ponding Depth (ft) =	3.54	6.02	4.75	6.57	6.97	7.16	7.82	8.20	8.67
Area at Maximum Ponding Depth (acres) =	3.33	3.70	3.51	3.79	3.85	3.88	3.98	4.04	4.12
Maximum Volume Stored (acre-ft) =	6.094	14.813	10.233	16.835	18.362	19.096	21.730	23.255	25.174

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley Oklahoma Basin - Option 4 LID

Basin ID: D_EURV_1395



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	129.65	acres
Watershed Length =	3,582	ft
Watershed Length to Centroid =	1,775	ft
Watershed Slope =	0.010	ft/ft
Watershed Imperviousness =	74.97%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	3.234	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	9.498	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 0.95 in.) =	7.474	acre-feet	0.95 inches
5-yr Runoff Volume (P1 = 1.35 in.) =	11.779	acre-feet	1.35 inches
10-yr Runoff Volume (P1 = 1.63 in.) =	14.921	acre-feet	1.63 inches
25-yr Runoff Volume (P1 = 1.69 in.) =	15.785	acre-feet	inches
50-yr Runoff Volume (P1 = 2.28 in.) =	22.571	acre-feet	2.28 inches
100-yr Runoff Volume (P1 = 2.58 in.) =	26.231	acre-feet	2.58 inches
500-yr Runoff Volume (P1 = 3.14 in.) =	32.748	acre-feet	inches
Approximate 2-yr Detention Volume =	6.841	acre-feet	
Approximate 5-yr Detention Volume =	10.626	acre-feet	
Approximate 10-yr Detention Volume =	12.634	acre-feet	
Approximate 25-yr Detention Volume =	12.166	acre-feet	
Approximate 50-yr Detention Volume =	14.962	acre-feet	
Approximate 100-yr Detention Volume =	16.145	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	3.234	acre-feet
Zone 2 Volume (EURV - Zone 1) =	6.264	acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	9.498	acre-feet
Initial Surcharge Volume (ISV) =	578	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{Total}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.003	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Total detention volume is less than 100-year volume.

Initial Surcharge Area (A_{ISV}) =	1,752	ft^2
Surcharge Volume Length (L_{ISV}) =	41.9	ft
Surcharge Volume Width (W_{ISV}) =	41.9	ft
Depth of Basin Floor (H_{FLOOR}) =	1.02	ft
Length of Basin Floor (L_{FLOOR}) =	385.9	ft
Width of Basin Floor (W_{FLOOR}) =	211.9	ft
Area of Basin Floor (A_{FLOOR}) =	81,760	ft^2
Volume of Basin Floor (V_{FLOOR}) =	32,463	ft^3
Depth of Main Basin (H_{MAIN}) =	4.15	ft
Length of Main Basin (L_{MAIN}) =	419.1	ft
Width of Main Basin (W_{MAIN}) =	245.1	ft
Area of Main Basin (A_{MAIN}) =	102,709	ft^2
Volume of Main Basin (V_{MAIN}) =	381,947	ft^3
Calculated Total Basin Volume (V_{total}) =	**9.547**	acre-feet

Depth Increment = 0.50 ft

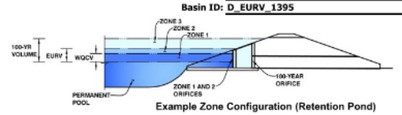
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		41.9	41.9	1,752		0.040		
ISV	0.33		41.9	41.9	1,752		0.040	578	0.013
	0.50		41.9	41.9	1,752		0.040	876	0.020
	1.00		99.2	70.2	6,962		0.160	2,148	0.049
	1.50		267.9	153.5	41,122		0.944	12,998	0.298
Floor	1.85		385.9	211.9	81,760		1.877	34,101	0.783
	2.00		387.1	213.1	82,479		1.893	46,419	1.066
	2.50		391.1	217.1	84,895		1.949	88,261	2.026
	3.00		395.1	221.1	87,344		2.005	131,319	3.015
Zone 1 (WQCV)	3.11		396.0	221.9	87,887		2.018	140,957	3.236
	3.50		399.1	225.1	89,825		2.062	175,610	4.031
	4.00		403.1	229.1	92,338		2.120	221,150	5.077
	4.50		407.1	233.1	94,882		2.178	267,953	6.151
	5.00		411.1	237.1	97,459		2.237	316,037	7.255
	5.50		415.1	241.1	100,068		2.297	365,418	8.389
Zone 2 (EURV)	5.98		419.0	244.9	102,602		2.355	414,057	9.505
	6.00		419.1	245.1	102,709		2.358	416,110	9.553
	6.50		423.1	249.1	105,381		2.419	468,131	10.747
	7.00		427.1	253.1	108,086		2.481	521,497	11.972
	7.50		431.1	257.1	110,823		2.544	576,223	13.228
	8.00		435.1	261.1	113,591		2.608	632,325	14.516
	8.50		439.1	265.1	116,392		2.672	689,820	15.836
	9.00		443.1	269.1	119,225		2.737	748,723	17.188
	9.50		447.1	273.1	122,090		2.803	809,050	18.573
	10.00		451.1	277.1	124,986		2.869	870,818	19.991
	10.50		455.1	281.1	127,915		2.937	934,042	21.443
	11.00		459.1	285.1	130,876		3.004	998,738	22.928
	11.50		463.1	289.1	133,869		3.073	1,064,923	24.447
	12.00		467.1	293.1	136,893		3.143	1,132,612	26.001
	12.50		471.1	297.1	139,950		3.213	1,201,821	27.590
	13.00		475.1	301.1	143,039		3.284	1,272,567	29.214
	13.50		479.1	305.1	146,159		3.355	1,344,865	30.874
	14.00		483.1	309.1	149,312		3.428	1,418,732	32.570
	14.50		487.1	313.1	152,497		3.501	1,494,183	34.302
	15.00		491.1	317.1	155,714		3.575	1,571,234	36.071
	15.50		495.1	321.1	158,962		3.649	1,649,902	37.877
	16.00		499.1	325.1	162,243		3.725	1,730,202	39.720
	16.50		503.1	329.1	165,556		3.801	1,812,150	41.601
	17.00		507.1	333.1	168,901		3.877	1,895,763	43.521
	17.50		511.1	337.1	172,277		3.955	1,981,056	45.479
	18.00		515.1	341.1	175,686		4.033	2,068,046	47.476
	18.50		519.1	345.1	179,127		4.112	2,156,748	49.512
	19.00		523.1	349.1	182,599		4.192	2,247,178	51.588
	19.50		527.1	353.1	186,104		4.272	2,339,353	53.704
	20.00		531.1	357.1	189,641		4.354	2,433,287	55.861
	20.50		535.1	361.1	193,210		4.435	2,528,999	58.058
	21.00		539.1	365.1	196,810		4.518	2,626,502	60.296
	21.50		543.1	369.1	200,443		4.602	2,725,815	62.576
	22.00		547.1	373.1	204,108		4.686	2,826,951	64.898
	22.50		551.1	377.1	207,805		4.771	2,929,928	67.262
	23.00		555.1	381.1	211,533		4.856	3,034,761	69.669
	23.50		559.1	385.1	215,294		4.942	3,141,466	72.118
	24.00		563.1	389.1	219,087		5.030	3,250,060	74.611
	24.50		567.1	393.1	222,912		5.117	3,360,559	77.148
	25.00		571.1	397.1	226,768		5.206	3,472,977	79.729
	25.50		575.1	401.1	230,657		5.295	3,587,332	82.354
	26.00		579.1	405.1	234,578		5.385	3,703,639	85.024
	26.50		583.1	409.1	238,530		5.476	3,821,915	87.739
	27.00		587.1	413.1	242,515		5.567	3,942,175	90.500
	27.50		591.1	417.1	246,532		5.660	4,064,436	93.307
	28.00		595.1	421.1	250,581		5.753	4,188,712	96.160
	28.50		599.1	425.1	254,661		5.846	4,315,022	99.059
	29.00		603.1	429.1	258,774		5.941	4,443,379	102.006
	29.50		607.1	433.1	262,919		6.036	4,573,801	105.000
	30.00		611.1	437.1	267,096		6.132	4,706,303	108.042

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley Oklahoma Basin - Option 4 LID

Basin ID: D_EURV_1395



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.11	3.234	Orifice Plate
Zone 2 (EURV)	5.98	6.264	Rectangular Orifice
Zone 3			
Total (all zones)		9.498	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	N/A	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	3.11	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	N/A	inches
Orifice Plate: Orifice Area per Row =	10.00	sq. inches (use rectangular openings)

Calculated Parameters for Plate

WQ Orifice Area per Row =	6.944E-02	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.00	2.00					
Orifice Area (sq. inches)	10.00	10.00	10.00					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangular	Not Selected	
Invert of Vertical Orifice =	3.11		ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	5.98		ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Height =	3.00		inches
Vertical Orifice Width =	6.00		inches

Calculated Parameters for Vertical Orifice

	Zone 2 Rectangular	Not Selected	
Vertical Orifice Area =	0.13		ft^2
Vertical Orifice Centroid =	0.13		feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Not Selected	Not Selected	
Overflow Weir Front Edge Height, Ho =			ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =			feet
Overflow Weir Grate Slope =			H:V
Horiz. Length of Weir Sides =			feet
Overflow Grate Type =			
Debris Clogging % =			%

Calculated Parameters for Overflow Weir

	Not Selected	Not Selected	
Height of Grate Upper Edge, H_t =			feet
Overflow Weir Slope Length =			feet
Grate Open Area / 100-yr Orifice Area =			
Overflow Grate Open Area w/o Debris =			ft^2
Overflow Grate Open Area w/ Debris =			ft^2

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =			ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter =			inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Not Selected	Not Selected	
Outlet Orifice Area =			ft^2
Outlet Orifice Centroid =			feet
Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	40.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth=	1.99	feet
Stage at Top of Freeboard =	8.99	feet
Basin Area at Top of Freeboard =	2.74	acres
Basin Volume at Top of Freeboard =	17.16	acre-ft

Routed Hydrograph Results — *The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).*

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.95	1.35	1.63	1.69	2.28	2.58	3.14
CUHP Runoff Volume (acre-ft) =	3.234	9.498	7.474	11.779	14.921	15.785	22.571	26.231	32.748
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	7.474	11.779	14.921	15.785	22.571	26.231	32.748
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	1.5	31.3	51.5	69.7	122.9	156.7	208.3
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.24	0.40	0.54	0.95	1.21	1.61
Peak Inflow Q (cfs) =	N/A	N/A	108.7	172.6	214.9	235.6	338.1	392.4	487.1
Peak Outflow Q (cfs) =	1.4	3.2	2.7	23.4	58.0	79.0	175.4	240.6	338.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.7	1.1	1.1	1.4	1.5	1.6
Structure Controlling Flow =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Spillway	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	67	61	69	68	67	64	62	59
Time to Drain 99% of Inflow Volume (hours) =	**41**	71	64	74	73	73	72	71	70
Maximum Ponding Depth (ft) =	3.11	5.98	4.90	6.30	6.57	6.71	7.20	7.46	7.81
Area at Maximum Ponding Depth (acres) =	2.02	2.36	2.23	2.39	2.43	2.44	2.51	2.54	2.58
Maximum Volume Stored (acre-ft) =	3.236	9.505	7.032	10.242	10.916	11.233	12.446	13.127	14.023

APPENDIX E – 3
HY-8 Culvert Sizing

Culvert Data: Structure#101

Site Data - Structure#101

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4778.22 ft
Outlet Station: 52.00 ft
Outlet Elevation: 4777.89 ft
Number of Barrels: 3

Culvert Data Summary - Structure#101

Barrel Shape: Concrete Box
Barrel Span: 12.00 ft
Barrel Rise: 5.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

Table 21 - Culvert Summary Table: Structure#101

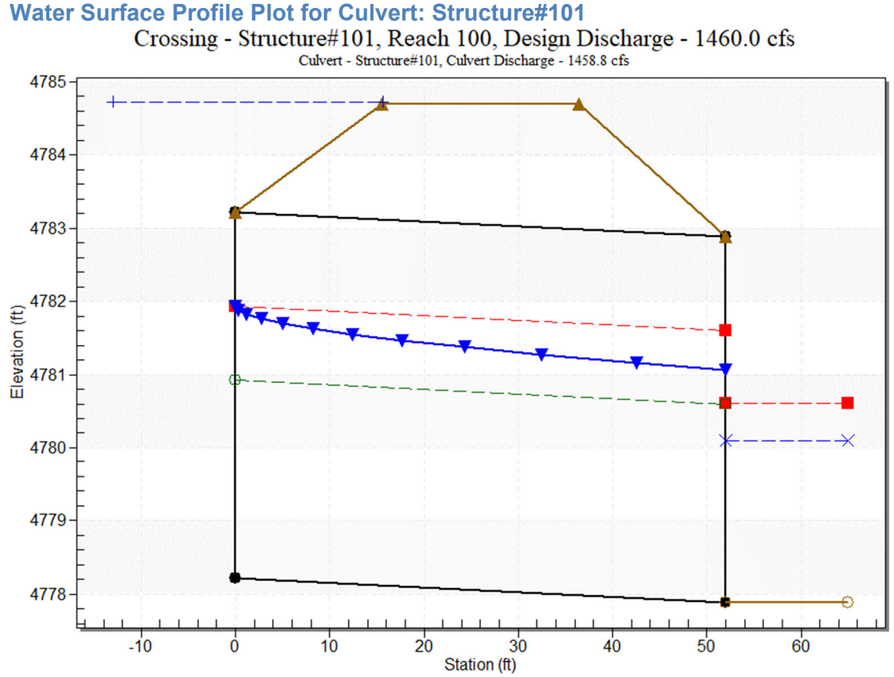
Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	5.18 cfs	5.18 cfs	4778.37	0.15	0.0*	1-JS1t	0.06	0.09	0.27	0.27	0.54	2.44
100 Year	1460.00	1458.85	4784.72	6.50	5.012	5-S2n	2.71	3.71	3.17	2.20	12.78	10.02
	O_100	cfs	cfs									

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4778.22 ft,
Outlet Elevation (invert): 4777.89 ft
Culvert Length: 52.00 ft,
Culvert Slope: 0.0063

Water Surface Profile Plot for Culvert: Structure#101



Tailwater Data for Crossing: Structure#101, Option 1 and 3

Table 22 - Downstream Channel Rating Curve (Crossing: Structure#101, Option 1 and 3

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
5.18	4778.16	0.27	2.44	0.38	1.18
1460.00	4780.09	2.20	10.02	3.16	1.68

Tailwater Channel Data - Structure#101, Option 1 and 3

Tailwater Channel Option: Triangular Channel
Side Slope (H:V): 30.00 (_:1)
Channel Slope: 0.0230
Channel Manning's n: 0.0240
Channel Invert Elevation: 4777.89 ft

Roadway Data for Crossing: Structure#101, Option 1 and 3

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4784.70 ft
Roadway Surface: Paved
Roadway Top Width: 21.00 ft

Culvert Data: Structure#102

Site Data - Structure#102

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4782.03 ft
Outlet Station: 60.00 ft
Outlet Elevation: 4781.65 ft
Number of Barrels: 2

Culvert Data Summary - Structure#102

Barrel Shape: Concrete Box
Barrel Span: 10.00 ft
Barrel Rise: 6.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

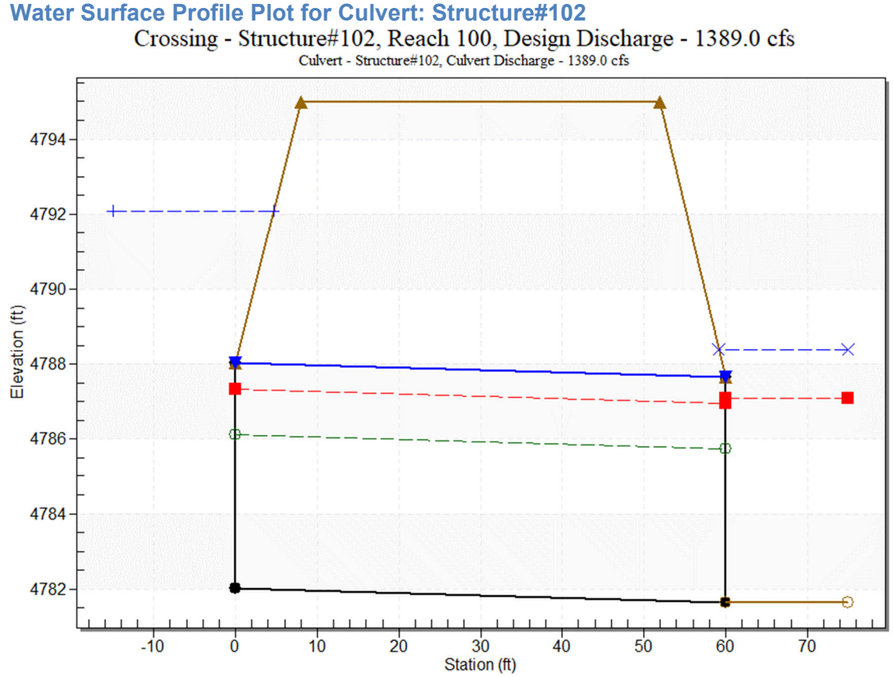
Table 19 - Culvert Summary Table: Structure#102

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	6.28 cfs	6.28 cfs	4782.55	0.25	0.516	1-S1t	0.11	0.15	0.89	0.89	0.35	1.59
100-YR	1389.00	1389.00	4792.08	10.05	9.700	4-FFf	4.09	5.31	6.00	6.73	11.57	6.13
Junction_113	cfs	cfs										

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4782.03 ft,
Outlet Elevation (invert): 4781.65 ft
Culvert Length: 60.00 ft,
Culvert Slope: 0.0063

Water Surface Profile Plot for Culvert: Structure#102



Tailwater Data for Crossing: Structure#102, Option 1 and 3

Table 20 - Downstream Channel Rating Curve (Crossing: Structure#102, Option 1 and 3

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
6.28	4782.54	0.89	1.59	0.39	0.42
1389.00	4788.38	6.73	6.13	2.94	0.59

Tailwater Channel Data - Structure#102, Option 1 and 3

Tailwater Channel Option: Triangular Channel
Side Slope (H:V): 5.00 (_:1)
Channel Slope: 0.0070
Channel Manning's n: 0.0450
Channel Invert Elevation: 4781.65 ft

Roadway Data for Crossing: Structure#102, Option 1 and 3

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4794.98 ft
Roadway Surface: Paved
Roadway Top Width: 44.00 ft

Culvert Data: Structure#103

Site Data - Structure#103

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4864.72 ft
Outlet Station: 295.00 ft
Outlet Elevation: 4858.55 ft
Number of Barrels: 1

Culvert Data Summary - Structure#103

Barrel Shape: Concrete Box
Barrel Span: 8.00 ft
Barrel Rise: 5.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

Table 13 - Culvert Summary Table: Structure#103

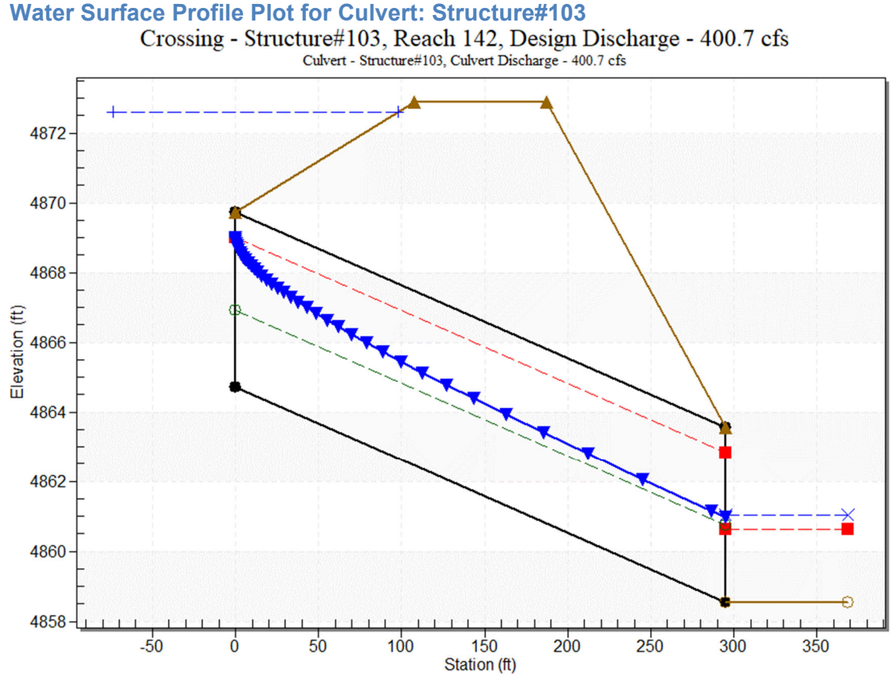
Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	85.77 cfs	85.77 cfs	4867.29	2.57	0.0*	1-S2n	0.79	1.53	0.80	1.18	13.34	3.21
100 Year_L_149	400.70 cfs	400.70 cfs	4872.61	7.89	1.884	5-S2n	2.21	4.27	2.41	2.48	20.75	4.86

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4864.72 ft,
Outlet Elevation (invert): 4858.55 ft
Culvert Length: 295.06 ft,
Culvert Slope: 0.0209

Water Surface Profile Plot for Culvert: Structure#103



Tailwater Data for Crossing: Structure#103, Option 1 and 3

Table 14 - Downstream Channel Rating Curve (Crossing: Structure#103, Option 1 and 3

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
85.77	4859.73	1.18	3.21	0.91	0.62
400.70	4861.03	2.48	4.86	1.91	0.69

Tailwater Channel Data - Structure#103, Option 1 and 3

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 12.70 ft
Side Slope (H:V): 8.30 (_:1)
Channel Slope: 0.0123
Channel Manning's n: 0.0450
Channel Invert Elevation: 4858.55 ft

Roadway Data for Crossing: Structure#103, Option 1 and 3

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4872.88 ft
Roadway Surface: Paved
Roadway Top Width: 80.00 ft

Culvert Data: Structure#104

Site Data - Structure#104

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4921.39 ft
Outlet Station: 127.00 ft
Outlet Elevation: 4919.92 ft
Number of Barrels: 1

Culvert Data Summary - Structure#104

Barrel Shape: Concrete Box
Barrel Span: 10.00 ft
Barrel Rise: 5.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

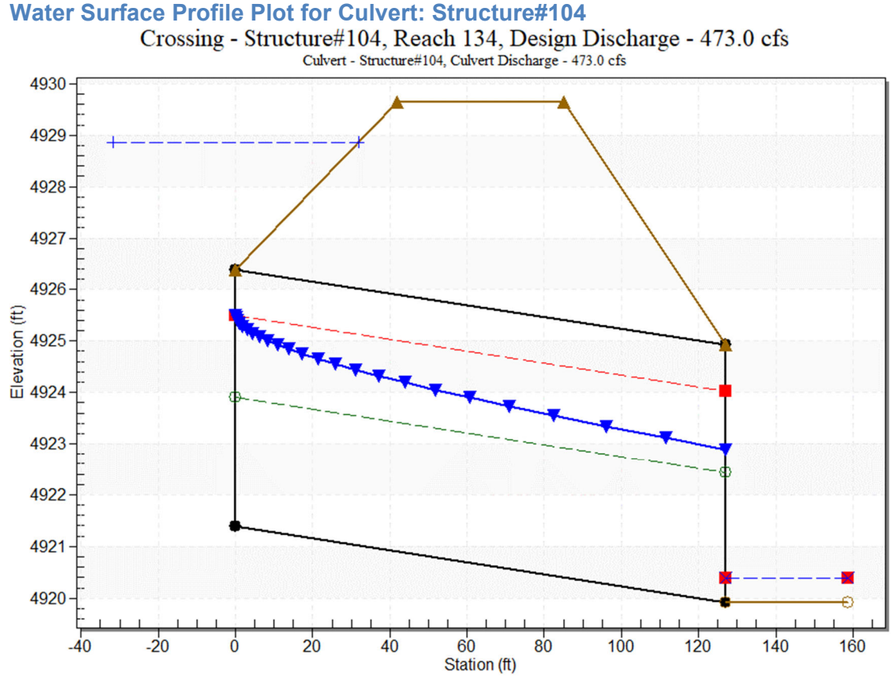
Table 11 - Culvert Summary Table: Structure#104

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	124.36 cfs	124.36 cfs	4924.24	2.85	0.387	1-S2n	1.03	1.69	1.10	0.26	11.26	2.12
100 Year, L_133	473.00 cfs	473.00 cfs	4928.86	7.47	5.543	5-S2n	2.51	4.11	2.97	0.47	15.94	3.00

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4921.39 ft,
Outlet Elevation (invert): 4919.92 ft
Culvert Length: 127.01 ft,
Culvert Slope: 0.0116

Water Surface Profile Plot for Culvert: Structure#104



Tailwater Data for Crossing: Structure#104, Option 1 and 3

Table 12 - Downstream Channel Rating Curve (Crossing: Structure#104, Option 1 and 3

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
124.36	4920.18	0.26	2.12	0.74	0.92
473.00	4920.39	0.47	3.00	1.35	1.01

Tailwater Channel Data - Structure#104, Option 1 and 3

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 100.00 ft
Side Slope (H:V): 500.00 (_:1)
Channel Slope: 0.0460
Channel Manning's n: 0.0450
Channel Invert Elevation: 4919.92 ft

Roadway Data for Crossing: Structure#104, Option 1 and 3

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4929.64 ft
Roadway Surface: Paved
Roadway Top Width: 43.00 ft

Culvert Data: Structure#105

Site Data - Structure#105

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4844.62 ft
Outlet Station: 88.00 ft
Outlet Elevation: 4840.85 ft
Number of Barrels: 1

Culvert Data Summary - Structure#105

Barrel Shape: Circular
Barrel Diameter: 2.00 ft
Barrel Material: Corrugated Steel
Embedment: 0.00 in
Barrel Manning's n: 0.0240
Culvert Type: Straight
Inlet Configuration: Thin Edge Projecting (Ke=0.9)
Inlet Depression: None

Table 17 - Culvert Summary Table: Structure#105

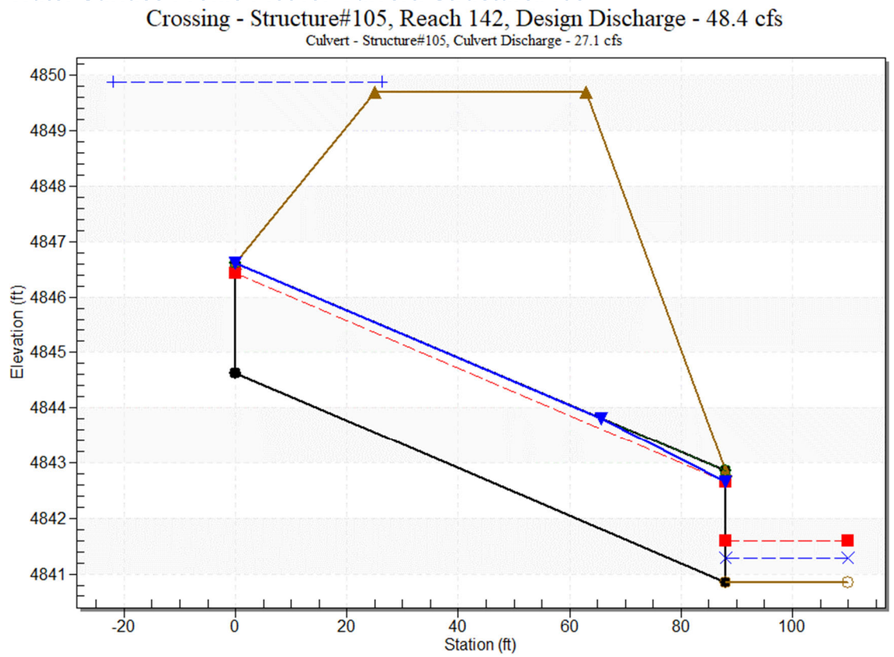
Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	7.46 cfs	7.46 cfs	4846.09	1.47	0.0*	1-S2n	0.74	0.97	0.74	0.15	7.03	4.54
100 Year	48.41 cfs	27.12 cfs	4849.88	5.26	4.585	7-M2c	2.00	1.81	1.81	0.43	9.07	8.54

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4844.62 ft,
Outlet Elevation (invert): 4840.85 ft
Culvert Length: 88.08 ft,
Culvert Slope: 0.0428

Water Surface Profile Plot for Culvert: Structure#105



Tailwater Data for Crossing: Structure#105, Option 1 and 3

Table 18 - Downstream Channel Rating Curve (Crossing: Structure#105, Option 1 and 3

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
7.46	4841.00	0.15	4.54	2.51	2.17
48.41	4841.28	0.43	8.54	7.32	2.54

Tailwater Channel Data - Structure#105, Option 1 and 3

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 10.00 ft
Side Slope (H:V): 7.00 (_:1)
Channel Slope: 0.2700
Channel Manning's n: 0.0450
Channel Invert Elevation: 4840.85 ft

Roadway Data for Crossing: Structure#105, Option 1 and 3

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4849.70 ft
Roadway Surface: Paved
Roadway Top Width: 38.00 ft

Culvert Data: Structure#106

Site Data - Structure#106

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4870.42 ft
Outlet Station: 100.00 ft
Outlet Elevation: 4867.47 ft
Number of Barrels: 1

Culvert Data Summary - Structure#106

Barrel Shape: Circular
Barrel Diameter: 2.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall (Ke=0.5)
Inlet Depression: None

Table 15 - Culvert Summary Table: Structure#106

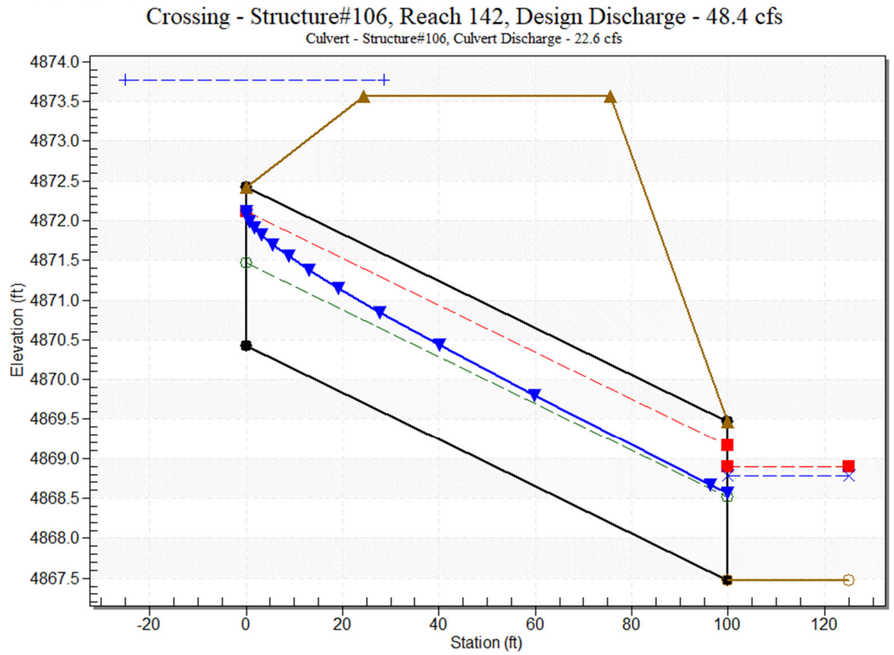
Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5	1.74 cfs	1.74 cfs	4871.03	0.61	0.0*	1-S2n	0.28	0.46	0.28	0.37	6.63	2.48
100	48.41 cfs	22.55 cfs	4873.76	3.34	0.941	5-S2n	1.04	1.69	1.09	1.30	12.87	5.69

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4870.42 ft,
Outlet Elevation (invert): 4867.47 ft
Culvert Length: 100.04 ft,
Culvert Slope: 0.0295

Water Surface Profile Plot for Culvert: Structure#106



Tailwater Data for Crossing: Structure#106, Option 1 and 3

Table 16 - Downstream Channel Rating Curve (Crossing: Structure#106, Option 1 and 3

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
1.74	4867.85	0.37	2.48	1.26	1.01
48.41	4868.78	1.30	5.69	4.39	1.24

Tailwater Channel Data - Structure#106, Option 1 and 3

Tailwater Channel Option: Triangular Channel
Side Slope (H:V): 5.00 (_:1)
Channel Slope: 0.0540
Channel Manning's n: 0.0450
Channel Invert Elevation: 4867.47 ft

Roadway Data for Crossing: Structure#106, Option 1 and 3

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4873.57 ft
Roadway Surface: Paved
Roadway Top Width: 51.00 ft

Culvert Data: Structure#107

Site Data - Structure#107

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4970.37 ft
Outlet Station: 228.00 ft
Outlet Elevation: 4967.06 ft
Number of Barrels: 1

Culvert Data Summary - Structure#107

Barrel Shape: Circular
Barrel Diameter: 2.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall (Ke=0.5)
Inlet Depression: None

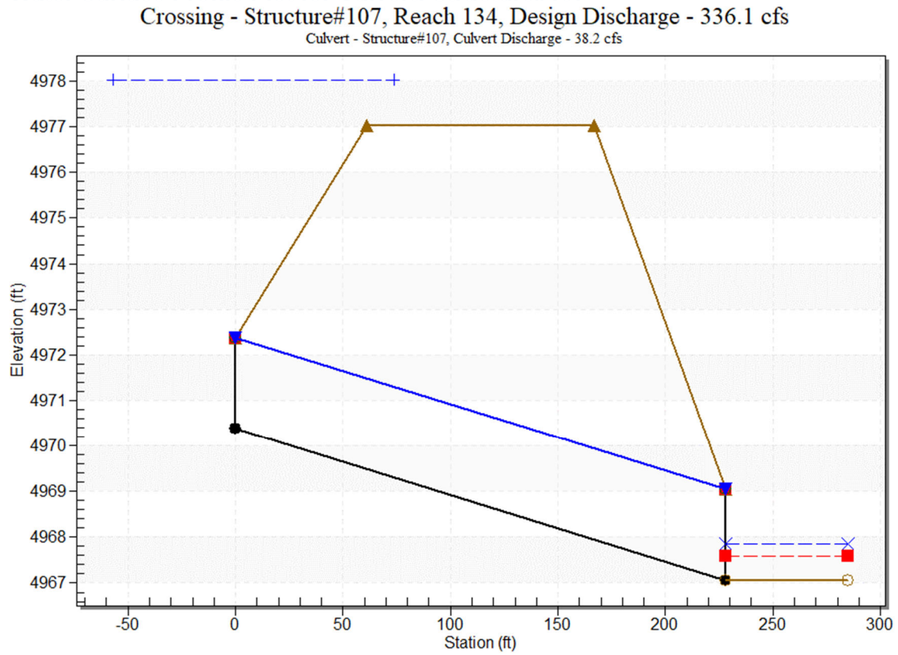
Table 9 - Culvert Summary Table: Structure#107

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	101.20 cfs	36.84 cfs	4977.39	6.84	7.018	7-M2c	2.00	1.69	1.69	0.48	13.00	1.08
100 Year	336.11 cfs	38.21 cfs	4978.02	7.29	7.648	6-FFc	2.00	2.00	2.00	0.79	12.16	1.47

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4970.37 ft,
Outlet Elevation (invert): 4967.06 ft
Culvert Length: 228.02 ft,
Culvert Slope: 0.0145

Water Surface Profile Plot for Culvert: Structure#107



Tailwater Data for Crossing: Structure#107, Option 1 and 3

Table 10 - Downstream Channel Rating Curve (Crossing: Structure#107, Option 1 and 3

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
101.20	4967.54	0.48	1.08	0.18	0.36
336.11	4967.85	0.79	1.47	0.30	0.39

Tailwater Channel Data - Structure#107, Option 1 and 3

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 50.00 ft
Side Slope (H:V): 302.00 (_:1)
Channel Slope: 0.0060
Channel Manning's n: 0.0450
Channel Invert Elevation: 4967.06 ft

Roadway Data for Crossing: Structure#107, Option 1 and 3

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4977.03 ft
Roadway Surface: Paved
Roadway Top Width: 106.00 ft

Culvert Data: Structure#108

Site Data - Structure#108

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4982.36 ft
Outlet Station: 76.00 ft
Outlet Elevation: 4981.67 ft
Number of Barrels: 1

Culvert Data Summary - Structure#108

Barrel Shape: Circular
Barrel Diameter: 2.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall (Ke=0.5)
Inlet Depression: None

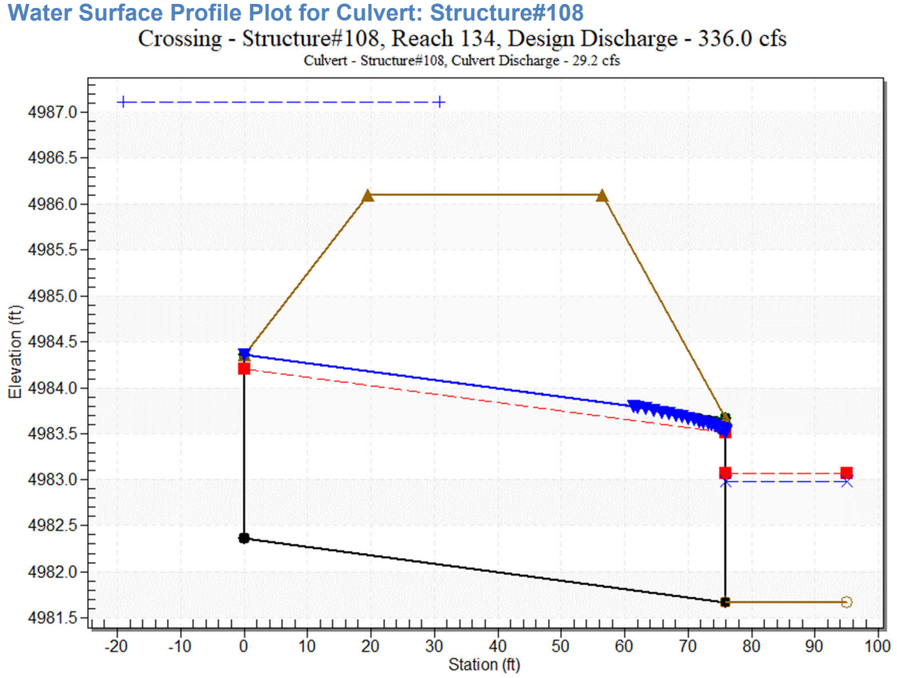
Table 7 - Culvert Summary Table: Structure#108

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5	101.00 cfs	26.47 cfs	4986.49	4.13	3.701	7-M2c	2.00	1.80	1.80	0.72	8.90	4.25
100	336.00 cfs	29.18 cfs	4987.11	4.75	4.317	7-M2c	2.00	1.85	1.85	1.31	9.62	5.91

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4982.36 ft,
Outlet Elevation (invert): 4981.67 ft
Culvert Length: 76.00 ft,
Culvert Slope: 0.0091

Water Surface Profile Plot for Culvert: Structure#108



Tailwater Data for Crossing: Structure#108, Option 1 and 3

Table 8 - Downstream Channel Rating Curve (Crossing: Structure#108, Option 1 and 3

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
101.00	4982.39	0.72	4.25	1.80	1.04
336.00	4982.98	1.31	5.91	3.26	1.13

Tailwater Channel Data - Structure#108, Option 1 and 3

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 20.00 ft
Side Slope (H:V): 18.00 (_:1)
Channel Slope: 0.0400
Channel Manning's n: 0.0450
Channel Invert Elevation: 4981.67 ft

Roadway Data for Crossing: Structure#108, Option 1 and 3

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4986.10 ft
Roadway Surface: Paved
Roadway Top Width: 37.00 ft

Culvert Data: Structure#109

Site Data - Structure#109

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4982.18 ft
Outlet Station: 137.00 ft
Outlet Elevation: 4978.92 ft
Number of Barrels: 1

Culvert Data Summary - Structure#109

Barrel Shape: Circular
Barrel Diameter: 2.50 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall (Ke=0.5)
Inlet Depression: None

Table 5 - Culvert Summary Table: Structure#109

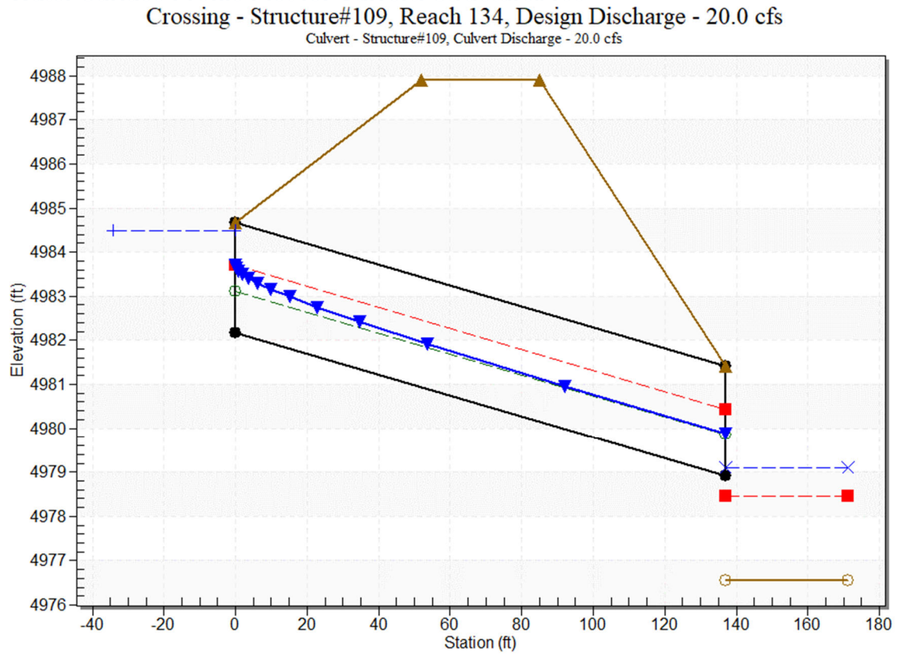
Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	5.00 cfs	5.00 cfs	4983.17	1.00	0.0*	1-S2n	0.46	0.74	0.46	1.51	8.16	2.20
100 Year	20.00 cfs	20.00 cfs	4984.47	2.30	0.0*	1-S2n	0.92	1.52	0.96	2.53	11.60	3.11

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4982.18 ft,
Outlet Elevation (invert): 4978.92 ft
Culvert Length: 137.04 ft,
Culvert Slope: 0.0238

Water Surface Profile Plot for Culvert: Structure#109



Tailwater Data for Crossing: Structure#109, Option 1 and 3

Table 6 - Downstream Channel Rating Curve (Crossing: Structure#109, Option 1 and 3

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
5.00	4978.06	1.51	2.20	0.97	0.45
20.00	4979.09	2.53	3.11	1.63	0.49

Tailwater Channel Data - Structure#109, Option 1 and 3

Tailwater Channel Option: Triangular Channel
Side Slope (H:V): 1.00 (_:1)
Channel Slope: 0.0103
Channel Manning's n: 0.0450
Channel Invert Elevation: 4976.56 ft

Roadway Data for Crossing: Structure#109, Option 1 and 3

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4987.90 ft
Roadway Surface: Paved
Roadway Top Width: 33.00 ft

Culvert Data: Structure#201

Site Data - Structure#201

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4761.52 ft
Outlet Station: 30.46 ft
Outlet Elevation: 4760.40 ft
Number of Barrels: 3

Culvert Data Summary - Structure#201

Barrel Shape: Concrete Box
Barrel Span: 12.00 ft
Barrel Rise: 5.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

Table 35 - Culvert Summary Table: Structure#201

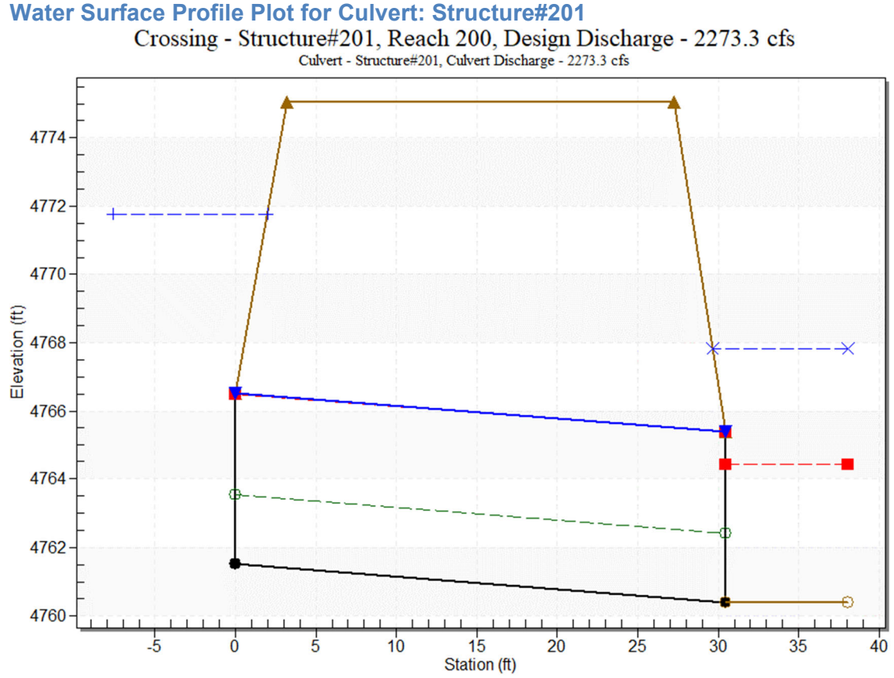
Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	5.00 cfs	5.00 cfs	4761.66	0.14	0.0*	1-S2n	0.02	0.08	0.02	0.23	5.96	0.54
100 Year	2273.28	2273.28	4771.75	10.23	10.176	4-FFf	2.02	4.98	5.00	7.43	12.63	4.39
O_220	cfs	cfs										

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4761.52 ft,
Outlet Elevation (invert): 4760.40 ft
Culvert Length: 30.48 ft,
Culvert Slope: 0.0368

Water Surface Profile Plot for Culvert: Structure#201



Tailwater Data for Crossing: Structure#201, Option 1 and 3

Table 36 - Downstream Channel Rating Curve (Crossing: Structure#201, Option 1 and 3

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
5.00	4760.63	0.23	0.54	0.03	0.20
2273.28	4767.83	7.43	4.39	0.93	0.34

Tailwater Channel Data - Structure#201, Option 1 and 3

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 40.00 ft
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.0020
Channel Manning's n: 0.0450
Channel Invert Elevation: 4760.40 ft

Roadway Data for Crossing: Structure#201, Option 1 and 3

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4775.04 ft
Roadway Surface: Gravel
Roadway Top Width: 24.00 ft

Culvert Data: Structure#202

Site Data - Structure#202

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4949.72 ft
Outlet Station: 100.00 ft
Outlet Elevation: 4944.32 ft
Number of Barrels: 1

Culvert Data Summary - Structure#202

Barrel Shape: Concrete Box
Barrel Span: 6.00 ft
Barrel Rise: 3.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

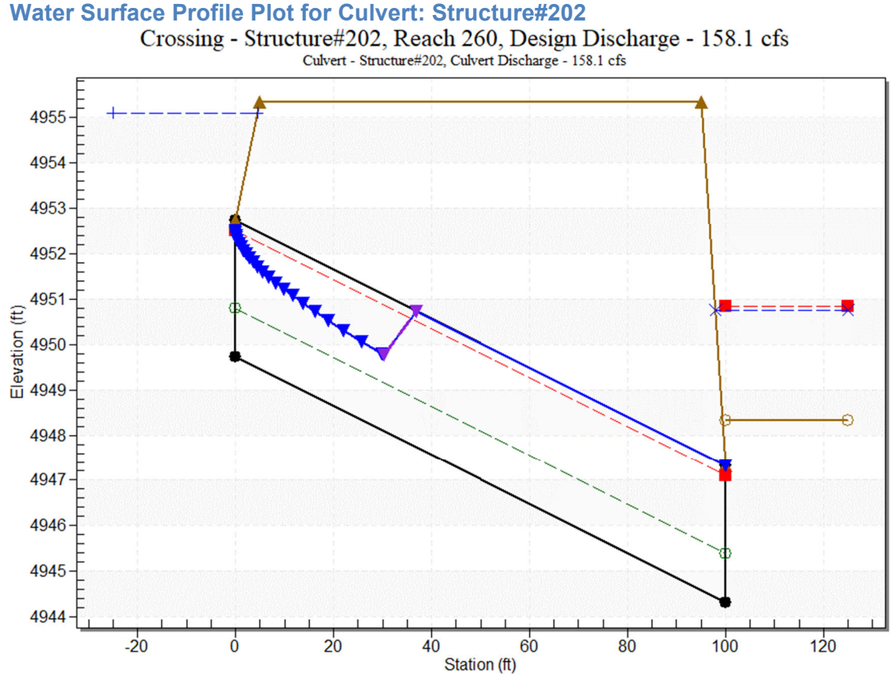
Table 3 - Culvert Summary Table: Structure#202

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5	40.39 cfs	40.39 cfs	4951.55	1.83	0.052	1-JS1f	0.44	1.12	3.00	1.31	2.24	5.11
100	158.12 cfs	158.12 cfs	4955.08	5.36	3.309	5-JS1f	1.07	2.78	3.00	2.41	8.78	7.64

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4949.72 ft,
Outlet Elevation (invert): 4944.32 ft
Culvert Length: 100.15 ft,
Culvert Slope: 0.0540

Water Surface Profile Plot for Culvert: Structure#202



Tailwater Data for Crossing: Structure#202, Option 1 and 3

Table 4 - Downstream Channel Rating Curve (Crossing: Structure#202, Option 1 and 3

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
40.39	4949.63	1.31	5.11	2.68	0.99
158.12	4950.74	2.41	7.64	4.96	1.08

Tailwater Channel Data - Structure#202, Option 1 and 3

Tailwater Channel Option: Irregular Channel
Channel Slope: Irregular Channel

User Defined Channel Cross-Section

Coord No.	Station (ft)	Elevation (ft)	Manning's n
1	0.00	4962.30	0.0450
2	3.23	4962.09	0.0450
3	6.47	4961.86	0.0450
4	9.70	4961.61	0.0450
5	12.93	4961.41	0.0450
6	16.17	4961.22	0.0450
7	19.40	4960.97	0.0450
8	22.64	4960.70	0.0450

9	25.87	4960.41	0.0450
10	29.10	4960.10	0.0450
11	32.34	4959.84	0.0450
12	35.57	4959.59	0.0450
13	38.80	4959.34	0.0450
14	42.04	4959.06	0.0450
15	45.27	4958.74	0.0450
16	48.50	4958.41	0.0450
17	51.74	4958.07	0.0450
18	54.97	4957.68	0.0450
19	58.20	4957.27	0.0450
20	61.44	4956.89	0.0450
21	64.67	4956.54	0.0450
22	67.91	4956.23	0.0450
23	71.14	4955.85	0.0450
24	74.37	4955.38	0.0450
25	77.61	4954.97	0.0450
26	80.84	4954.70	0.0450
27	84.07	4954.43	0.0450
28	87.31	4954.23	0.0450
29	90.54	4954.07	0.0450
30	93.77	4953.94	0.0450
31	97.01	4953.82	0.0450
32	100.24	4953.72	0.0450
33	103.47	4953.55	0.0450
34	106.71	4953.08	0.0450
35	109.94	4952.92	0.0450
36	113.17	4953.12	0.0450
37	116.41	4951.97	0.0450
38	119.64	4950.01	0.0450
39	122.88	4948.73	0.0450
40	126.11	4948.32	0.0450
41	129.34	4949.03	0.0450
42	132.58	4951.36	0.0450
43	135.81	4953.47	0.0450
44	139.04	4955.07	0.0450
45	142.28	4956.11	0.0450
46	145.51	4956.75	0.0450
47	148.75	4956.69	0.0450
48	151.98	4955.86	0.0450
49	155.21	4954.91	0.0450
50	158.45	4954.71	0.0450
51	161.68	4954.76	0.0450
52	164.91	4954.65	0.0450
53	168.15	4954.77	0.0450
54	171.38	4955.49	0.0450
55	174.61	4956.04	0.0450
56	177.85	4956.47	0.0450
57	181.08	4957.05	0.0450
58	184.31	4957.49	0.0450
59	187.55	4957.86	0.0450
60	190.78	4958.15	0.0450
61	194.01	4958.40	0.0450
62	197.25	4958.70	0.0450
63	200.48	4958.98	0.0450
64	203.72	4959.11	0.0450
65	206.95	4959.15	0.0450
66	210.18	4959.21	0.0450
67	213.42	4959.31	0.0450
68	216.65	4959.39	0.0450
69	219.88	4959.50	0.0450
70	223.12	4959.56	0.0000

Roadway Data for Crossing: Structure#202, Option 1 and 3

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4955.33 ft
Roadway Surface: Gravel
Roadway Top Width: 90.00 ft

Culvert Data: Structure#203

Site Data - Structure#203

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4979.58 ft
Outlet Station: 327.00 ft
Outlet Elevation: 4970.79 ft
Number of Barrels: 1

Culvert Data Summary - Structure#203

Barrel Shape: Circular
Barrel Diameter: 4.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall (Ke=0.5)
Inlet Depression: None

Table 1 - Culvert Summary Table: Structure#203

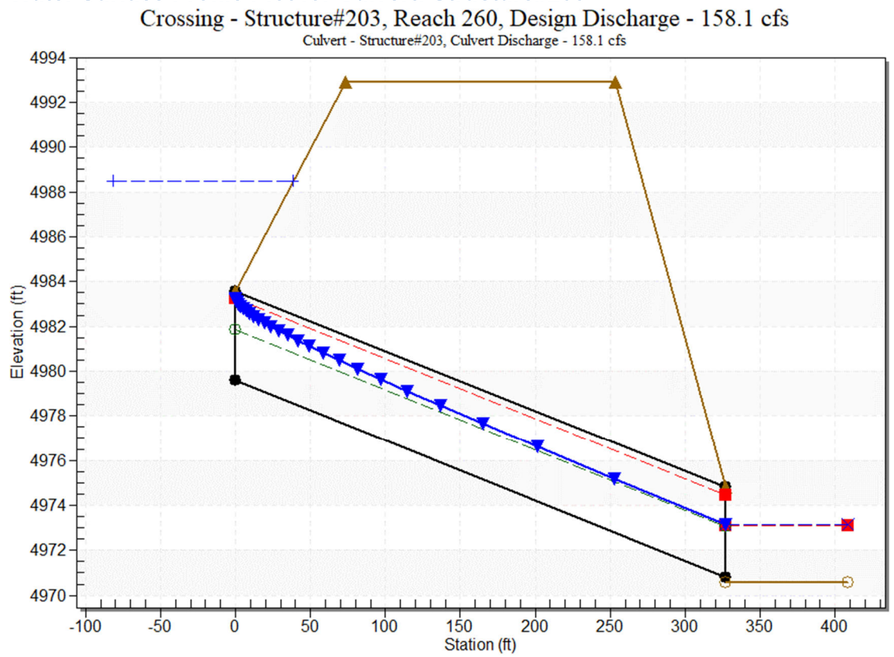
Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5-year	40.39 cfs	40.39 cfs	4982.30	2.72	0.0*	1-S2n	1.07	1.90	1.07	1.52	14.86	4.35
100-year	158.12 cfs	158.12 cfs	4988.47	8.89	2.083	5-S2n	2.28	3.65	2.36	2.54	20.51	6.12

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4979.58 ft,
Outlet Elevation (invert): 4970.79 ft
Culvert Length: 327.12 ft,
Culvert Slope: 0.0269

Water Surface Profile Plot for Culvert: Structure#203



Tailwater Data for Crossing: Structure#203, Option 1 and 3

Table 2 - Downstream Channel Rating Curve (Crossing: Structure#203, Option 1 and 3

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
40.39	4972.10	1.52	4.35	2.47	0.88
158.12	4973.12	2.54	6.12	4.12	0.96

Tailwater Channel Data - Structure#203, Option 1 and 3

Tailwater Channel Option: Triangular Channel
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.0260
Channel Manning's n: 0.0450
Channel Invert Elevation: 4970.58 ft

Roadway Data for Crossing: Structure#203, Option 1 and 3

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4992.89 ft
Roadway Surface: Paved
Roadway Top Width: 180.00

Culvert Data: Structure#301

Site Data - Structure#301

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4786.49 ft
Outlet Station: 35.60 ft
Outlet Elevation: 4786.34 ft
Number of Barrels: 1

Culvert Data Summary - Structure#301

Barrel Shape: Concrete Box
Barrel Span: 8.00 ft
Barrel Rise: 3.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

Table 33 - Culvert Summary Table: Structure#301

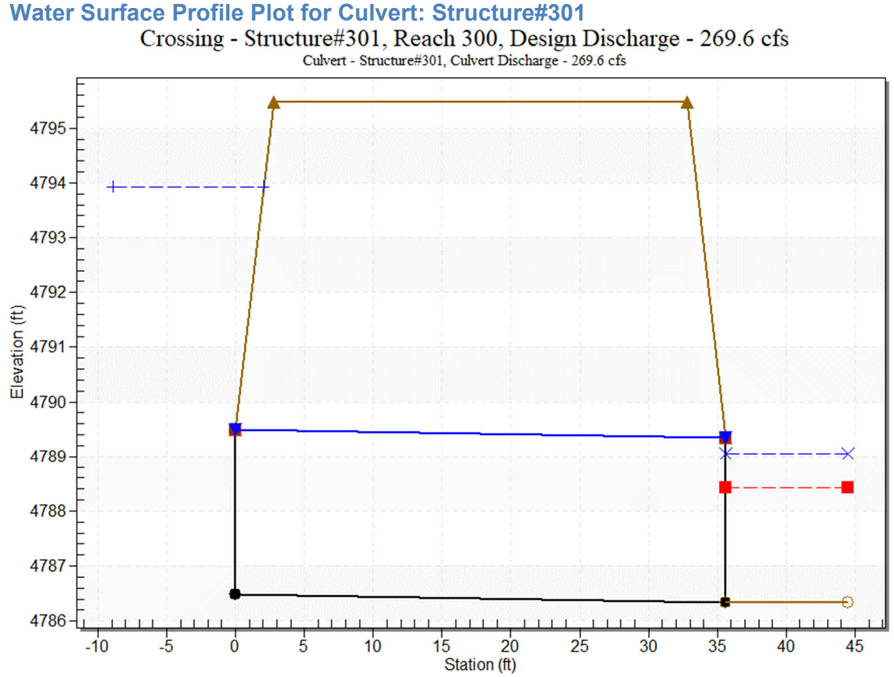
Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	23.55 cfs	23.55 cfs	4787.59	1.10	0.649	1-JS1t	0.58	0.65	0.78	0.78	3.80	2.25
100 Year	269.56 cfs	269.56 cfs	4793.92	7.43	6.048	6-FFc	3.00	3.00	3.00	2.71	11.23	4.49

Junction_309

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4786.49 ft,
Outlet Elevation (invert): 4786.34 ft
Culvert Length: 35.60 ft,
Culvert Slope: 0.0042

Water Surface Profile Plot for Culvert: Structure#301



Tailwater Data for Crossing: Structure#301, Option 1 and 3

Table 34 - Downstream Channel Rating Curve (Crossing: Structure#301, Option 1 and 3

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
23.55	4787.12	0.78	2.25	0.44	0.51
269.56	4789.05	2.71	4.49	1.52	0.60

Tailwater Channel Data - Structure#301, Option 1 and 3

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 10.00 ft
Side Slope (H:V): 4.50 (_:1)
Channel Slope: 0.0090
Channel Manning's n: 0.0450
Channel Invert Elevation: 4786.34 ft

Roadway Data for Crossing: Structure#301, Option 1 and 3

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4795.47 ft
Roadway Surface: Gravel
Roadway Top Width: 30.00 ft

Culvert Data: Structure#501

Site Data - Structure#501

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4824.39 ft
Outlet Station: 88.00 ft
Outlet Elevation: 4816.39 ft
Number of Barrels: 1

Culvert Data Summary - Structure#501

Barrel Shape: Concrete Box
Barrel Span: 8.00 ft
Barrel Rise: 5.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

Table 23 - Culvert Summary Table: Structure#501

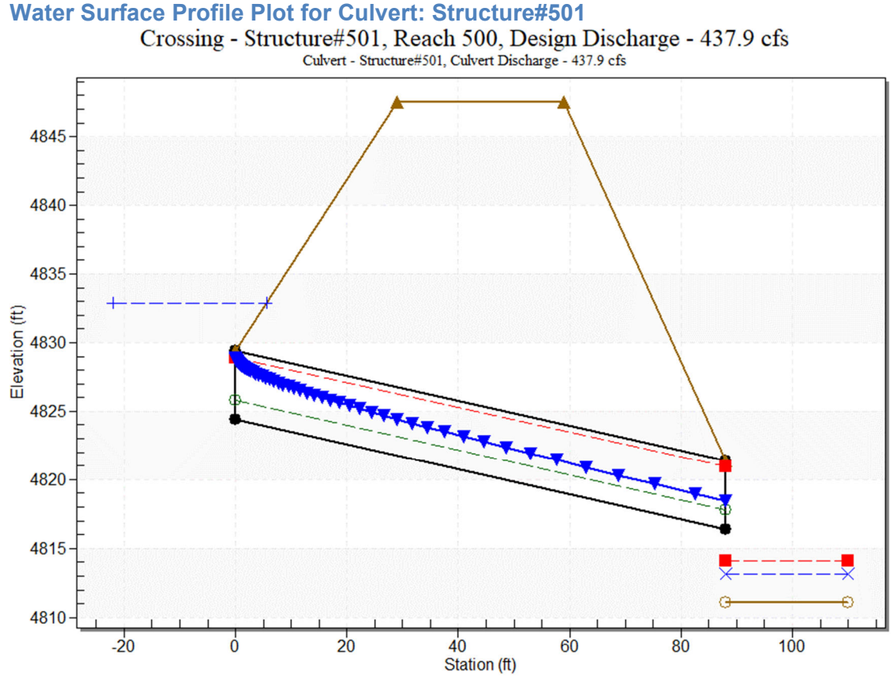
Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	19.99 cfs	19.99 cfs	4825.30	0.91	0.0*	1-S2n	0.19	0.58	0.19	0.64	12.84	7.02
100 Year - L_513	437.88 cfs	437.88 cfs	4832.89	8.50	0.0*	5-S2n	1.42	4.53	2.05	2.03	26.74	15.18

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4824.39 ft,
Outlet Elevation (invert): 4816.39 ft
Culvert Length: 88.36 ft,
Culvert Slope: 0.0909

Water Surface Profile Plot for Culvert: Structure#501



Tailwater Data for Crossing: Structure#501, Option 1 and 3

Table 24 - Downstream Channel Rating Curve (Crossing: Structure#501, Option 1 and 3

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
19.99	4811.74	0.64	7.02	8.36	2.19
437.88	4813.13	2.03	15.18	26.60	2.66

Tailwater Channel Data - Structure#501, Option 1 and 3

Tailwater Channel Option: Triangular Channel
Side Slope (H:V): 7.00 (_:1)
Channel Slope: 0.2100
Channel Manning's n: 0.0450
Channel Invert Elevation: 4811.10 ft

Roadway Data for Crossing: Structure#501, Option 1 and 3

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4847.50 ft
Roadway Surface: Paved
Roadway Top Width: 30.00 ft

Culvert Data: Structure#601

Site Data - Structure#601

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4827.99 ft
Outlet Station: 120.50 ft
Outlet Elevation: 4825.15 ft
Number of Barrels: 1

Culvert Data Summary - Structure#601

Barrel Shape: Concrete Box
Barrel Span: 10.00 ft
Barrel Rise: 6.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

Table 31 - Culvert Summary Table: Structure#601

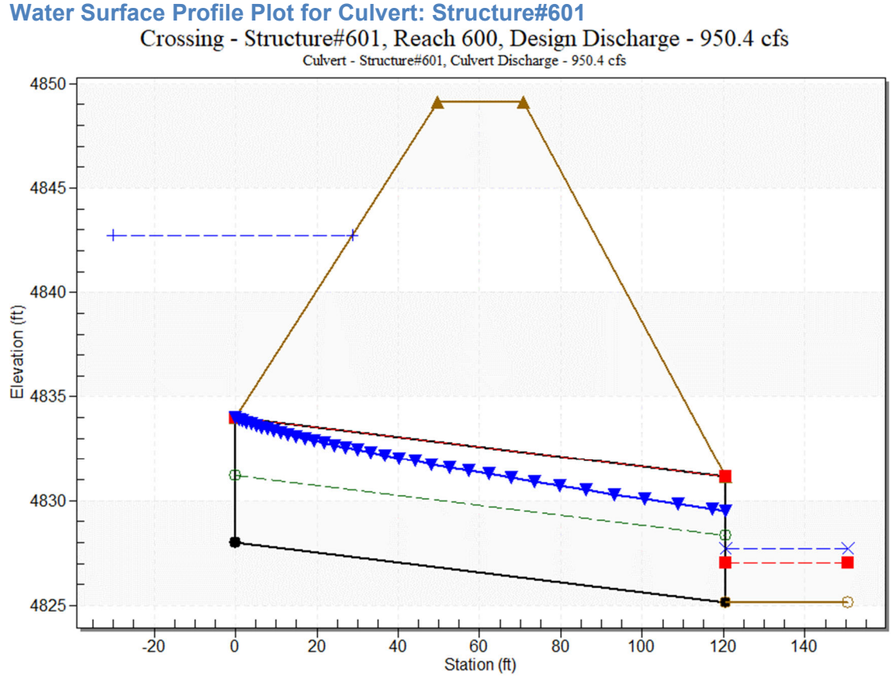
Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	17.62 cfs	17.62 cfs	4828.76	0.77	0.0*	1-S2n	0.24	0.46	0.24	0.31	7.45	1.20
100 Year - Junction 609	950.35 cfs	950.35 cfs	4842.74	14.75	9.852	5-S2n	3.20	6.00	4.33	2.54	21.93	3.92

* Full Flow Headwater elevation is below inlet invert
.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4827.99 ft,
Outlet Elevation (invert): 4825.15 ft
Culvert Length: 120.53 ft,
Culvert Slope: 0.0236

Water Surface Profile Plot for Culvert: Structure#601



Tailwater Data for Crossing: Structure#601, Option 1 and 3

Table 32 - Downstream Channel Rating Curve (Crossing: Structure#601, Option 1 and 3

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
17.62	4825.46	0.31	1.20	0.15	0.41
950.35	4827.69	2.54	3.92	1.19	0.55

Tailwater Channel Data - Structure#601, Option 1 and 3

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 40.00 ft
Side Slope (H:V): 21.90 (_:1)
Channel Slope: 0.0075
Channel Manning's n: 0.0450
Channel Invert Elevation: 4825.15 ft

Roadway Data for Crossing: Structure#601, Option 1 and 3

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4849.11 ft
Roadway Surface: Gravel
Roadway Top Width: 21.00 ft

Culvert Data: Structure#602

Site Data - Structure#602

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4832.33 ft
Outlet Station: 41.00 ft
Outlet Elevation: 4832.02 ft
Number of Barrels: 2

Culvert Data Summary - Structure#602

Barrel Shape: Concrete Box
Barrel Span: 8.00 ft
Barrel Rise: 5.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

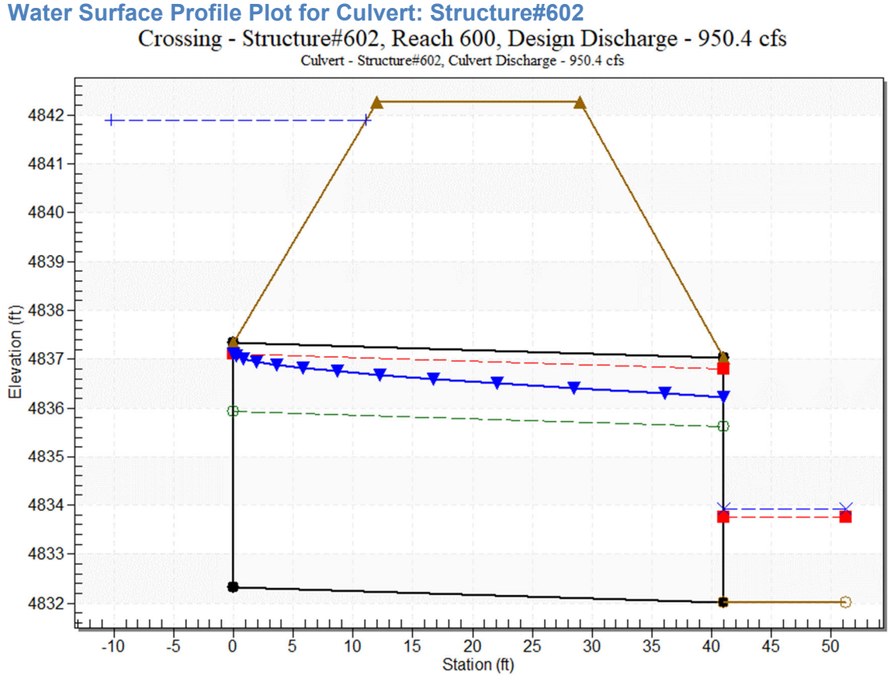
Table 27 - Culvert Summary Table: Structure#602

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	17.62 cfs	17.62 cfs	4832.90	0.57	0.026	1-S2n	0.26	0.34	0.26	0.21	4.23	1.52
100-YR, Junction_609	950.35 cfs	950.35 cfs	4841.89	9.56	8.081	5-S2n	3.60	4.79	4.21	1.91	14.11	5.53

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4832.33 ft,
Outlet Elevation (invert): 4832.02 ft
Culvert Length: 41.00 ft,
Culvert Slope: 0.0076

Water Surface Profile Plot for Culvert: Structure#602



Tailwater Data for Crossing: Structure#602, Option 1 and 3

Table 28 - Downstream Channel Rating Curve (Crossing: Structure#602, Option 1 and 3

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
17.62	4832.23	0.21	1.52	0.25	0.61
950.35	4833.93	1.91	5.53	2.26	0.84

Tailwater Channel Data - Structure#602, Option 1 and 3

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 52.00 ft
Side Slope (H:V): 20.00 (_:1)
Channel Slope: 0.0190
Channel Manning's n: 0.0450
Channel Invert Elevation: 4832.02 ft

Roadway Data for Crossing: Structure#602, Option 1 and 3

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4842.26 ft
Roadway Surface: Paved
Roadway Top Width: 17.00 ft

Culvert Data: Structure#603

Site Data - Structure#603

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4918.96 ft
Outlet Station: 234.00 ft
Outlet Elevation: 4917.04 ft
Number of Barrels: 1

Culvert Data Summary - Structure#603

Barrel Shape: Concrete Box
Barrel Span: 12.00 ft
Barrel Rise: 5.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

Table 25 - Culvert Summary Table: Structure#603

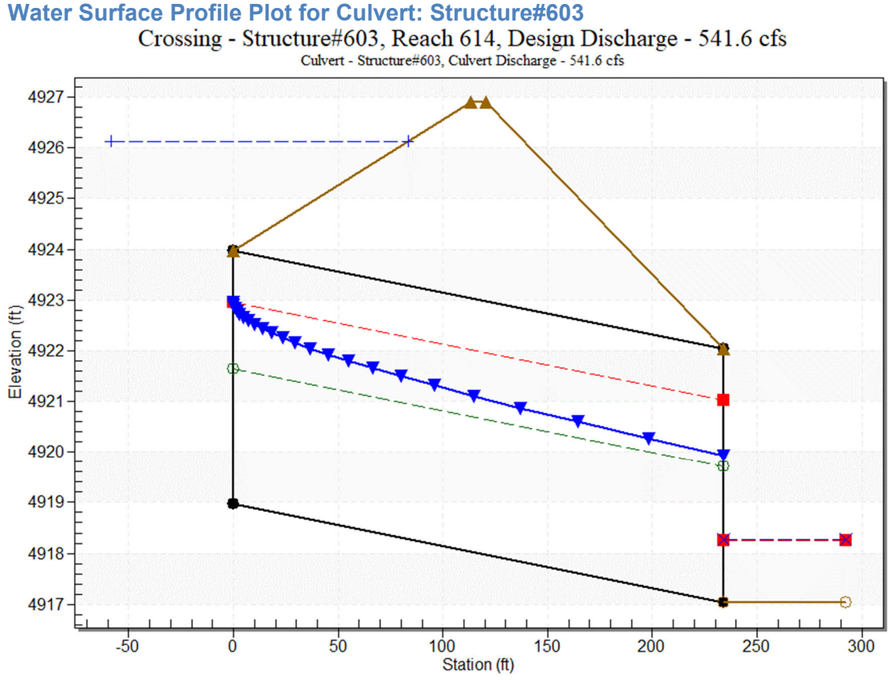
Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	78.44 cfs	78.44 cfs	4920.84	1.87	0.0*	1-S2n	0.76	1.10	0.76	0.38	8.64	2.88
100-YR, L_617	541.60 cfs	541.60 cfs	4926.12	7.15	5.046	5-S2n	2.67	3.98	2.89	1.22	15.60	6.12

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4918.96 ft,
Outlet Elevation (invert): 4917.04 ft
Culvert Length: 234.01 ft,
Culvert Slope: 0.0082

Water Surface Profile Plot for Culvert: Structure#603



Tailwater Data for Crossing: Structure#603, Option 1 and 3

Table 26 - Downstream Channel Rating Curve (Crossing: Structure#603, Option 1 and 3

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
78.44	4917.42	0.38	2.88	0.67	0.82
541.60	4918.26	1.22	6.12	2.12	0.99

Tailwater Channel Data - Structure#603, Option 1 and 3

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 70.00 ft
Side Slope (H:V): 2.00 (_:1)
Channel Slope: 0.0278
Channel Manning's n: 0.0450
Channel Invert Elevation: 4917.04 ft

Roadway Data for Crossing: Structure#603, Option 1 and 3

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4926.90 ft
Roadway Surface: Gravel
Roadway Top Width: 7.00 ft

Culvert Data: Structure#801

Site Data - Structure#801

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4960.15 ft
Outlet Station: 71.00 ft
Outlet Elevation: 4960.01 ft
Number of Barrels: 2

Culvert Data Summary - Structure#801

Barrel Shape: Concrete Box
Barrel Span: 9.00 ft
Barrel Rise: 5.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

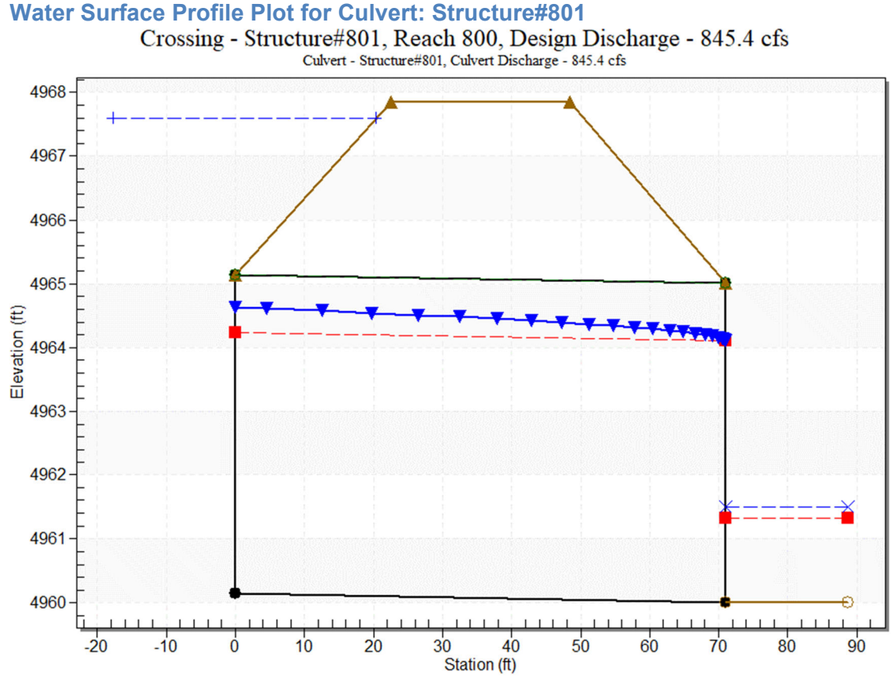
Table 29 - Culvert Summary Table: Structure#801

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	62.87 cfs	62.87 cfs	4961.39	1.24	1.243	2-M2c	0.82	0.72	0.72	0.31	4.83	2.04
100-YR, O_800	845.36 cfs	845.36 cfs	4967.59	7.44	7.041	7-M2c	5.00	4.09	4.09	1.48	11.48	5.72

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4960.15 ft,
Outlet Elevation (invert): 4960.01 ft
Culvert Length: 71.00 ft,
Culvert Slope: 0.0019

Water Surface Profile Plot for Culvert: Structure#801



Tailwater Data for Crossing: Structure#801, Option 1 and 3

Table 30 - Downstream Channel Rating Curve (Crossing: Structure#801, Option 1 and 3

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
62.87	4960.32	0.31	2.04	0.36	0.65
845.36	4961.49	1.48	5.72	1.71	0.83

Tailwater Channel Data - Structure#801, Option 1 and 3

Tailwater Channel Option: Rectangular Channel
Bottom Width: 100.00 ft
Channel Slope: 0.0185
Channel Manning's n: 0.0450
Channel Invert Elevation: 4960.01 ft

Roadway Data for Crossing: Structure#801, Option 1 and 3

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4967.84 ft
Roadway Surface: Paved
Roadway Top Width: 26.00 ft

Culvert Data: Structure#101, Option 2A/2B

Site Data - Structure#101, Option 2A/2B

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4778.22 ft
Outlet Station: 52.00 ft
Outlet Elevation: 4777.89 ft
Number of Barrels: 2

Culvert Data Summary - Structure#101, Option 2A/2B

Barrel Shape: Concrete Box
Barrel Span: 12.00 ft
Barrel Rise: 4.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

Table 11 - Culvert Summary Table: Structure#101, Option 2A/2B

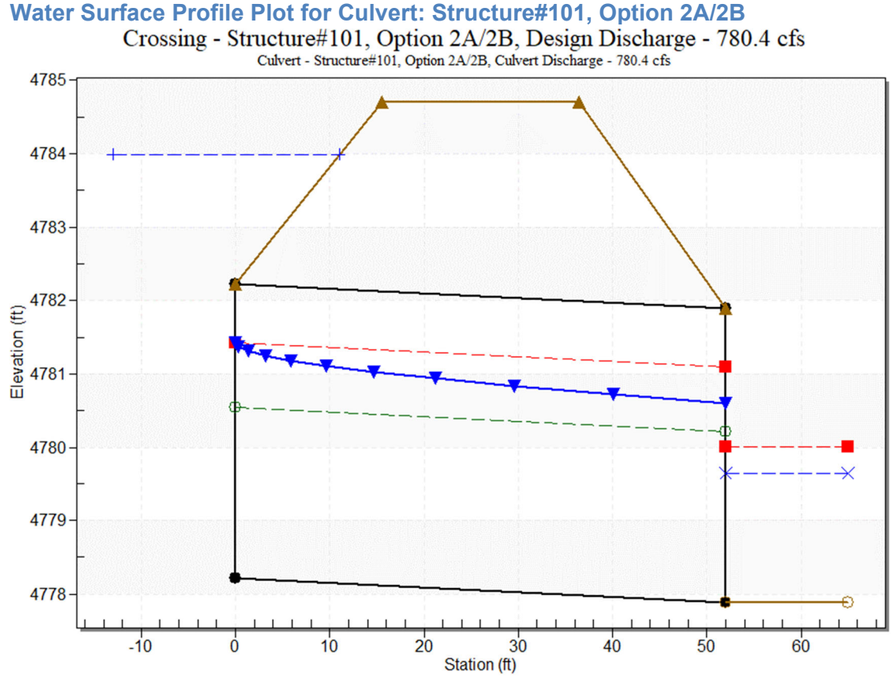
Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	5.18 cfs	5.18 cfs	4778.41	0.19	0.0*	1-JS1t	0.10	0.11	0.27	0.27	0.81	2.44
100 Year	72.62 cfs	72.62 cfs	4779.34	1.12	0.400	1-S2n	0.51	0.66	0.52	0.72	5.84	4.73
100-YR, L_115	780.40 cfs	780.40 cfs	4783.98	5.76	4.940	5-S2n	2.33	3.20	2.71	1.74	12.01	8.56

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4778.22 ft,
Outlet Elevation (invert): 4777.89 ft
Culvert Length: 52.00 ft,
Culvert Slope: 0.0063

Water Surface Profile Plot for Culvert: Structure#101, Option 2A/2B



Tailwater Data for Crossing: Structure#101, Option 2A/2B

Table 12 - Downstream Channel Rating Curve (Crossing: Structure#101, Option 2A/2B)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
5.18	4778.16	0.27	2.44	0.38	1.18
72.62	4778.61	0.72	4.73	1.03	1.39
780.40	4779.63	1.74	8.56	2.50	1.62

Tailwater Channel Data - Structure#101, Option 2A/2B

Tailwater Channel Option: Triangular Channel
Side Slope (H:V): 30.00 (_:1)
Channel Slope: 0.0230
Channel Manning's n: 0.0240
Channel Invert Elevation: 4777.89 ft

Roadway Data for Crossing: Structure#101, Option 2A/2B

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4784.70 ft
Roadway Surface: Paved
Roadway Top Width: 21.00 ft

Culvert Data: Structure#101, Option 2C

Site Data - Structure#101, Option 2C

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4778.22 ft
Outlet Station: 52.00 ft
Outlet Elevation: 4777.89 ft
Number of Barrels: 2

Culvert Data Summary - Structure#101, Option 2C

Barrel Shape: Concrete Box
Barrel Span: 14.00 ft
Barrel Rise: 4.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

Table 27 - Culvert Summary Table: Structure#101, Option 2C

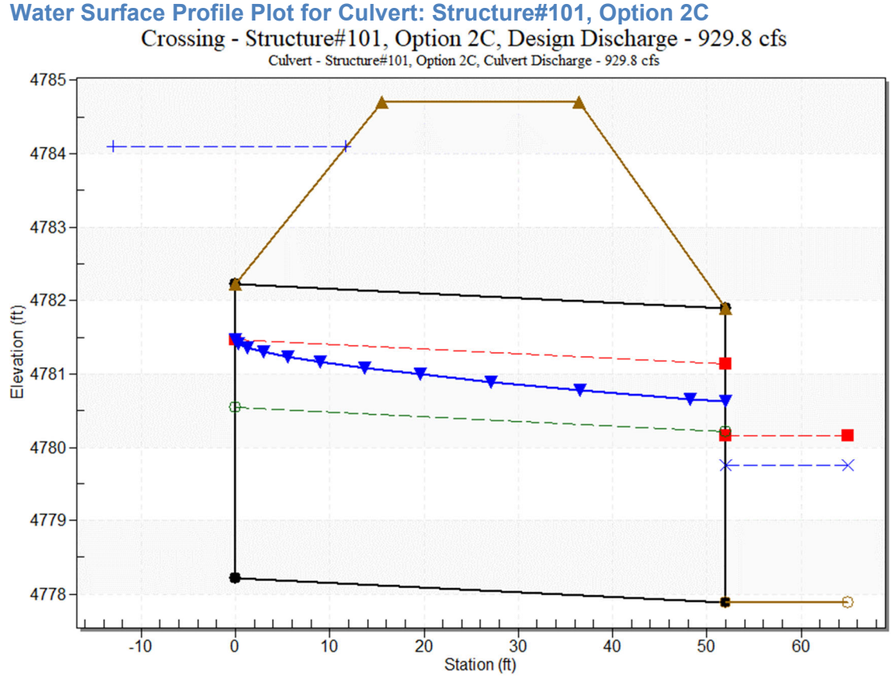
Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	5.18 cfs	5.18 cfs	4778.39	0.17	0.0*	1-JS1t	0.09	0.10	0.27	0.27	0.70	2.44
100 Year	72.62 cfs	72.62 cfs	4779.23	1.01	0.396	1-S2n	0.46	0.59	0.47	0.72	5.56	4.73
100-YR, L_115	929.80 cfs	929.80 cfs	4784.10	5.88	5.028	5-S2n	2.32	3.25	2.73	1.86	12.14	8.95

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4778.22 ft,
Outlet Elevation (invert): 4777.89 ft
Culvert Length: 52.00 ft,
Culvert Slope: 0.0063

Water Surface Profile Plot for Culvert: Structure#101, Option 2C



Tailwater Data for Crossing: Structure#101, Option 2C

Table 28 - Downstream Channel Rating Curve (Crossing: Structure#101, Option 2C)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
5.18	4778.16	0.27	2.44	0.38	1.18
72.62	4778.61	0.72	4.73	1.03	1.39
929.80	4779.75	1.86	8.95	2.67	1.63

Tailwater Channel Data - Structure#101, Option 2C

Tailwater Channel Option: Triangular Channel
Side Slope (H:V): 30.00 (_:1)
Channel Slope: 0.0230
Channel Manning's n: 0.0240
Channel Invert Elevation: 4777.89 ft

Roadway Data for Crossing: Structure#101, Option 2C

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4784.70 ft
Roadway Surface: Paved
Roadway Top Width: 21.00 ft

Culvert Data: Structure#102, Option 2A/2B/2C

Site Data - Structure#102, Option 2A/2B/2C

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4782.03 ft
Outlet Station: 60.00 ft
Outlet Elevation: 4781.65 ft
Number of Barrels: 2

Culvert Data Summary - Structure#102, Option 2A/2B/2C

Barrel Shape: Concrete Box
Barrel Span: 10.00 ft
Barrel Rise: 6.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

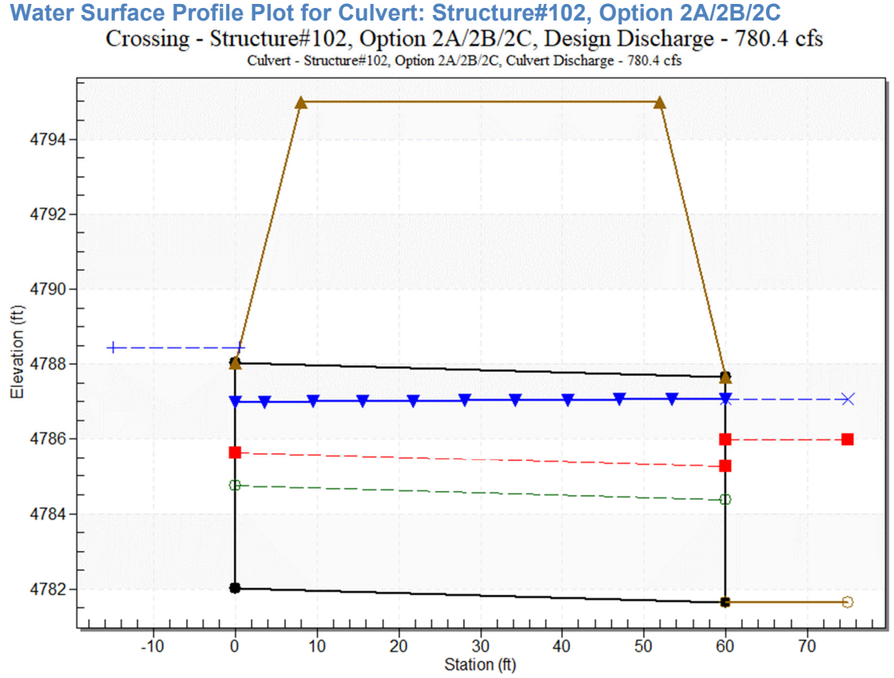
Table 9 - Culvert Summary Table: Structure#102, Option 2A/2B/2C

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	6.28 cfs	6.28 cfs	4782.55	0.25	0.516	1-S1t	0.11	0.15	0.89	0.89	0.35	1.59
100 Year	157.30 cfs	157.30 cfs	4784.82	2.12	2.791	1-S1t	0.93	1.24	2.98	2.98	2.64	3.55
100-YR, L_115	780.40 cfs	780.40 cfs	4788.43	6.13	6.396	1-S1t	2.71	3.62	5.42	5.42	7.19	5.30

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4782.03 ft,
Outlet Elevation (invert): 4781.65 ft
Culvert Length: 60.00 ft,
Culvert Slope: 0.0063

Water Surface Profile Plot for Culvert: Structure#102, Option 2A/2B/2C



Tailwater Data for Crossing: Structure#102, Option 2A/2B/2C

Table 10 - Downstream Channel Rating Curve (Crossing: Structure#102, Option 2A/2B/2C)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
6.28	4782.54	0.89	1.59	0.39	0.42
157.30	4784.63	2.98	3.55	1.30	0.51
780.40	4787.07	5.42	5.30	2.37	0.57

Tailwater Channel Data - Structure#102, Option 2A/2B/2C

Tailwater Channel Option: Triangular Channel
Side Slope (H:V): 5.00 (_:1)
Channel Slope: 0.0070
Channel Manning's n: 0.0450
Channel Invert Elevation: 4781.65 ft

Roadway Data for Crossing: Structure#102, Option 2A/2B/2C

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4794.98 ft
Roadway Surface: Paved
Roadway Top Width: 44.00 ft

Culvert Data: Structure#103, Option 2A/2C

Site Data - Structure#103, Option 2A/2C

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4864.72 ft
Outlet Station: 295.00 ft
Outlet Elevation: 4858.55 ft
Number of Barrels: 1

Culvert Data Summary - Structure#103, Option 2A/2C

Barrel Shape: Concrete Box
Barrel Span: 6.00 ft
Barrel Rise: 4.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

Table 7 - Culvert Summary Table: Structure#103, Option 2A/2C

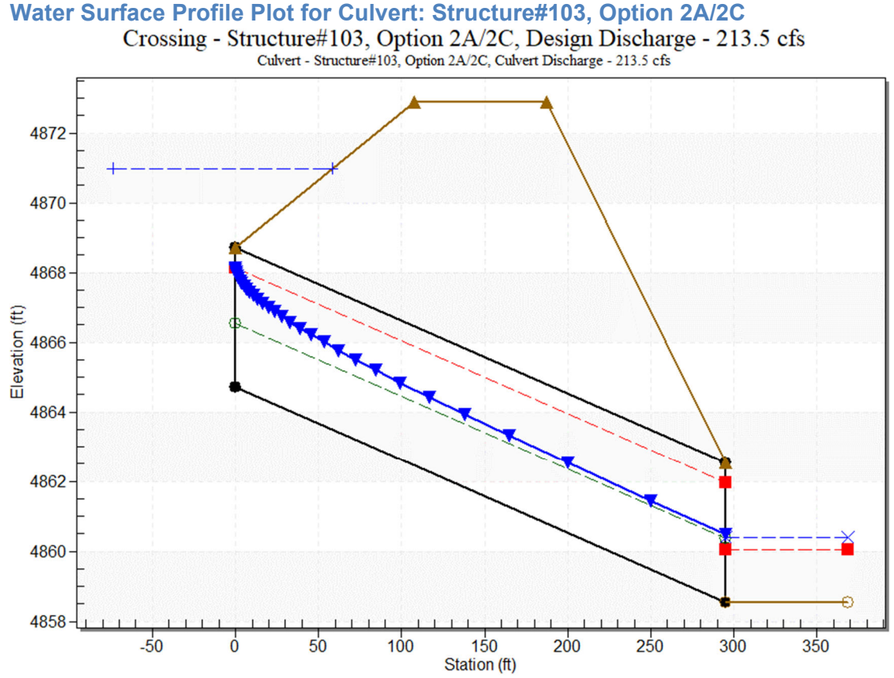
Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	85.77 cfs	85.77 cfs	4867.81	3.09	0.0*	1-S2n	0.98	1.85	0.98	1.18	14.65	3.21
100 Year_L_149	213.50 cfs	213.50 cfs	4870.98	6.26	0.561	5-S2n	1.82	3.40	1.92	1.85	18.52	4.12

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4864.72 ft,
Outlet Elevation (invert): 4858.55 ft
Culvert Length: 295.06 ft,
Culvert Slope: 0.0209

Water Surface Profile Plot for Culvert: Structure#103, Option 2A/2C



Tailwater Data for Crossing: Structure#103, Option 2A/2C

Table 8 - Downstream Channel Rating Curve (Crossing: Structure#103, Option 2A/2C)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
85.77	4859.73	1.18	3.21	0.91	0.62
213.50	4860.40	1.85	4.12	1.42	0.66

Tailwater Channel Data - Structure#103, Option 2A/2C

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 12.70 ft
Side Slope (H:V): 8.30 (_:1)
Channel Slope: 0.0123
Channel Manning's n: 0.0450
Channel Invert Elevation: 4858.55 ft

Roadway Data for Crossing: Structure#103, Option 2A/2C

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4872.88 ft
Roadway Surface: Paved
Roadway Top Width: 80.00 ft

Culvert Data: Structure#104, Option 2A/2B

Site Data - Structure#104, Option 2A/2B

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4921.39 ft
Outlet Station: 127.00 ft
Outlet Elevation: 4919.92 ft
Number of Barrels: 1

Culvert Data Summary - Structure#104, Option 2A/2B

Barrel Shape: Concrete Box
Barrel Span: 6.00 ft
Barrel Rise: 3.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

Table 5 - Culvert Summary Table: Structure#104, Option 2A/2B

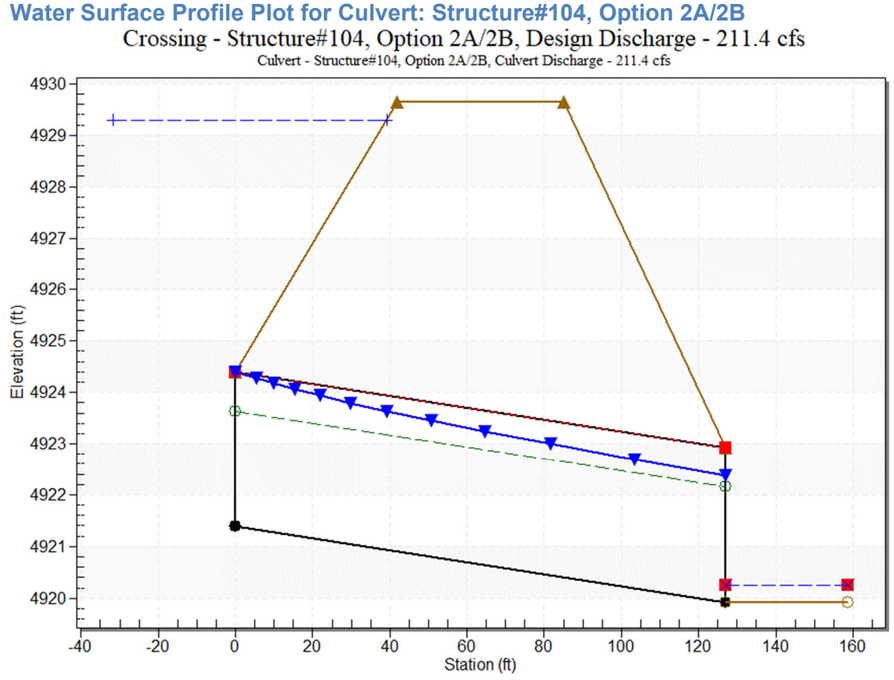
Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	124.36 cfs	124.36 cfs	4925.63	4.24	2.721	5-S2n	1.54	2.37	1.66	0.26	12.48	2.12
100 Year,	211.40 cfs	211.40 cfs	4929.30	7.91	5.879	5-S2n	2.24	3.00	2.46	0.33	14.34	2.44

L_133

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4921.39 ft,
Outlet Elevation (invert): 4919.92 ft
Culvert Length: 127.01 ft,
Culvert Slope: 0.0116

Water Surface Profile Plot for Culvert: Structure#104, Option 2A/2B



Tailwater Data for Crossing: Structure#104, Option 2A/2B

Table 6 - Downstream Channel Rating Curve (Crossing: Structure#104, Option 2A/2B)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
124.36	4920.18	0.26	2.12	0.74	0.92
211.40	4920.25	0.33	2.44	0.94	0.96

Tailwater Channel Data - Structure#104, Option 2A/2B

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 100.00 ft
Side Slope (H:V): 500.00 (_:1)
Channel Slope: 0.0460
Channel Manning's n: 0.0450
Channel Invert Elevation: 4919.92 ft

Roadway Data for Crossing: Structure#104, Option 2A/2B

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4929.64 ft
Roadway Surface: Paved
Roadway Top Width: 43.00 ft

Culvert Data: Structure#201, Option 2A

Site Data - Structure#201, Option 2A

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4761.52 ft
Outlet Station: 30.46 ft
Outlet Elevation: 4760.40 ft
Number of Barrels: 2

Culvert Data Summary - Structure#201, Option 2A

Barrel Shape: Concrete Box
Barrel Span: 11.00 ft
Barrel Rise: 4.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

Table 25 - Culvert Summary Table: Structure#201, Option 2A

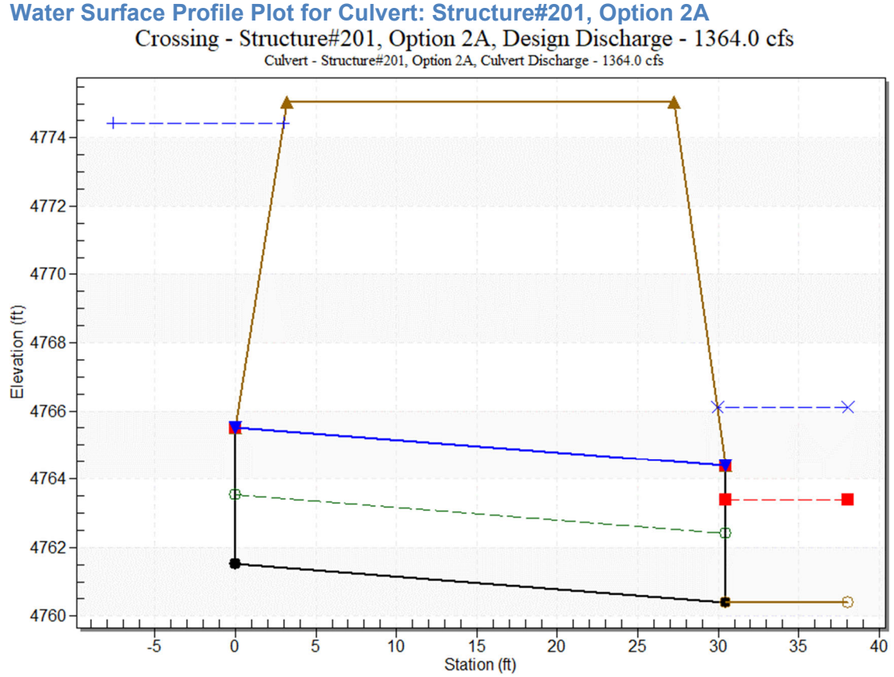
Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	5.00 cfs	5.00 cfs	4761.71	0.19	0.0*	1-S2n	0.04	0.12	0.06	0.23	3.60	0.54
100-YR, O_220	1364.00 cfs	1364.00 cfs	4774.42	12.90	10.475	4-FFf	2.01	4.00	4.00	5.71	15.50	3.80

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4761.52 ft,
Outlet Elevation (invert): 4760.40 ft
Culvert Length: 30.48 ft,
Culvert Slope: 0.0368

Water Surface Profile Plot for Culvert: Structure#201, Option 2A



Tailwater Data for Crossing: Structure#201, Option 2A

Table 26 - Downstream Channel Rating Curve (Crossing: Structure#201, Option 2A)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
5.00	4760.63	0.23	0.54	0.03	0.20
1364.00	4766.11	5.71	3.80	0.71	0.33

Tailwater Channel Data - Structure#201, Option 2A

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 40.00 ft
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.0020
Channel Manning's n: 0.0450
Channel Invert Elevation: 4760.40 ft

Roadway Data for Crossing: Structure#201, Option 2A

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4775.04 ft
Roadway Surface: Gravel
Roadway Top Width: 24.00 ft

Culvert Data: Structure#201, Option 2B

Site Data - Structure#201, Option 2B

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4761.52 ft
Outlet Station: 30.46 ft
Outlet Elevation: 4760.40 ft
Number of Barrels: 2

Culvert Data Summary - Structure#201, Option 2B

Barrel Shape: Concrete Box
Barrel Span: 12.00 ft
Barrel Rise: 5.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

Table 29 - Culvert Summary Table: Structure#201, Option 2B

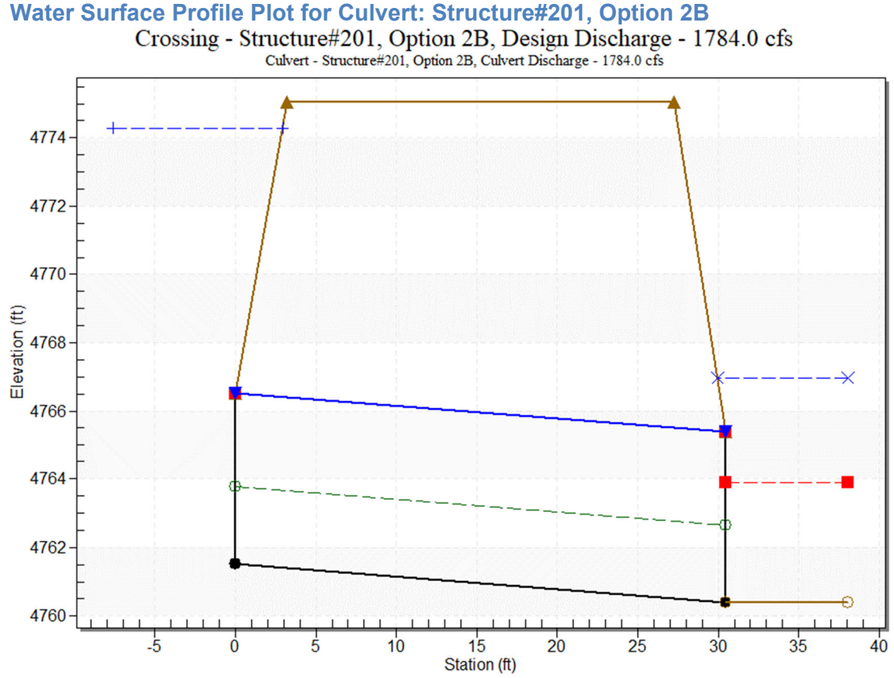
Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	5.00 cfs	5.00 cfs	4761.70	0.18	0.0*	1-S2n	0.03	0.11	0.03	0.23	5.96	0.54
100 Year	1784.00	1784.00	4774.27	12.75	10.800	4-FFf	2.25	5.00	5.00	6.57	14.87	4.10
O_220	cfs	cfs										

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4761.52 ft,
Outlet Elevation (invert): 4760.40 ft
Culvert Length: 30.48 ft,
Culvert Slope: 0.0368

Water Surface Profile Plot for Culvert: Structure#201, Option 2B



Tailwater Data for Crossing: Structure#201, Option 2B

Table 30 - Downstream Channel Rating Curve (Crossing: Structure#201, Option 2B)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
5.00	4760.63	0.23	0.54	0.03	0.20
1784.00	4766.97	6.57	4.10	0.82	0.33

Tailwater Channel Data - Structure#201, Option 2B

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 40.00 ft
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.0020
Channel Manning's n: 0.0450
Channel Invert Elevation: 4760.40 ft

Roadway Data for Crossing: Structure#201, Option 2B

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4775.04 ft
Roadway Surface: Gravel
Roadway Top Width: 24.00 ft

Culvert Data: Structure#201, Option 2C

Site Data - Structure#201, Option 2C

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4761.52 ft
Outlet Station: 30.46 ft
Outlet Elevation: 4760.40 ft
Number of Barrels: 2

Culvert Data Summary - Structure#201, Option 2C

Barrel Shape: Concrete Box
Barrel Span: 12.00 ft
Barrel Rise: 5.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

Table 31 - Culvert Summary Table: Structure#201, Option 2C

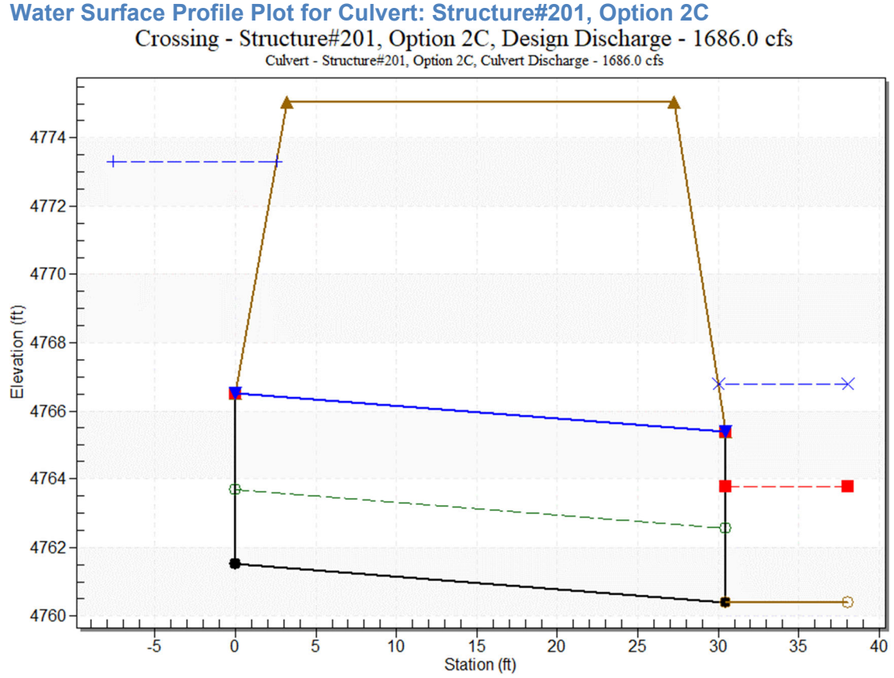
Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	5.00 cfs	5.00 cfs	4761.70	0.18	0.0*	1-S2n	0.03	0.11	0.03	0.23	5.96	0.54
100 Year	1686.00	1686.00	4773.30	11.78	10.040	4-FFf	2.17	5.00	5.00	6.38	14.05	4.03
O_220	cfs	cfs										

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4761.52 ft,
Outlet Elevation (invert): 4760.40 ft
Culvert Length: 30.48 ft,
Culvert Slope: 0.0368

Water Surface Profile Plot for Culvert: Structure#201, Option 2C



Tailwater Data for Crossing: Structure#201, Option 2C

Table 32 - Downstream Channel Rating Curve (Crossing: Structure#201, Option 2C)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
5.00	4760.63	0.23	0.54	0.03	0.20
1686.00	4766.78	6.38	4.03	0.80	0.33

Tailwater Channel Data - Structure#201, Option 2C

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 40.00 ft
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.0020
Channel Manning's n: 0.0450
Channel Invert Elevation: 4760.40 ft

Roadway Data for Crossing: Structure#201, Option 2C

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4775.04 ft
Roadway Surface: Gravel
Roadway Top Width: 24.00 ft

Culvert Data: Structure#202, Option 2A/2B/2C

Site Data - Structure#202, Option 2A/2B/2C

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4949.72 ft
Outlet Station: 100.00 ft
Outlet Elevation: 4944.32 ft
Number of Barrels: 1

Culvert Data Summary - Structure#202, Option 2A/2B/2C

Barrel Shape: Concrete Box
Barrel Span: 6.00 ft
Barrel Rise: 3.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

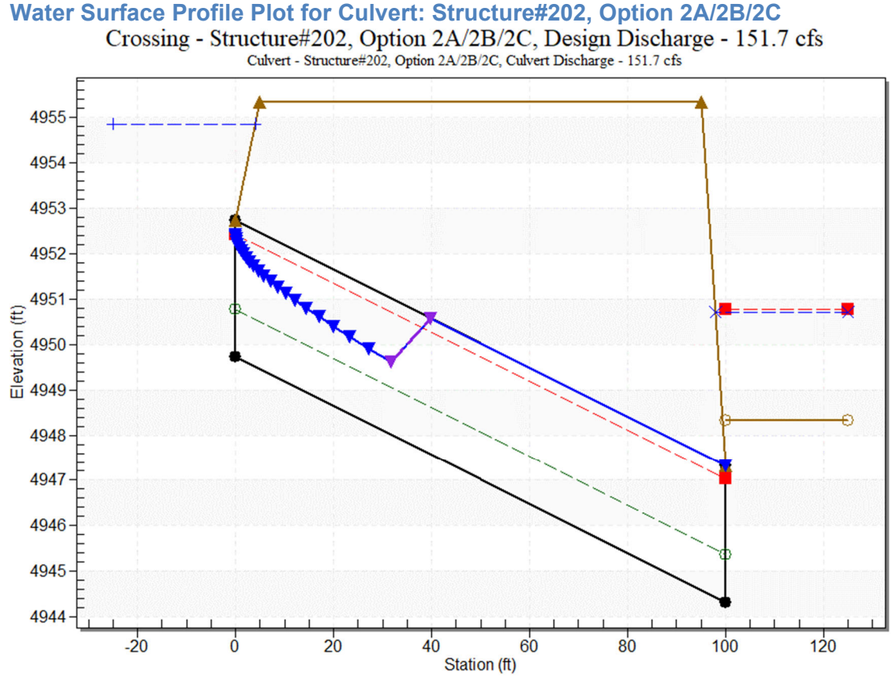
Table 3 - Culvert Summary Table: Structure#202, Option 2A/2B/2C

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5	40.39 cfs	40.39 cfs	4951.55	1.83	0.052	1-JS1f	0.44	1.12	3.00	1.31	2.24	5.11
100-YR, Junction_263	151.66 cfs	151.66 cfs	4954.84	5.12	3.080	5-JS1f	1.04	2.71	3.00	2.37	8.43	7.55

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4949.72 ft,
Outlet Elevation (invert): 4944.32 ft
Culvert Length: 100.15 ft,
Culvert Slope: 0.0540

Water Surface Profile Plot for Culvert: Structure#202, Option 2A/2B/2C



Tailwater Data for Crossing: Structure#202, Option 2A/2B/2C

Table 4 - Downstream Channel Rating Curve (Crossing: Structure#202, Option 2A/2B/2C)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
40.39	4949.63	1.31	5.11	2.68	0.99
151.66	4950.69	2.37	7.55	4.86	1.08

Tailwater Channel Data - Structure#202, Option 2A/2B/2C

Tailwater Channel Option: Irregular Channel
Channel Slope: Irregular Channel

User Defined Channel Cross-Section

Coord No.	Station (ft)	Elevation (ft)	Manning's n
1	0.00	4962.30	0.0450
2	3.23	4962.09	0.0450
3	6.47	4961.86	0.0450
4	9.70	4961.61	0.0450
5	12.93	4961.41	0.0450
6	16.17	4961.22	0.0450
7	19.40	4960.97	0.0450
8	22.64	4960.70	0.0450

9	25.87	4960.41	0.0450
10	29.10	4960.10	0.0450
11	32.34	4959.84	0.0450
12	35.57	4959.59	0.0450
13	38.80	4959.34	0.0450
14	42.04	4959.06	0.0450
15	45.27	4958.74	0.0450
16	48.50	4958.41	0.0450
17	51.74	4958.07	0.0450
18	54.97	4957.68	0.0450
19	58.20	4957.27	0.0450
20	61.44	4956.89	0.0450
21	64.67	4956.54	0.0450
22	67.91	4956.23	0.0450
23	71.14	4955.85	0.0450
24	74.37	4955.38	0.0450
25	77.61	4954.97	0.0450
26	80.84	4954.70	0.0450
27	84.07	4954.43	0.0450
28	87.31	4954.23	0.0450
29	90.54	4954.07	0.0450
30	93.77	4953.94	0.0450
31	97.01	4953.82	0.0450
32	100.24	4953.72	0.0450
33	103.47	4953.55	0.0450
34	106.71	4953.08	0.0450
35	109.94	4952.92	0.0450
36	113.17	4953.12	0.0450
37	116.41	4951.97	0.0450
38	119.64	4950.01	0.0450
39	122.88	4948.73	0.0450
40	126.11	4948.32	0.0450
41	129.34	4949.03	0.0450
42	132.58	4951.36	0.0450
43	135.81	4953.47	0.0450
44	139.04	4955.07	0.0450
45	142.28	4956.11	0.0450
46	145.51	4956.75	0.0450
47	148.75	4956.69	0.0450
48	151.98	4955.86	0.0450
49	155.21	4954.91	0.0450
50	158.45	4954.71	0.0450
51	161.68	4954.76	0.0450
52	164.91	4954.65	0.0450
53	168.15	4954.77	0.0450
54	171.38	4955.49	0.0450
55	174.61	4956.04	0.0450
56	177.85	4956.47	0.0450
57	181.08	4957.05	0.0450
58	184.31	4957.49	0.0450
59	187.55	4957.86	0.0450
60	190.78	4958.15	0.0450
61	194.01	4958.40	0.0450
62	197.25	4958.70	0.0450
63	200.48	4958.98	0.0450
64	203.72	4959.11	0.0450
65	206.95	4959.15	0.0450
66	210.18	4959.21	0.0450
67	213.42	4959.31	0.0450
68	216.65	4959.39	0.0450
69	219.88	4959.50	0.0450
70	223.12	4959.56	0.0000

Roadway Data for Crossing: Structure#202, Option 2A/2B/2C

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4955.33 ft
Roadway Surface: Gravel
Roadway Top Width: 90.00 ft

Culvert Data: Structure#202, Option 2C

Site Data - Structure#202, Option 2C

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4949.72 ft
Outlet Station: 100.00 ft
Outlet Elevation: 4944.32 ft
Number of Barrels: 2

Culvert Data Summary - Structure#202, Option 2C

Barrel Shape: Concrete Box
Barrel Span: 7.00 ft
Barrel Rise: 3.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

Table 33 - Culvert Summary Table: Structure#202, Option 2C

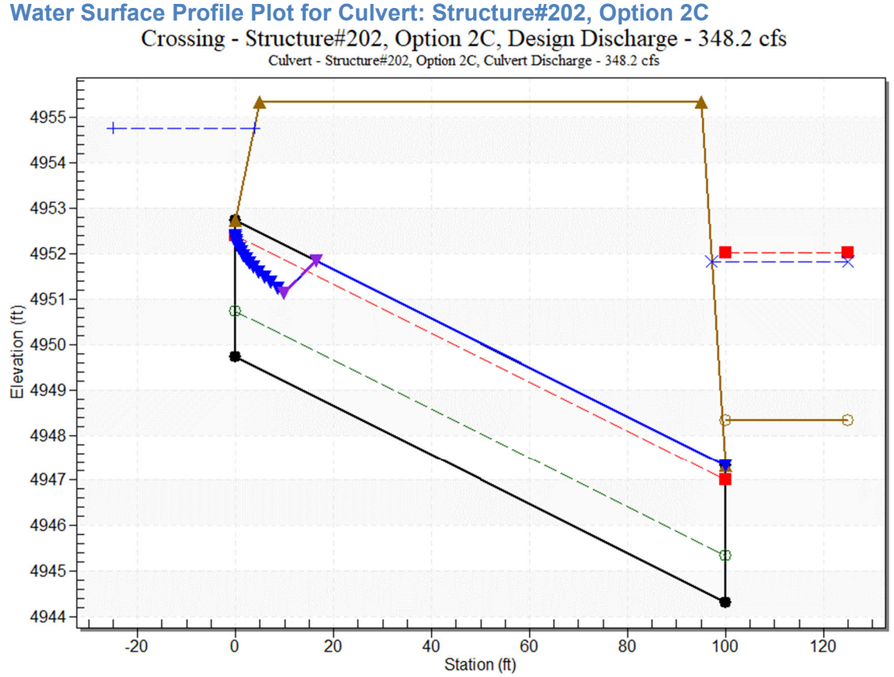
Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5	40.39 cfs	40.39 cfs	4950.76	1.04	0.0*	1-JS1f	0.26	0.64	3.00	1.31	0.96	5.11
100-YR, Junction_263	348.25 cfs	348.25 cfs	4954.75	5.03	4.098	5-JS1f	1.01	2.68	3.00	3.48	8.29	9.51

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4949.72 ft,
Outlet Elevation (invert): 4944.32 ft
Culvert Length: 100.15 ft,
Culvert Slope: 0.0540

Water Surface Profile Plot for Culvert: Structure#202, Option 2C



Tailwater Data for Crossing: Structure#202, Option 2C

Table 34 - Downstream Channel Rating Curve (Crossing: Structure#202, Option 2C)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
40.39	4949.63	1.31	5.11	2.68	0.99
348.25	4951.81	3.48	9.51	7.15	1.13

Tailwater Channel Data - Structure#202, Option 2C

Tailwater Channel Option: Irregular Channel
Channel Slope: Irregular Channel

User Defined Channel Cross-Section

Coord No.	Station (ft)	Elevation (ft)	Manning's n
1	0.00	4962.30	0.0450
2	3.23	4962.09	0.0450
3	6.47	4961.86	0.0450
4	9.70	4961.61	0.0450
5	12.93	4961.41	0.0450
6	16.17	4961.22	0.0450
7	19.40	4960.97	0.0450
8	22.64	4960.70	0.0450

9	25.87	4960.41	0.0450
10	29.10	4960.10	0.0450
11	32.34	4959.84	0.0450
12	35.57	4959.59	0.0450
13	38.80	4959.34	0.0450
14	42.04	4959.06	0.0450
15	45.27	4958.74	0.0450
16	48.50	4958.41	0.0450
17	51.74	4958.07	0.0450
18	54.97	4957.68	0.0450
19	58.20	4957.27	0.0450
20	61.44	4956.89	0.0450
21	64.67	4956.54	0.0450
22	67.91	4956.23	0.0450
23	71.14	4955.85	0.0450
24	74.37	4955.38	0.0450
25	77.61	4954.97	0.0450
26	80.84	4954.70	0.0450
27	84.07	4954.43	0.0450
28	87.31	4954.23	0.0450
29	90.54	4954.07	0.0450
30	93.77	4953.94	0.0450
31	97.01	4953.82	0.0450
32	100.24	4953.72	0.0450
33	103.47	4953.55	0.0450
34	106.71	4953.08	0.0450
35	109.94	4952.92	0.0450
36	113.17	4953.12	0.0450
37	116.41	4951.97	0.0450
38	119.64	4950.01	0.0450
39	122.88	4948.73	0.0450
40	126.11	4948.32	0.0450
41	129.34	4949.03	0.0450
42	132.58	4951.36	0.0450
43	135.81	4953.47	0.0450
44	139.04	4955.07	0.0450
45	142.28	4956.11	0.0450
46	145.51	4956.75	0.0450
47	148.75	4956.69	0.0450
48	151.98	4955.86	0.0450
49	155.21	4954.91	0.0450
50	158.45	4954.71	0.0450
51	161.68	4954.76	0.0450
52	164.91	4954.65	0.0450
53	168.15	4954.77	0.0450
54	171.38	4955.49	0.0450
55	174.61	4956.04	0.0450
56	177.85	4956.47	0.0450
57	181.08	4957.05	0.0450
58	184.31	4957.49	0.0450
59	187.55	4957.86	0.0450
60	190.78	4958.15	0.0450
61	194.01	4958.40	0.0450
62	197.25	4958.70	0.0450
63	200.48	4958.98	0.0450
64	203.72	4959.11	0.0450
65	206.95	4959.15	0.0450
66	210.18	4959.21	0.0450
67	213.42	4959.31	0.0450
68	216.65	4959.39	0.0450
69	219.88	4959.50	0.0450
70	223.12	4959.56	0.0000

Roadway Data for Crossing: Structure#202, Option 2C

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4955.33 ft
Roadway Surface: Gravel
Roadway Top Width: 90.00 ft

Culvert Data: Structure#203, Option 2A/2B/2C

Site Data - Structure#203, Option 2A/2B/2C

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4979.58 ft
Outlet Station: 327.00 ft
Outlet Elevation: 4970.79 ft
Number of Barrels: 1

Culvert Data Summary - Structure#203, Option 2A/2B/2C

Barrel Shape: Circular
Barrel Diameter: 4.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall (Ke=0.5)
Inlet Depression: None

Table 1 - Culvert Summary Table: Structure#203, Option 2A/2B/2C

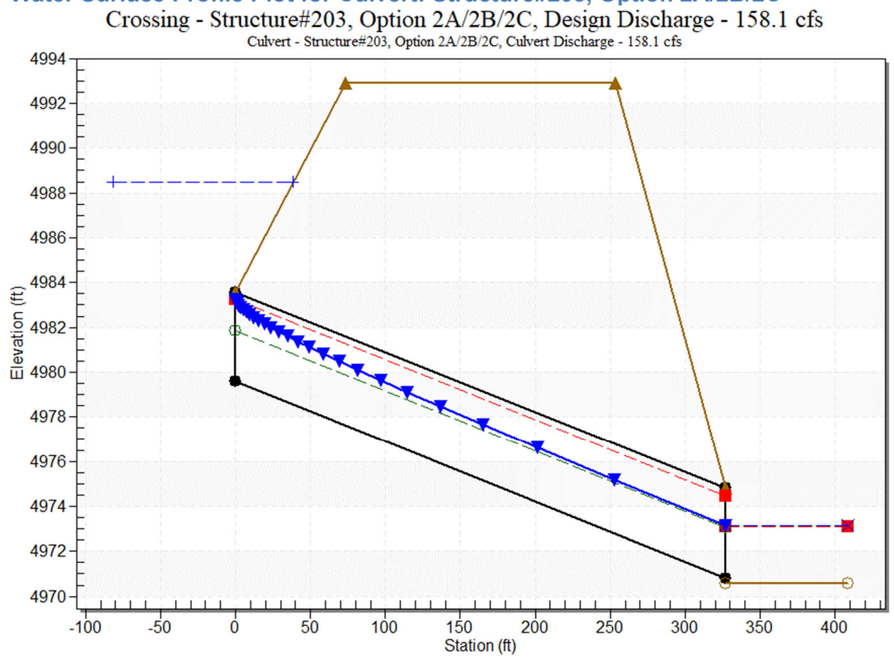
Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5-year	40.39 cfs	40.39 cfs	4982.30	2.72	0.0*	1-S2n	1.07	1.90	1.07	1.52	14.86	4.35
100-year, Junction _268	158.12 cfs	158.12 cfs	4988.47	8.89	2.083	5-S2n	2.28	3.65	2.36	2.54	20.51	6.12

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4979.58 ft,
Outlet Elevation (invert): 4970.79 ft
Culvert Length: 327.12 ft,
Culvert Slope: 0.0269

Water Surface Profile Plot for Culvert: Structure#203, Option 2A/2B/2C



Tailwater Data for Crossing: Structure#203, Option 2A/2B/2C

Table 2 - Downstream Channel Rating Curve (Crossing: Structure#203, Option 2A/2B/2C)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
40.39	4972.10	1.52	4.35	2.47	0.88
158.12	4973.12	2.54	6.12	4.12	0.96

Tailwater Channel Data - Structure#203, Option 2A/2B/2C

Tailwater Channel Option: Triangular Channel
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.0260
Channel Manning's n: 0.0450
Channel Invert Elevation: 4970.58 ft

Roadway Data for Crossing: Structure#203, Option 2A/2B/2C

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4992.89 ft
Roadway Surface: Paved
Roadway Top Width: 180.00 ft

Culvert Data: Structure#301, Reach 300

Site Data - Structure#301, Reach 300

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4786.49 ft
Outlet Station: 35.60 ft
Outlet Elevation: 4786.34 ft
Number of Barrels: 1

Culvert Data Summary - Structure#301, Reach 300

Barrel Shape: Concrete Box
Barrel Span: 8.00 ft
Barrel Rise: 3.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

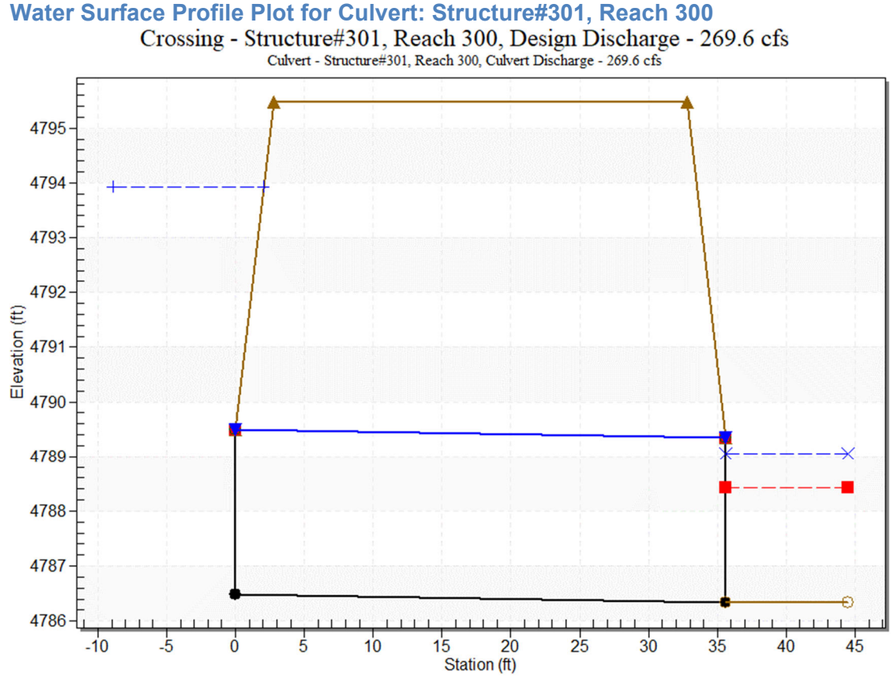
Table 23 - Culvert Summary Table: Structure#301, Reach 300

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	23.55 cfs	23.55 cfs	4787.59	1.10	0.649	1-JS1t	0.58	0.65	0.78	0.78	3.80	2.25
100 Year	269.56 cfs	269.56 cfs	4793.92	7.43	6.048	6-FFc	3.00	3.00	3.00	2.71	11.23	4.49

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4786.49 ft,
Outlet Elevation (invert): 4786.34 ft
Culvert Length: 35.60 ft,
Culvert Slope: 0.0042

Water Surface Profile Plot for Culvert: Structure#301, Reach 300



Tailwater Data for Crossing: Structure#301, Reach 300

Table 24 - Downstream Channel Rating Curve (Crossing: Structure#301, Reach 300)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
23.55	4787.12	0.78	2.25	0.44	0.51
269.56	4789.05	2.71	4.49	1.52	0.60

Tailwater Channel Data - Structure#301, Reach 300

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 10.00 ft
Side Slope (H:V): 4.50 (_:1)
Channel Slope: 0.0090
Channel Manning's n: 0.0450
Channel Invert Elevation: 4786.34 ft

Roadway Data for Crossing: Structure#301, Reach 300

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4795.47 ft
Roadway Surface: Gravel
Roadway Top Width: 30.00 ft

Culvert Data: Structure#501, Option 2

Site Data - Structure#501, Option 2

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4824.39 ft
Outlet Station: 88.00 ft
Outlet Elevation: 4816.39 ft
Number of Barrels: 1

Culvert Data Summary - Structure#501, Option 2

Barrel Shape: Concrete Box
Barrel Span: 8.00 ft
Barrel Rise: 3.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

Table 13 - Culvert Summary Table: Structure#501, Option 2

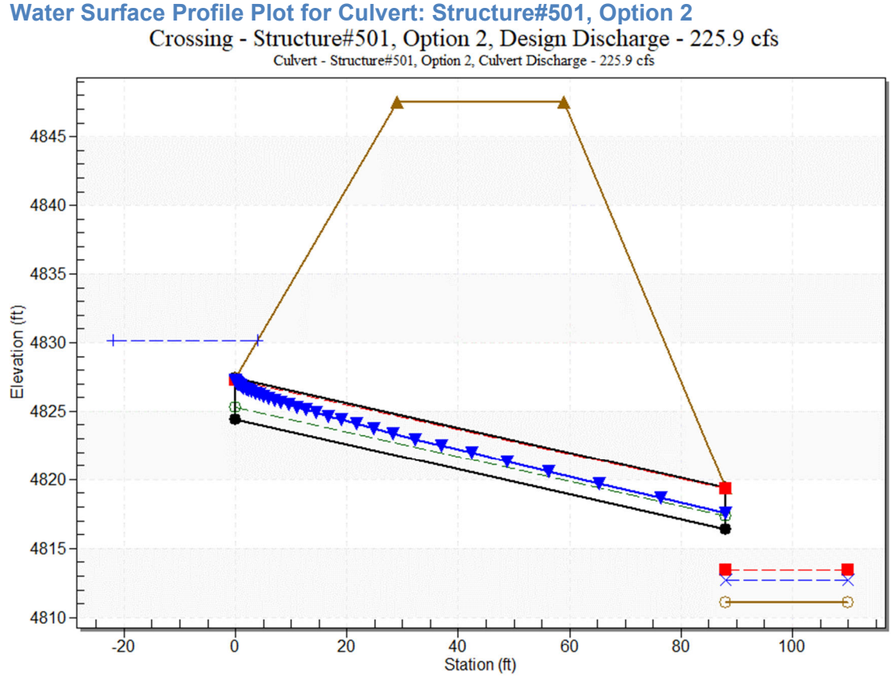
Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	19.99 cfs	19.99 cfs	4825.30	0.91	0.0*	1-S2n	0.20	0.58	0.20	0.64	12.57	7.02
100 Year	174.84 cfs	174.84 cfs	4828.73	4.34	0.0*	5-S2n	0.78	2.46	0.95	1.44	23.02	12.07
100-YR, L_513	225.90 cfs	225.90 cfs	4830.16	5.77	0.0*	5-S2n	0.92	2.91	1.17	1.58	24.08	12.87

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4824.39 ft,
Outlet Elevation (invert): 4816.39 ft
Culvert Length: 88.36 ft,
Culvert Slope: 0.0909

Water Surface Profile Plot for Culvert: Structure#501, Option 2



Tailwater Data for Crossing: Structure#501, Option 2

Table 14 - Downstream Channel Rating Curve (Crossing: Structure#501, Option 2)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
19.99	4811.74	0.64	7.02	8.36	2.19
174.84	4812.54	1.44	12.07	18.85	2.51
225.90	4812.68	1.58	12.87	20.75	2.55

Tailwater Channel Data - Structure#501, Option 2

Tailwater Channel Option: Triangular Channel
Side Slope (H:V): 7.00 (_:1)
Channel Slope: 0.2100
Channel Manning's n: 0.0450
Channel Invert Elevation: 4811.10 ft

Roadway Data for Crossing: Structure#501, Option 2

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4847.50 ft
Roadway Surface: Paved
Roadway Top Width: 30.00 ft

Culvert Data: Structure#601, Option 2

Site Data - Structure#601, Option 2

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4827.99 ft
Outlet Station: 120.50 ft
Outlet Elevation: 4825.15 ft
Number of Barrels: 1

Culvert Data Summary - Structure#601, Option 2

Barrel Shape: Concrete Box
Barrel Span: 8.00 ft
Barrel Rise: 5.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

Table 21 - Culvert Summary Table: Structure#601, Option 2

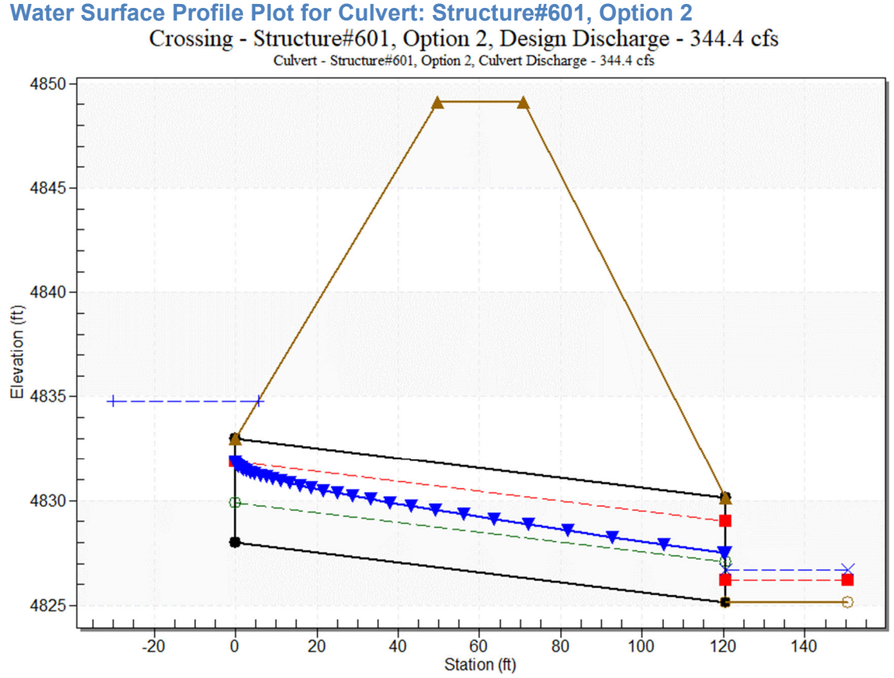
Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	17.62 cfs	17.62 cfs	4828.88	0.89	0.0*	1-S2n	0.28	0.53	0.28	0.31	7.89	1.20
100 Year	145.90 cfs	145.90 cfs	4831.62	3.63	0.0*	1-S2n	1.07	2.18	1.21	1.00	15.07	2.34
100-YR, L_613	344.40 cfs	344.40 cfs	4834.80	6.81	3.643	5-S2n	1.91	3.86	2.36	1.56	18.25	2.98

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4827.99 ft,
Outlet Elevation (invert): 4825.15 ft
Culvert Length: 120.53 ft,
Culvert Slope: 0.0236

Water Surface Profile Plot for Culvert: Structure#601, Option 2



Tailwater Data for Crossing: Structure#601, Option 2

Table 22 - Downstream Channel Rating Curve (Crossing: Structure#601, Option 2)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
17.62	4825.46	0.31	1.20	0.15	0.41
145.90	4826.15	1.00	2.34	0.47	0.48
344.40	4826.71	1.56	2.98	0.73	0.51

Tailwater Channel Data - Structure#601, Option 2

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 40.00 ft
Side Slope (H:V): 21.90 (_:1)
Channel Slope: 0.0075
Channel Manning's n: 0.0450
Channel Invert Elevation: 4825.15 ft

Roadway Data for Crossing: Structure#601, Option 2

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4849.11 ft
Roadway Surface: Gravel
Roadway Top Width: 21.00 ft

Culvert Data: Structure#602, Option 2

Site Data - Structure#602, Option 2

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4832.33 ft
Outlet Station: 41.00 ft
Outlet Elevation: 4832.02 ft
Number of Barrels: 1

Culvert Data Summary - Structure#602, Option 2

Barrel Shape: Concrete Box
Barrel Span: 8.00 ft
Barrel Rise: 4.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

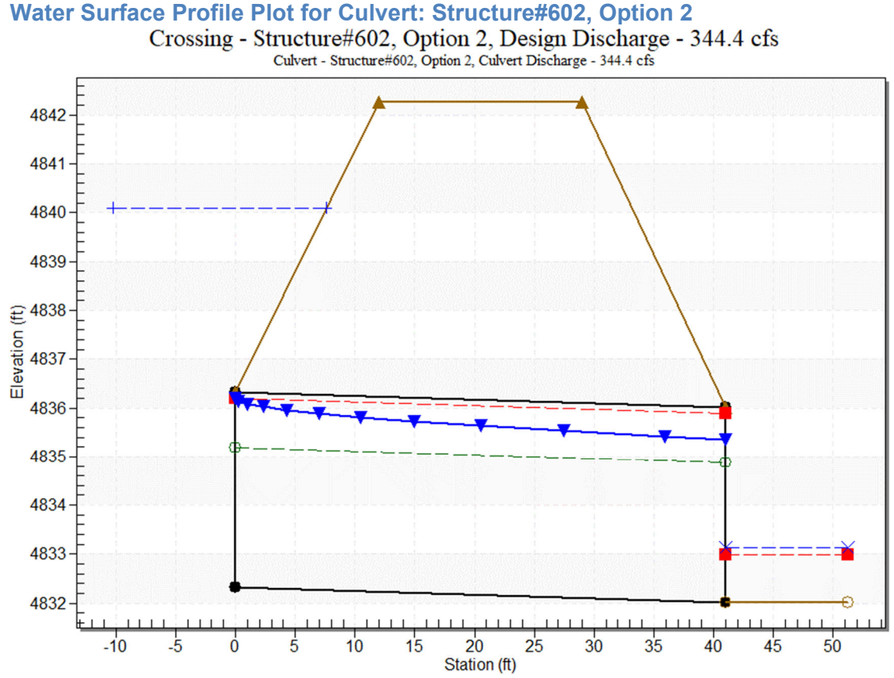
Table 17 - Culvert Summary Table: Structure#602, Option 2

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	17.62 cfs	17.62 cfs	4833.24	0.91	0.230	1-S2n	0.40	0.53	0.41	0.21	5.38	1.52
100 Year	145.90 cfs	145.90 cfs	4836.00	3.67	2.390	1-S2n	1.56	2.18	1.79	0.70	10.16	3.16
100-YR, L_613	344.40 cfs	344.40 cfs	4840.10	7.77	6.528	5-S2n	2.84	3.86	3.34	1.12	12.90	4.12

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4832.33 ft,
Outlet Elevation (invert): 4832.02 ft
Culvert Length: 41.00 ft,
Culvert Slope: 0.0076

Water Surface Profile Plot for Culvert: Structure#602, Option 2



Tailwater Data for Crossing: Structure#602, Option 2

Table 18 - Downstream Channel Rating Curve (Crossing: Structure#602, Option 2)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
17.62	4832.23	0.21	1.52	0.25	0.61
145.90	4832.72	0.70	3.16	0.83	0.73
344.40	4833.14	1.12	4.12	1.33	0.78

Tailwater Channel Data - Structure#602, Option 2

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 52.00 ft
Side Slope (H:V): 20.00 (_:1)
Channel Slope: 0.0190
Channel Manning's n: 0.0450
Channel Invert Elevation: 4832.02 ft

Roadway Data for Crossing: Structure#602, Option 2

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4842.26 ft
Roadway Surface: Paved
Roadway Top Width: 17.00 ft

Culvert Data: Structure#603, Option 2

Site Data - Structure#603, Option 2

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4918.96 ft
Outlet Station: 234.00 ft
Outlet Elevation: 4917.04 ft
Number of Barrels: 1

Culvert Data Summary - Structure#603, Option 2

Barrel Shape: Concrete Box
Barrel Span: 7.00 ft
Barrel Rise: 3.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

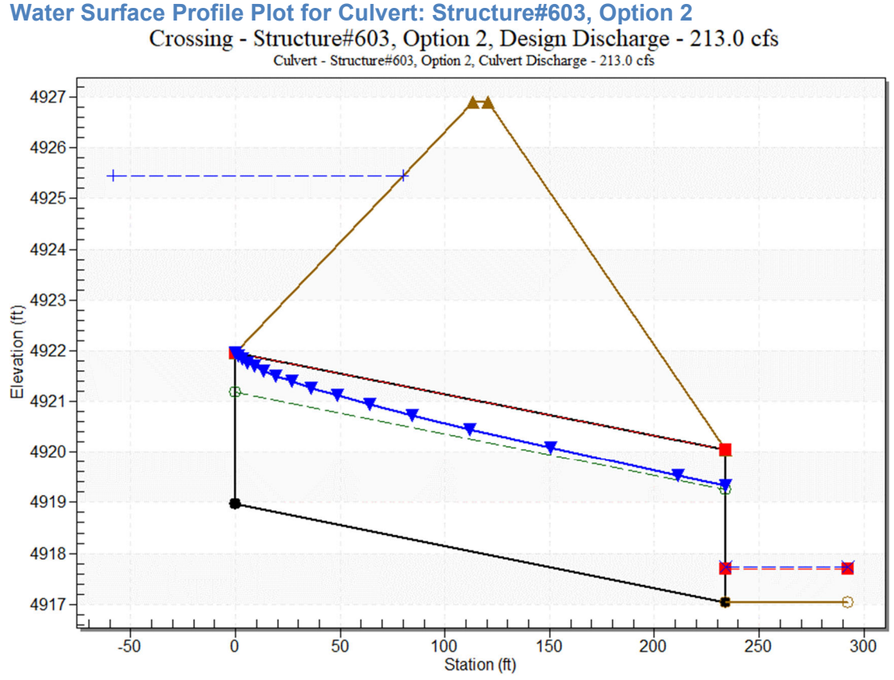
Table 15 - Culvert Summary Table: Structure#603, Option 2

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	78.44 cfs	78.44 cfs	4921.61	2.65	0.173	1-S2n	1.11	1.57	1.11	0.38	10.06	2.88
100-YR, L_613	213.03 cfs	213.03 cfs	4925.44	6.47	4.936	5-S2n	2.21	3.00	2.29	0.70	13.29	4.27

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4918.96 ft,
Outlet Elevation (invert): 4917.04 ft
Culvert Length: 234.01 ft,
Culvert Slope: 0.0082

Water Surface Profile Plot for Culvert: Structure#603, Option 2



Tailwater Data for Crossing: Structure#603, Option 2

Table 16 - Downstream Channel Rating Curve (Crossing: Structure#603, Option 2)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
78.44	4917.42	0.38	2.88	0.67	0.82
213.03	4917.74	0.70	4.27	1.21	0.91

Tailwater Channel Data - Structure#603, Option 2

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 70.00 ft
Side Slope (H:V): 2.00 (_:1)
Channel Slope: 0.0278
Channel Manning's n: 0.0450
Channel Invert Elevation: 4917.04 ft

Roadway Data for Crossing: Structure#603, Option 2

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4926.90 ft
Roadway Surface: Gravel
Roadway Top Width: 7.00 ft

Culvert Data: Structure#801, Option 2

Site Data - Structure#801, Option 2

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4960.15 ft
Outlet Station: 71.00 ft
Outlet Elevation: 4960.01 ft
Number of Barrels: 1

Culvert Data Summary - Structure#801, Option 2

Barrel Shape: Concrete Box
Barrel Span: 8.00 ft
Barrel Rise: 4.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

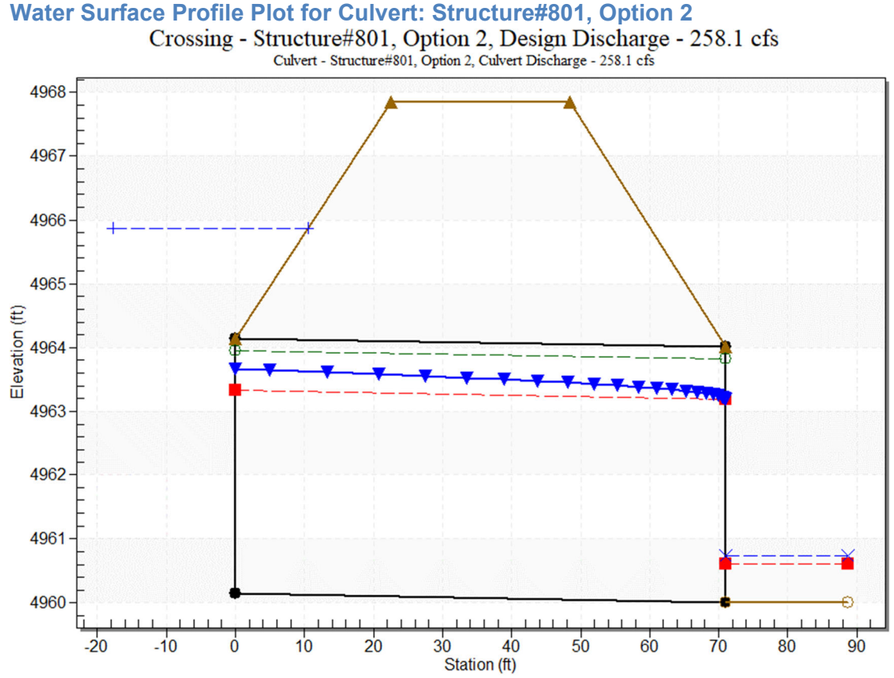
Table 19 - Culvert Summary Table: Structure#801, Option 2

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	62.87 cfs	62.87 cfs	4962.28	2.13	2.136	2-M2c	1.41	1.24	1.24	0.31	6.33	2.04
100 Year	199.58 cfs	199.58 cfs	4964.76	4.61	4.615	7-M2c	3.15	2.68	2.68	0.62	9.30	3.23
100-YR, L_813	258.10 cfs	258.10 cfs	4965.87	5.73	5.478	7-M2c	3.81	3.19	3.19	0.72	10.13	3.58

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4960.15 ft,
Outlet Elevation (invert): 4960.01 ft
Culvert Length: 71.00 ft,
Culvert Slope: 0.0019

Water Surface Profile Plot for Culvert: Structure#801, Option 2



Tailwater Data for Crossing: Structure#801, Option 2

Table 20 - Downstream Channel Rating Curve (Crossing: Structure#801, Option 2)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
62.87	4960.32	0.31	2.04	0.36	0.65
199.58	4960.63	0.62	3.23	0.71	0.72
258.10	4960.73	0.72	3.58	0.83	0.74

Tailwater Channel Data - Structure#801, Option 2

Tailwater Channel Option: Rectangular Channel
Bottom Width: 100.00 ft
Channel Slope: 0.0185
Channel Manning's n: 0.0450
Channel Invert Elevation: 4960.01 ft

Roadway Data for Crossing: Structure#801, Option 2

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4967.84 ft
Roadway Surface: Paved
Roadway Top Width: 26.00 ft

Culvert Data: Structure#702

Site Data - Structure#702

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4867.00 ft
Outlet Station: 97.00 ft
Outlet Elevation: 4862.00 ft
Number of Barrels: 1

Culvert Data Summary - Structure#702

Barrel Shape: Circular
Barrel Diameter: 2.00 ft
Barrel Material: Corrugated Steel
Embedment: 0.00 in
Barrel Manning's n: 0.0240
Culvert Type: Straight
Inlet Configuration: Mitered to Conform to Slope (Ke=0.7)
Inlet Depression: None

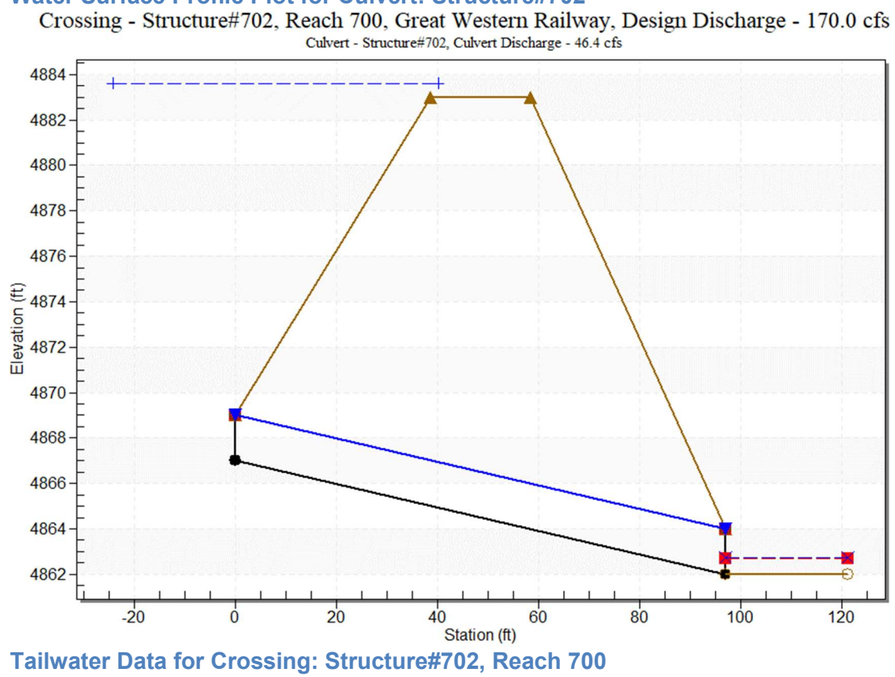
Table 1- Culvert Summary Table: Structure#702

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	24.91 cfs	24.91 cfs	4871.48	4.48	2.530	5-S2n	1.47	1.76	1.47	0.23	10.03	2.12
100 Year	170.02 cfs	46.38 cfs	4883.59	12.46	16.591	6-FFc	2.00	2.00	2.00	0.72	14.76	4.44

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4867.00 ft,
Outlet Elevation (invert): 4862.00 ft
Culvert Length: 97.13 ft,
Culvert Slope: 0.0515

Water Surface Profile Plot for Culvert: Structure#702



Tailwater Data for Crossing: Structure#702, Reach 700

Table 2 - Downstream Channel Rating Curve (Crossing: Structure#702, Reach 700)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
24.91	4862.23	0.23	2.12	0.43	0.79
172	4862.72	0.72	4.44	1.35	0.94

Tailwater Channel Data - Structure#702, Reach 700

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 50.00 ft
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.0300
Channel Manning's n: 0.0450
Channel Invert Elevation: 4862.00 ft

Roadway Data for Crossing: Structure#702, Reach 700

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4883.00 ft
Roadway Surface: Gravel
Roadway Top Width: 20.00 ft

Culvert Data: Structure#703

Site Data - Structure#703,

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4872.00 ft
Outlet Station: 42.00 ft
Outlet Elevation: 4871.00 ft
Number of Barrels: 1

Culvert Data Summary - Structure#703,

Barrel Shape: Circular
Barrel Diameter: 0.83 ft
Barrel Material: PVC
Embedment: 0.00 in
Barrel Manning's n: 0.0130
Culvert Type: Straight
Inlet Configuration: Mitered to Conform to Slope (Ke=0.7)
Inlet Depression: None

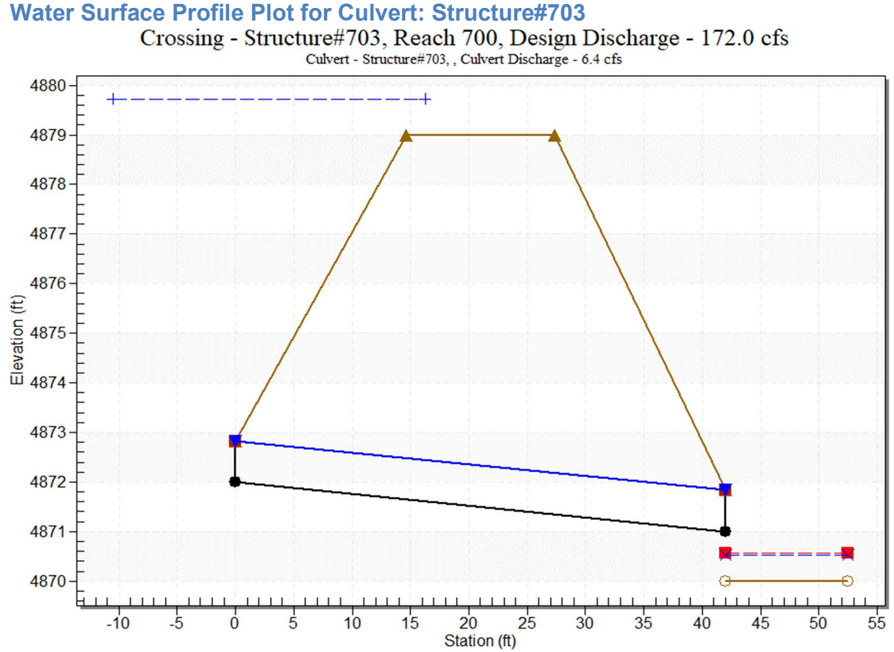
Table 3 - Culvert Summary Table: Structure#703

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	24.91 cfs	6.21 cfs	4879.17	7.17	6.613	6-FFc	0.83	0.83	0.83	0.16	11.39	2.18
100 Year	172.00 cfs	6.45 cfs	4879.71	7.71	7.155	6-FFc	0.83	0.83	0.83	0.52	11.83	4.68

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4872.00 ft,
Outlet Elevation (invert): 4871.00 ft
Culvert Length: 42.01 ft,
Culvert Slope: 0.0238

Water Surface Profile Plot for Culvert: Structure#703



Tailwater Data for Crossing: Structure#703, Reach 700

Table 4 - Downstream Channel Rating Curve (Crossing: Structure#703, Reach 700)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
24.91	4870.16	0.16	2.18	0.22	0.95
172	4870.52	0.52	4.68	0.71	1.15

Tailwater Channel Data - Structure#703, Reach 700

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 70.00 ft
Side Slope (H:V): 2.00 (_:1)
Channel Slope: 0.0220
Channel Manning's n: 0.0300
Channel Invert Elevation: 4870.00 ft

Roadway Data for Crossing: Structure#703, Reach 700

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4879.00 ft
Roadway Surface: Gravel
Roadway Top Width: 12.76 ft

Culvert Data: Structure#704

Site Data - Structure#704

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4891.00 ft
Outlet Station: 89.00 ft
Outlet Elevation: 4888.00 ft
Number of Barrels: 1

Culvert Data Summary - Structure#704

Barrel Shape: Circular
Barrel Diameter: 2.50 ft
Barrel Material: Corrugated Steel
Embedment: 0.00 in
Barrel Manning's n: 0.0240
Culvert Type: Straight
Inlet Configuration: Thin Edge Projecting (Ke=0.9)
Inlet Depression: None

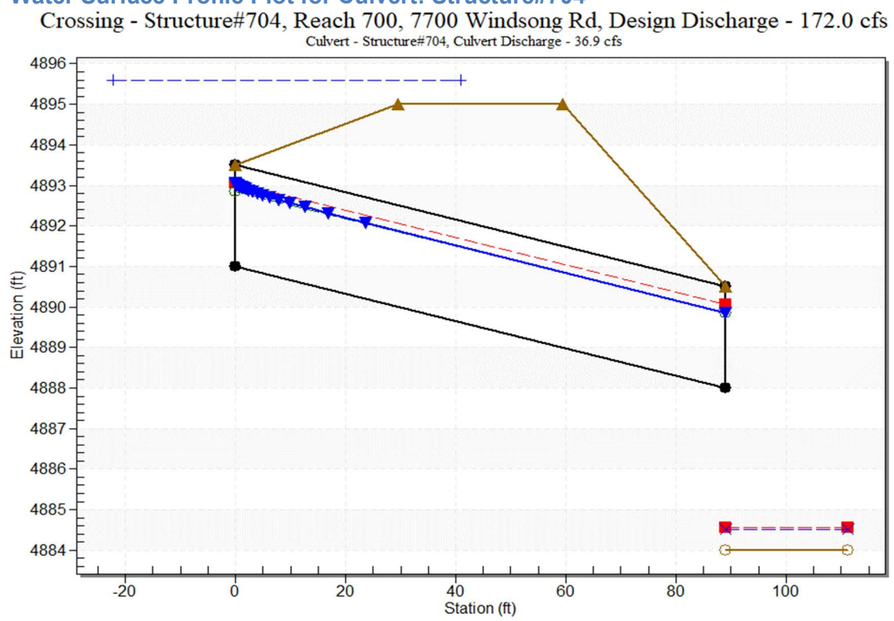
Table 5 - Culvert Summary Table: Structure#704

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	24.91 cfs	24.91 cfs	4893.98	2.98	0.573	5-S2n	1.41	1.70	1.41	0.16	8.73	2.09
100 Year	172.00 cfs	36.92 cfs	4895.58	4.58	3.393	5-S2n	1.86	2.06	1.86	0.51	9.43	4.47

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4891.00 ft,
Outlet Elevation (invert): 4888.00 ft
Culvert Length: 89.05 ft,
Culvert Slope: 0.0337

Water Surface Profile Plot for Culvert: Structure#704



Tailwater Data for Crossing: Structure#704, Reach 700

Table 6 - Downstream Channel Rating Curve (Crossing: Structure#704, Reach 700)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
24.91	4884.16	0.16	2.09	0.28	0.92
172.00	4884.51	0.51	4.47	0.90	1.11

Tailwater Channel Data - Structure#704, Reach 700

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 73.00 ft
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.0280
Channel Manning's n: 0.0350
Channel Invert Elevation: 4884.00 ft

Roadway Data for Crossing: Structure#704, Reach 700

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4895.00 ft
Roadway Surface: Paved
Roadway Top Width: 30.00 ft

Culvert Data: Structure#801

Site Data - Structure#801

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4960.15 ft
Outlet Station: 74.00 ft
Outlet Elevation: 4960.01 ft
Number of Barrels: 1

Culvert Data Summary - Structure#801

Barrel Shape: Circular
Barrel Diameter: 4.00 ft
Barrel Material: Corrugated Steel
Embedment: 0.00 in
Barrel Manning's n: 0.0240
Culvert Type: Straight
Inlet Configuration: Thin Edge Projecting (Ke=0.9)
Inlet Depression: None

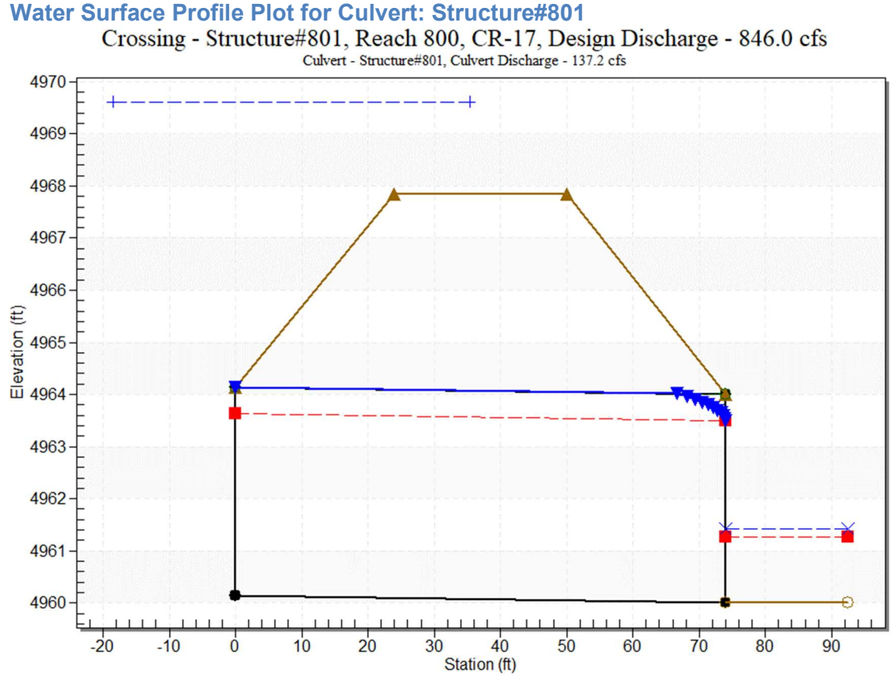
Table 7 - Culvert Summary Table: Structure#801

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	18.94 cfs	18.94 cfs	4962.29	1.90	2.145	2-M2c	2.16	1.28	1.28	0.15	5.47	1.25
100 Year	846.00 cfs	137.19 cfs	4969.60	8.94	9.458	7-M2c	4.00	3.48	3.48	1.42	11.81	5.23

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4960.15 ft,
Outlet Elevation (invert): 4960.01 ft
Culvert Length: 74.00 ft,
Culvert Slope: 0.0018

Water Surface Profile Plot for Culvert: Structure#801



Tailwater Data for Crossing: Structure#802, Reach 800

Table 8 - Downstream Channel Rating Curve (Crossing: Structure#802, Reach 800)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
18.94	4960.16	0.15	1.25	0.17	0.58
846.00	4961.43	1.42	5.23	1.63	0.82

Tailwater Channel Data - Structure#801, Reach 800

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 100.00 ft
Side Slope (H:V): 10.00 (_:1)
Channel Slope: 0.0185
Channel Manning's n: 0.0450
Channel Invert Elevation: 4960.01 ft

Roadway Data for Crossing: Structure#801, Reach 800

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4967.84 ft
Roadway Surface: Paved
Roadway Top Width: 26.00 ft

Culvert Data: Structure#804

Site Data - Structure#804

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4889.00 ft
Outlet Station: 90.00 ft
Outlet Elevation: 4881.00 ft

Culvert Data Summary - Structure#804

Number of Barrels: 1
Barrel Shape: Concrete Box
Barrel Span: 5.00 ft
Barrel Rise: 6.33 ft
Barrel Material: Concrete
Embedment: 60.00 in
Barrel Manning's n: 0.0130 (top and sides)
Manning's n: 0.0130 (bottom)
Culvert Type: Straight
Inlet Configuration: Square Edge (30-75º flare) Wingwall (Ke=0.4)
Inlet Depression: None

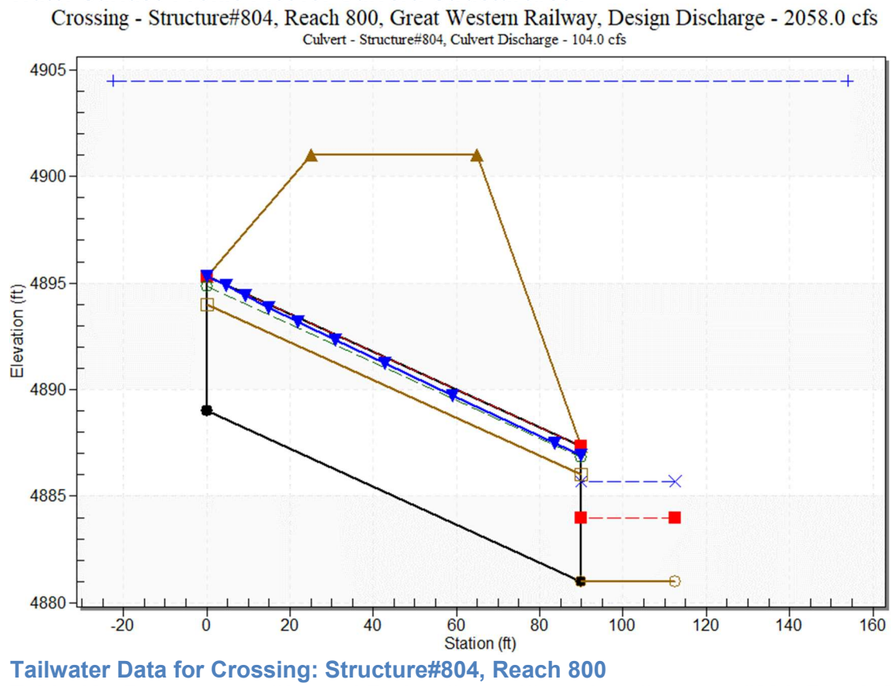
Table 9 - Culvert Summary Table: Structure#804

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	126.99 cfs	85.50 cfs	4901.29	7.29	0.0*	5-S2n	0.73	1.33	0.81	0.92	21.16	2.04
100 Year	2058.00 cfs	103.95 cfs	4904.46	10.46	2.606	5-S2n	0.83	1.33	0.92	4.70	22.52	5.54

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4894.00 ft,
Outlet Elevation (invert): 4886.00 ft
Culvert Length: 90.35 ft,
Culvert Slope: 0.0889

Water Surface Profile Plot for Culvert: Structure#804



Tailwater Data for Crossing: Structure#804, Reach 800

Table 10 - Downstream Channel Rating Curve (Crossing: Structure#804, Reach 800)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
126.99	4881.92	0.92	2.04	0.63	0.38
2058.00	4885.70	4.70	5.54	3.22	0.49

Tailwater Channel Data - Structure#804, Reach 800

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 65.00 ft
Side Slope (H:V): 3.00 (_:1)
Channel Slope: 0.0110
Channel Manning's n: 0.0700
Channel Invert Elevation: 4881.00 ft

Roadway Data for Crossing: Structure#804, Reach 800

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4901.00 ft
Roadway Surface: Gravel
Roadway Top Width: 40.00 ft

Culvert Data: Structure#805

Site Data - Structure#805

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4893.00 ft
Outlet Station: 62.00 ft
Outlet Elevation: 4892.00 ft
Number of Barrels: 1

Culvert Data Summary - Structure#805

Barrel Shape: Circular
Barrel Diameter: 2.00 ft
Barrel Material: Corrugated Steel
Embedment: 0.00 in
Barrel Manning's n: 0.0240
Culvert Type: Straight
Inlet Configuration: Thin Edge Projecting (Ke=0.9)
Inlet Depression: None

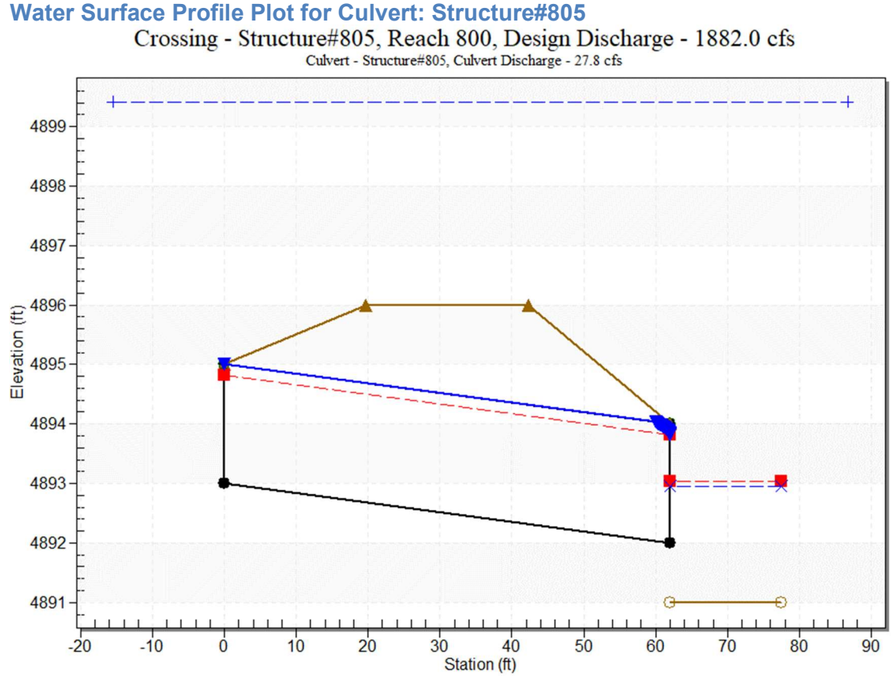
Table 11 - Culvert Summary Table: Structure#805

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	126.99 cfs	19.78 cfs	4896.54	3.39	3.538	7-M2c	2.00	1.60	1.60	0.40	7.35	2.93
100 Year	1882.00 cfs	27.78 cfs	4899.41	5.49	6.405	7-M2c	2.00	1.82	1.82	1.96	9.24	8.10

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4893.00 ft,
Outlet Elevation (invert): 4892.00 ft
Culvert Length: 62.01 ft,
Culvert Slope: 0.0161

Water Surface Profile Plot for Culvert: Structure#805



Tailwater Data for Crossing: Structure#805, Reach 800

Table 12 - Downstream Channel Rating Curve (Crossing: Structure#805, Reach 800)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
126.99	4891.40	0.40	2.93	0.69	0.83
1882.00	4892.96	1.96	8.10	3.42	1.07

Tailwater Channel Data - Structure#805, Reach 800

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 107.00 ft
Side Slope (H:V): 6.00 (_:1)
Channel Slope: 0.0280
Channel Manning's n: 0.0450
Channel Invert Elevation: 4891.00 ft

Roadway Data for Crossing: Structure#805, Reach 800

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4896.00 ft
Roadway Surface: Gravel
Roadway Top Width: 22.60 ft

Culvert Data: Structure#806

Site Data - Structure#806

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4900.00 ft
Outlet Station: 50.00 ft
Outlet Elevation: 4899.00 ft
Number of Barrels: 1

Culvert Data Summary - Structure#806

Barrel Shape: Circular
Barrel Diameter: 2.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0130
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall (Ke=0.5)
Inlet Depression: None

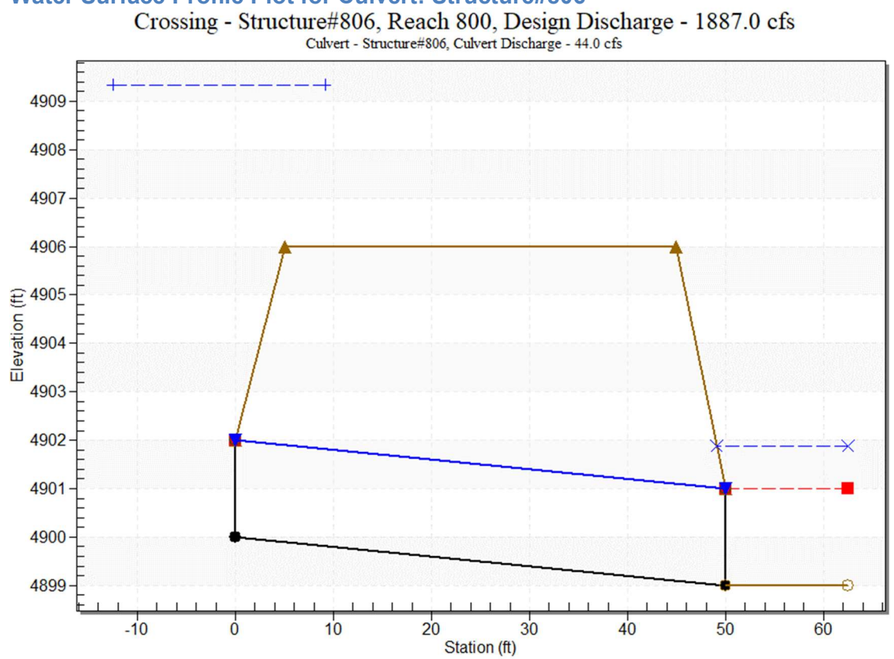
Table 13 - Culvert Summary Table: Structure#806

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	124.66 cfs	35.58 cfs	4906.44	6.44	5.217	7-M2c	2.00	1.82	1.82	0.57	11.85	1.88
100 Year	1887.00 cfs	44.00 cfs	4909.33	9.33	8.320	4-FFf	2.00	2.00	2.00	2.87	14.01	5.32

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4900.00 ft,
Outlet Elevation (invert): 4899.00 ft
Culvert Length: 50.01 ft,
Culvert Slope: 0.0200

Water Surface Profile Plot for Culvert: Structure#806



Tailwater Data for Crossing: Structure#806, Reach 800

Table 14 - Downstream Channel Rating Curve (Crossing: Structure#806, Reach 800)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
124.66	4899.57	0.57	1.88	0.60	0.44
1887.00	4901.87	2.87	5.32	3.04	0.57

Tailwater Channel Data - Structure#806, Reach 800

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 115.00 ft
Side Slope (H:V): 3.00 (_:1)
Channel Slope: 0.0170
Channel Manning's n: 0.0700
Channel Invert Elevation: 4899.00 ft

Roadway Data for Crossing: Structure#806, Reach 800

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4906.00 ft
Roadway Surface: Paved
Roadway Top Width: 40.00 ft

Culvert Data: Structure#807

Site Data - Structure#807

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4917.00 ft
Outlet Station: 80.00 ft
Outlet Elevation: 4916.00 ft
Number of Barrels: 2

Culvert Data Summary - Structure#807

Barrel Shape: Concrete Box
Barrel Span: 12.00 ft
Barrel Rise: 5.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (30-75º flare) Wingwall (Ke=0.4)
Inlet Depression: None

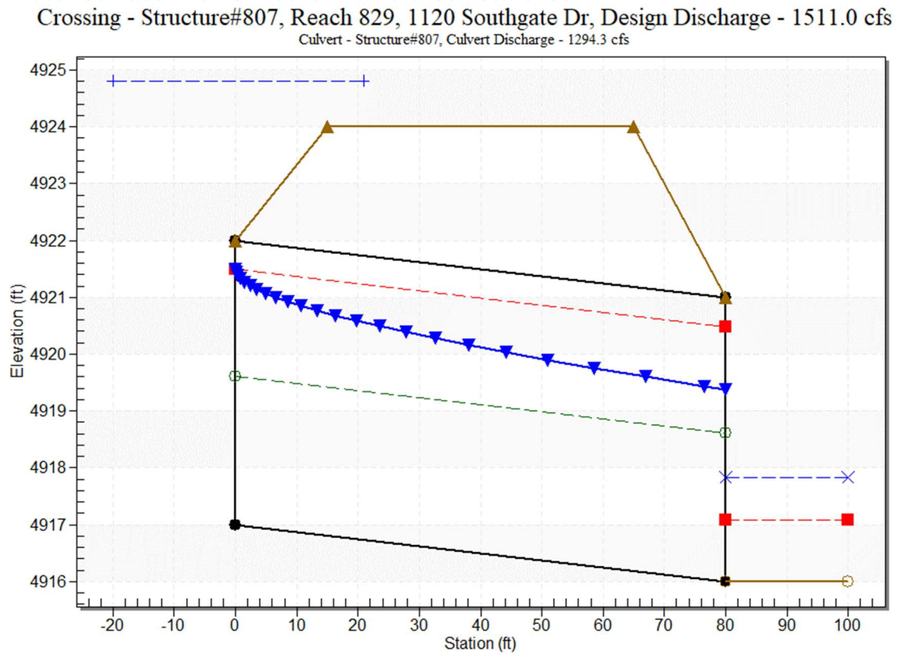
Table 15 - Culvert Summary Table: Structure#807

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	63.00 cfs	63.00 cfs	4917.91	0.91	0.0*	1-S2n	0.38	0.60	0.38	0.27	6.97	0.98
100 Year	1511.00 cfs	1294.26 cfs	4924.80	7.80	6.555	5-S2n	2.61	4.49	3.37	1.82	16.00	3.40

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4917.00 ft,
Outlet Elevation (invert): 4916.00 ft
Culvert Length: 80.01 ft,
Culvert Slope: 0.0125

Water Surface Profile Plot for Culvert: Structure#807



Tailwater Data for Crossing: Structure#807, Reach 829

Table 16 - Downstream Channel Rating Curve (Crossing: Structure#807, Reach 829)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
63.00	4916.27	0.27	0.98	0.09	0.33
1511.00	4917.82	1.82	3.40	0.57	0.45

Tailwater Channel Data - Structure#807, Reach 829

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 235.00 ft
Side Slope (H:V): 5.00 (_:1)
Channel Slope: 0.0050
Channel Manning's n: 0.0450
Channel Invert Elevation: 4916.00 ft

Roadway Data for Crossing: Structure#807, Reach 829

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4924.00 ft
Roadway Surface: Paved
Roadway Top Width: 50.00 ft

Culvert Data: Structure#808

Site Data - Structure#808

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4942.00 ft
Outlet Station: 527.00 ft
Outlet Elevation: 4932.00 ft
Number of Barrels: 1

Culvert Data Summary - Structure#808

Barrel Shape: Circular
Barrel Diameter: 4.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0130
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall (Ke=0.5)
Inlet Depression: None

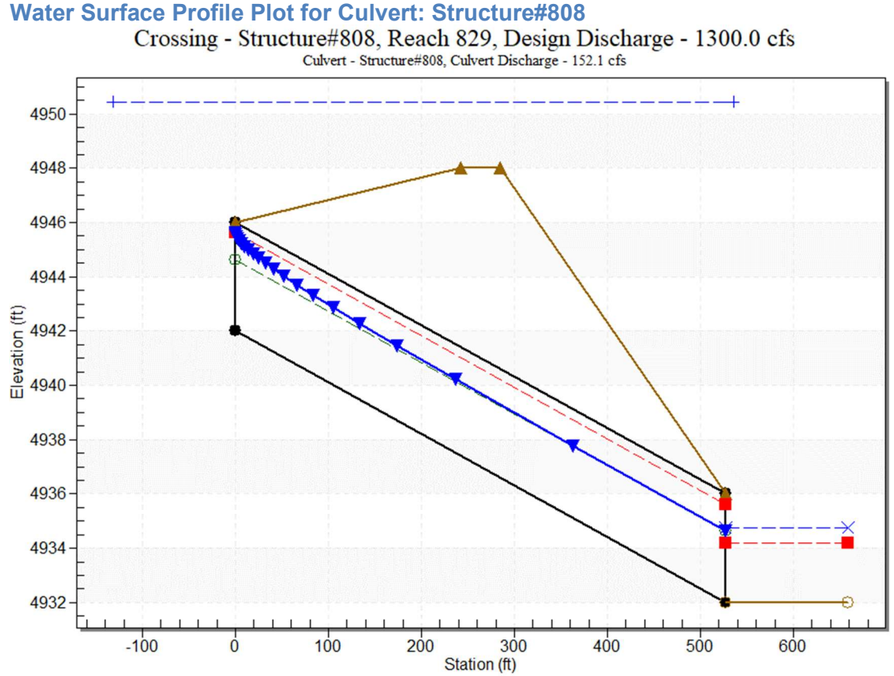
Table 17 - Culvert Summary Table: Structure#808

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	36.03 cfs	36.03 cfs	4944.55	2.55	0.0*	1-S2n	1.15	1.79	1.16	0.33	11.92	1.64
100 Year	1300.00 cfs	152.07 cfs	4950.43	8.43	3.091	5-S2n	2.63	3.61	2.65	2.74	17.18	6.02

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4942.00 ft,
Outlet Elevation (invert): 4932.00 ft
Culvert Length: 527.09 ft,
Culvert Slope: 0.0190

Water Surface Profile Plot for Culvert: Structure#808



Tailwater Data for Crossing: Structure#808, Reach 829

Table 18 - Downstream Channel Rating Curve (Crossing: Structure#808, Reach 829)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
36.03	4932.33	0.33	1.64	0.23	0.51
1300.00	4934.74	2.74	6.02	1.88	0.70

Tailwater Channel Data - Structure#808, Reach 829

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 64.00 ft
Side Slope (H:V): 5.40 (_:1)
Channel Slope: 0.0110
Channel Manning's n: 0.0450
Channel Invert Elevation: 4932.00 ft

Roadway Data for Crossing: Structure#808, Reach 829

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4948.00 ft
Roadway Surface: Paved
Roadway Top Width: 43.00 ft

Culvert Data: Structure#809

Site Data - Structure#809

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4958.00 ft
Outlet Station: 304.00 ft
Outlet Elevation: 4948.00 ft
Number of Barrels: 1

Culvert Data Summary - Structure#809

Barrel Shape: Circular
Barrel Diameter: 4.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0110
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall (Ke=0.5)
Inlet Depression: None

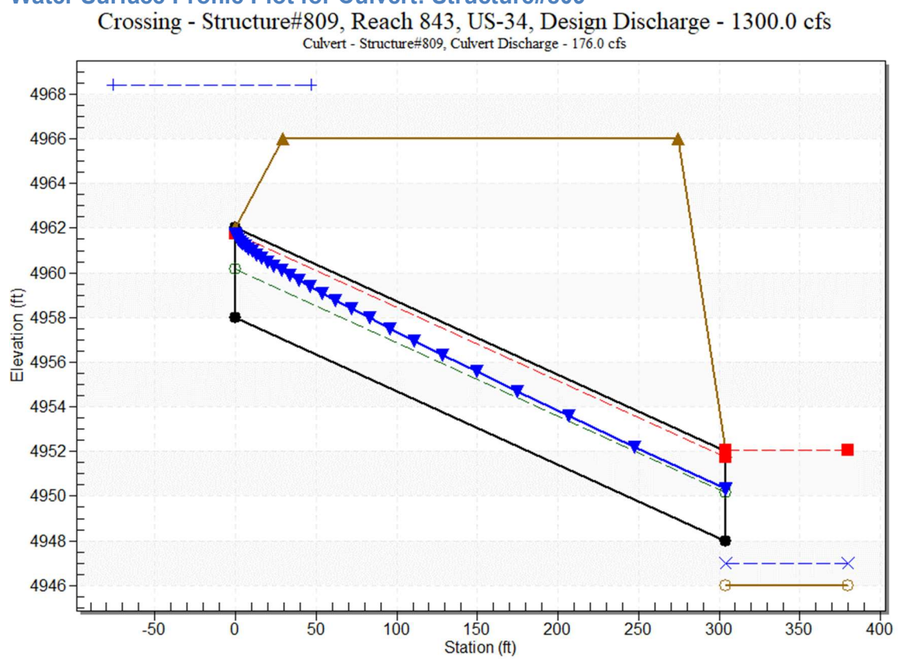
Table 19 - Culvert Summary Table: Structure#809

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	36.03 cfs	36.03 cfs	4960.52	2.52	0.0*	1-S2n	0.92	1.79	0.92	0.11	16.43	21.45
100 Year	1300.00 cfs	175.97 cfs	4968.39	10.39	1.695	5-S2n	2.16	3.76	2.31	0.98	23.45	86.35

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4958.00 ft,
Outlet Elevation (invert): 4948.00 ft
Culvert Length: 304.16 ft,
Culvert Slope: 0.0329

Water Surface Profile Plot for Culvert: Structure#809



Tailwater Data for Crossing: Structure#809, Reach 843

Table 20 - Downstream Channel Rating Curve (Crossing: Structure#809, Reach 843)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
36.03	4946.11	0.11	21.45	34.03	11.45
1300.00	4946.98	0.98	86.35	305.00	15.39

Tailwater Channel Data - Structure#809, Reach 843

Tailwater Channel Option: Rectangular Channel
Bottom Width: 15.40 ft
Channel Slope: 5.0000
Channel Manning's n: 0.0350
Channel Invert Elevation: 4946.00 ft

Roadway Data for Crossing: Structure#809, Reach 843

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4966.00 ft
Roadway Surface: Paved
Roadway Top Width: 245.00 ft

Culvert Data: Structure#1003

Site Data - Structure#1003

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4811.14 ft
Outlet Station: 221.30 ft
Outlet Elevation: 4810.04 ft
Number of Barrels: 3

Culvert Data Summary - Structure#1003

Barrel Shape: Concrete Box
Barrel Span: 12.00 ft
Barrel Rise: 12.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0130
Culvert Type: Straight
Inlet Configuration: Square Edge (90 & 15º flare) Wingwall
Inlet Depression: None

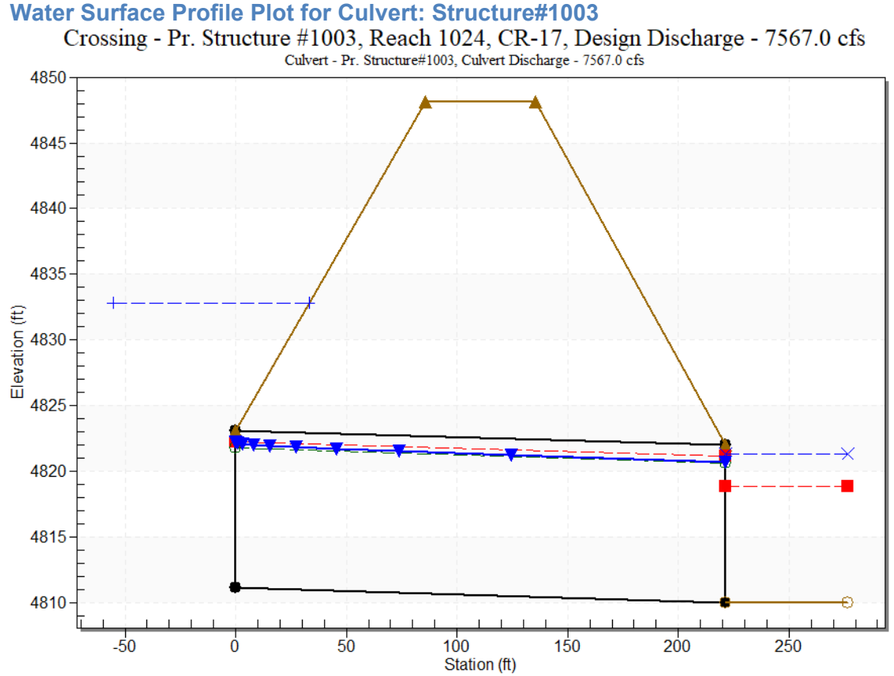
Culvert Summary Table: Structure#1003

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
Option3_100-Year	7546.00	7546.00	4832.75	21.61	18.452	5-S2n	10.60	11.09	10.65	11.26	19.69	10.72
Option1_100-Year	7567.00	7567.00	4832.82	21.68	18.514	5-S2n	10.62	11.11	10.67	11.27	19.70	10.73
Overtopping	15134.00	11796.39	4851.21	40.07	35.292	4-FFf	12.00	12.00	12.00	16.12	27.31	12.99

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4811.14 ft
Outlet Elevation (invert): 4810.04 ft
Culvert Length: 221.30 ft
Culvert Slope: 0.00 ft/ft

Water Surface Profile Plot for Culvert: Structure#1003



Tailwater Data for Crossing: Structure#1003, Reach 1024

Downstream Channel Rating Curve (Crossing: Structure#1003, Reach 1024)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
7546.00	4821.30	10.72	11.26	7.17	0.66
7567.00	4821.31	10.73	11.27	7.18	0.66

Tailwater Channel Data - Structure#1003, Reach 1024

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 40.00 ft
Side Slope (H:V): 2.00 (_:1)
Channel Slope: 0.01 ft/ft
Channel Manning's n: 0.0550
Channel Invert Elevation: 4810.04 ft

Roadway Data for Crossing: Structure#1003, Reach 1024

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 200.00 ft
Crest Elevation: 4848.10 ft
Roadway Surface: Paved
Roadway Top Width: 50.00 ft

Culvert Data: Structure#1004

Site Data - Structure#1004

Site Data Option: Culvert Invert Data
Inlet Station: 143.00 ft
Inlet Elevation: 4843.00 ft
Outlet Station: 100.00 ft
Outlet Elevation: 4842.00 ft
Number of Barrels: 4

Culvert Data Summary - Structure#1004

Barrel Shape: Concrete Box
Barrel Span: 10.00 ft
Barrel Rise: 10.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (30-75º flare) Wingwall
Inlet Depression: None

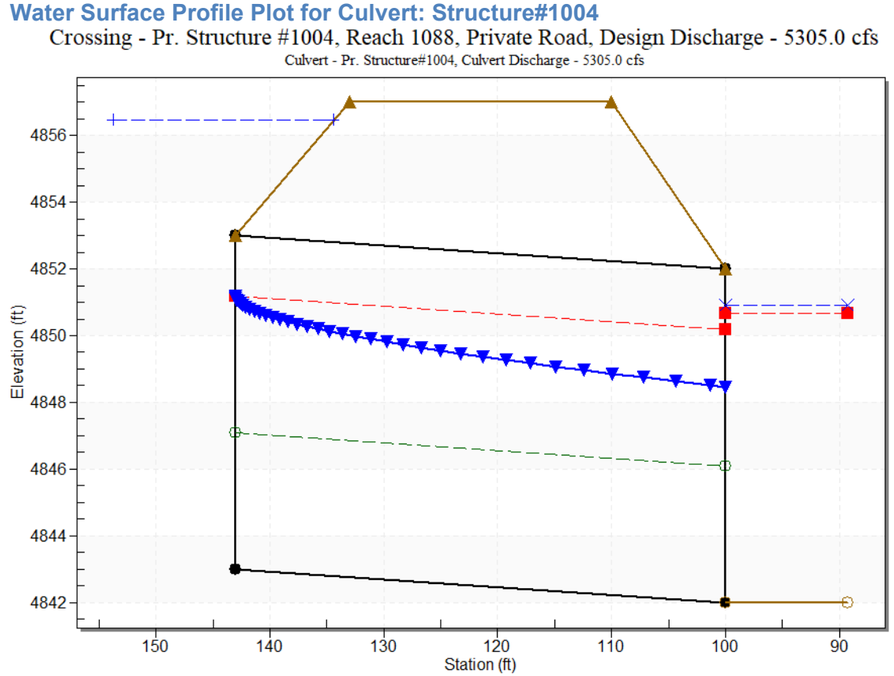
Culvert Summary Table: Structure#1004

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
Option3_100-Year	5237.00	5237.00	4856.29	13.29	11.712	5-S2n	4.05	8.10	6.39	8.84	20.48	12.72
Option1_100-Year	5305.00	5305.00	4856.45	13.45	11.867	5-S2n	4.08	8.17	6.45	8.90	20.55	12.77
Overtopping	7957.50	5826.33	4857.79	14.79	14.606	5-S1f	4.38	8.70	10.00	10.74	14.57	14.19

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4843.00 ft
Outlet Elevation (invert): 4842.00 ft
Culvert Length: 43.01 ft
Culvert Slope: 0.02 ft/ft

Water Surface Profile Plot for Culvert: Structure#1004



Tailwater Data for Crossing: Structure#1004, Reach 1088

Downstream Channel Rating Curve (Crossing: Structure#1004, Reach 1088)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
5237.00	4850.84	12.72	8.84	12.86	0.94
5305.00	4850.90	12.77	8.90	12.94	0.95

Tailwater Channel Data - Structure#1004, Reach 1088

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 20.00 ft
Side Slope (H:V): 3.00 (_:1)
Channel Slope: 0.02 ft/ft
Channel Manning's n: 0.0550
Channel Invert Elevation: 4842.00 ft

Roadway Data for Crossing: Structure#1004, Reach 1088

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 1000.00 ft
Crest Elevation: 4857.00 ft
Roadway Surface: Paved
Roadway Top Width: 23.00 ft

Culvert Data: Structure#1005

Site Data - Structure#1005

Site Data Option: Culvert Invert Data
Inlet Station: 149.00 ft
Inlet Elevation: 4851.00 ft
Outlet Station: 100.00 ft
Outlet Elevation: 4850.50 ft
Number of Barrels: 5

Culvert Data Summary - Structure#1005

Barrel Shape: Concrete Box
Barrel Span: 12.00 ft
Barrel Rise: 8.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (30-75º flare) Wingwall
Inlet Depression: None

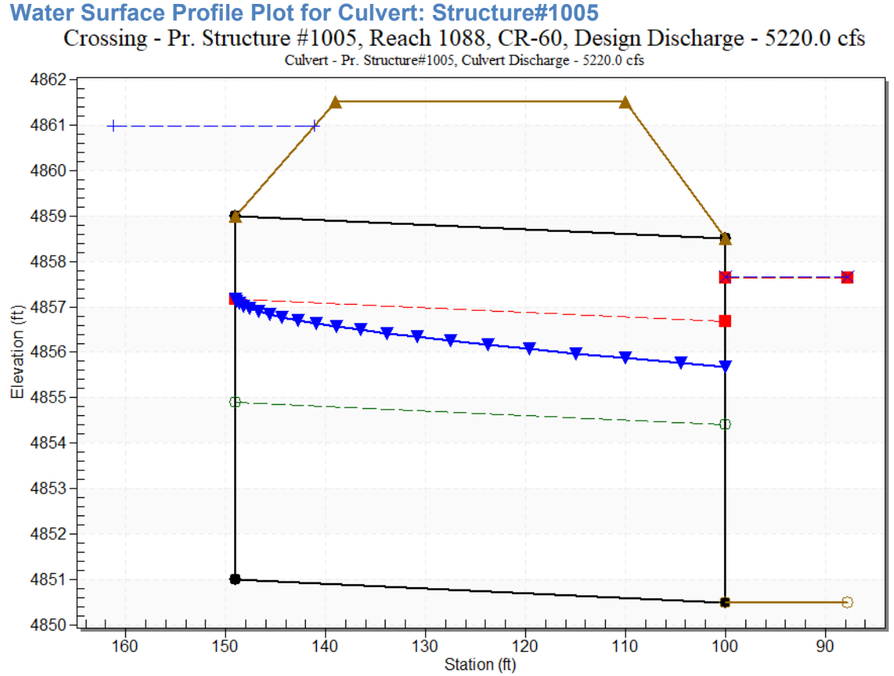
Culvert Summary Table: Structure#1005

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
Option3_100-Year	5152.00	5152.00	4860.86	9.86	9.222	5-S2n	3.87	6.12	5.14	7.10	16.72	11.98
Option1_100-Year	5220.00	5220.00	4860.98	9.98	9.335	5-S2n	3.91	6.17	5.19	7.15	16.78	12.02
Overtopping	7830.00	5715.49	4862.33	10.85	11.333	4-FFf	4.17	6.56	8.00	8.61	11.91	13.36

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4851.00 ft
Outlet Elevation (invert): 4850.50 ft
Culvert Length: 49.00 ft
Culvert Slope: 0.01 ft/ft

Water Surface Profile Plot for Culvert: Structure#1005



Tailwater Data for Crossing: Structure#1005, Reach 1088

Downstream Channel Rating Curve (Crossing: Structure#1005, Reach 1088)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
5152.00	4857.60	11.98	7.10	7.71	1.00
5220.00	4857.65	12.02	7.15	7.76	1.00

Tailwater Channel Data - Structure#1005, Reach 1088

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 25.00 ft
Side Slope (H:V): 5.00 (_:1)
Channel Slope: 0.02 ft/ft
Channel Manning's n: 0.0440
Channel Invert Elevation: 4850.50 ft

Roadway Data for Crossing: Structure#1005, Reach 1088

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 1000.00 ft
Crest Elevation: 4861.50 ft
Roadway Surface: Gravel
Roadway Top Width: 29.00 ft

Culvert Data: Structure#1103

Site Data - Structure#1103

Site Data Option: Culvert Invert Data
Inlet Station: 193.00 ft
Inlet Elevation: 4878.00 ft
Outlet Station: 0.00 ft
Outlet Elevation: 4876.50 ft
Number of Barrels: 3

Culvert Data Summary - Structure#1103

Barrel Shape: Concrete Box
Barrel Span: 10.00 ft
Barrel Rise: 6.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (30-75º flare) Wingwall
Inlet Depression: None

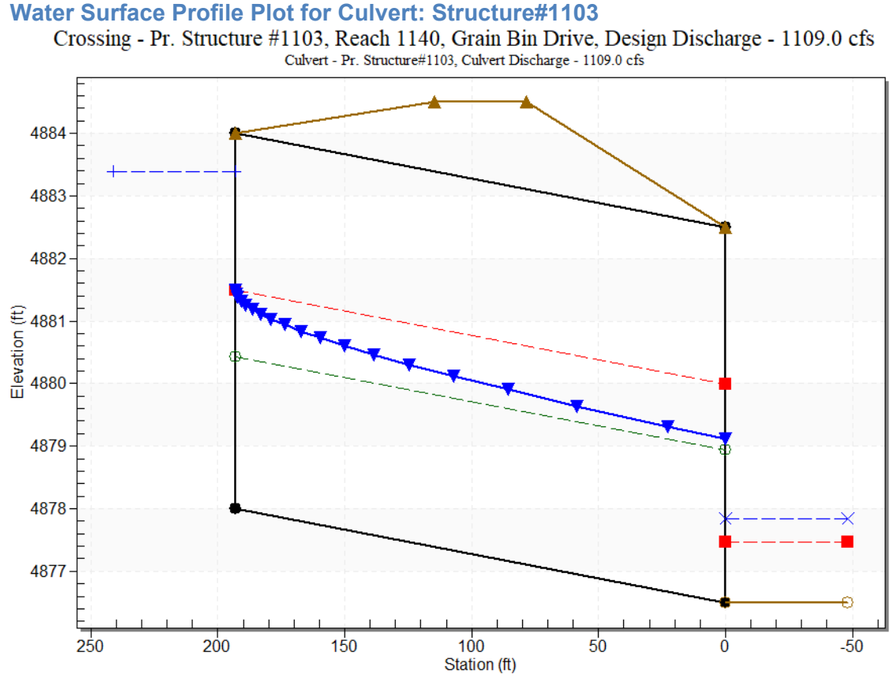
Culvert Summary Table: Structure#1103

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
Option3_100-Year	1082.00	1082.00	4883.30	5.30	2.912	1-S2n	2.39	3.43	2.57	1.32	14.05	3.83
Option1_100-Year	1109.00	1109.00	4883.39	5.39	3.019	1-S2n	2.43	3.49	2.61	1.34	14.14	3.87
Overtopping	1663.50	1479.14	4884.67	6.67	4.560	5-S2n	2.97	4.23	3.23	1.71	15.26	4.49

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4878.00 ft
Outlet Elevation (invert): 4876.50 ft
Culvert Length: 193.01 ft
Culvert Slope: 0.01 ft/ft

Water Surface Profile Plot for Culvert: Structure#1103



Tailwater Data for Crossing: Structure#1103, Reach 1140

Downstream Channel Rating Curve (Crossing: Structure#1130, Reach 1140)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
1082.00	4877.82	3.83	1.32	1.24	0.60
1109.00	4877.84	3.87	1.34	1.26	0.61

Tailwater Channel Data - Structure#1103, Reach 1140

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 200.00 ft
Side Slope (H:V): 10.00 (_:1)
Channel Slope: 0.01 ft/ft
Channel Manning's n: 0.0550
Channel Invert Elevation: 4876.50 ft

Roadway Data for Crossing: Structure#1103, Reach 1140

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 1000.00 ft
Crest Elevation: 4884.50 ft
Roadway Surface: Paved
Roadway Top Width: 36.00 ft

Culvert Data: Structure#1301

Site Data - Structure#1301

Site Data Option: Culvert Invert Data
Inlet Station: 48.00 ft
Inlet Elevation: 4892.00 ft
Outlet Station: 0.00 ft
Outlet Elevation: 4891.00 ft
Number of Barrels: 3

Culvert Data Summary - Structure#1301

Barrel Shape: Concrete Box
Barrel Span: 10.00 ft
Barrel Rise: 8.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (30-75º flare) Wingwall
Inlet Depression: None

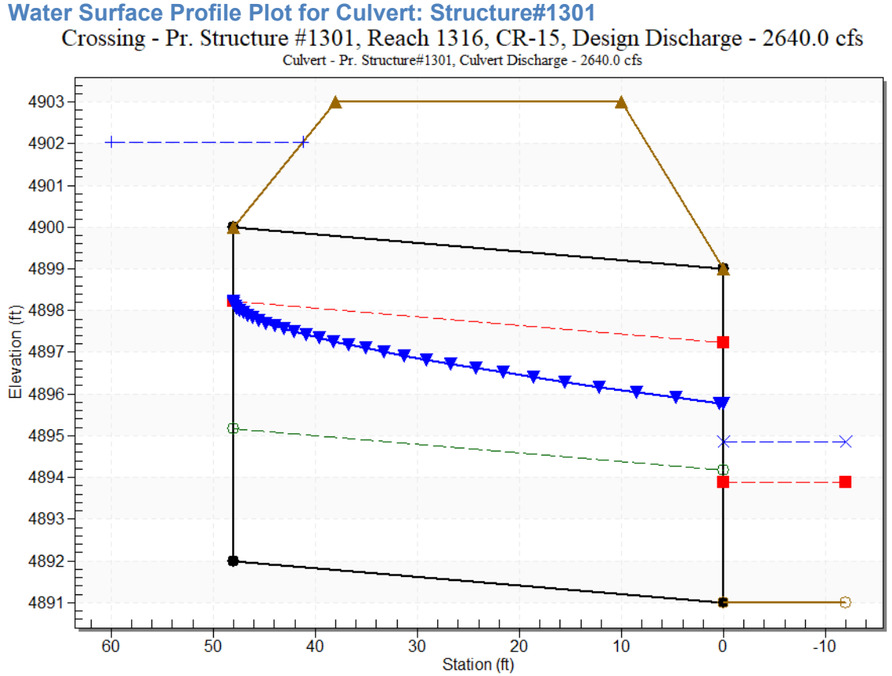
Culvert Summary Table: Structure#1301

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
Option3_100-Year	2627.00	2627.00	4901.99	9.99	8.832	5-S2n	3.15	6.20	4.75	3.84	18.45	6.74
Option1_100-Year	2640.00	2640.00	4902.04	10.04	8.870	5-S2n	3.16	6.22	4.76	3.85	18.47	6.75
Overtopping	3960.00	3037.21	4903.49	11.49	10.067	5-S2n	3.49	6.83	5.29	4.88	19.12	7.76

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4892.00 ft
Outlet Elevation (invert): 4891.00 ft
Culvert Length: 48.01 ft
Culvert Slope: 0.02 ft/ft

Water Surface Profile Plot for Culvert: Structure#1301



Tailwater Data for Crossing: Structure#1301, Reach 1316

Downstream Channel Rating Curve (Crossing: Structure#1301, Reach 1316)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
2627.00	4894.84	6.74	3.84	2.90	0.64
2640.00	4894.85	6.75	3.85	2.91	0.64

Tailwater Channel Data - Structure#1301, Reach 1316

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 90.00 ft
Side Slope (H:V): 3.00 (_:1)
Channel Slope: 0.01 ft/ft
Channel Manning's n: 0.0550
Channel Invert Elevation: 4891.00 ft

Roadway Data for Crossing: Structure#1301, Reach 1316

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 1000.00 ft
Crest Elevation: 4903.00 ft
Roadway Surface: Gravel
Roadway Top Width: 28.00 ft

Culvert Data: Structure#1002

Site Data - Structure#1002

Site Data Option: Culvert Invert Data
Inlet Station: 123.00 ft
Inlet Elevation: 4772.00 ft
Outlet Station: 0.00 ft
Outlet Elevation: 4771.50 ft
Number of Barrels: 2

Culvert Data Summary - Structure#1002

Barrel Shape: Concrete Box
Barrel Span: 10.00 ft
Barrel Rise: 10.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (30-75º flare) Wingwall
Inlet Depression: None

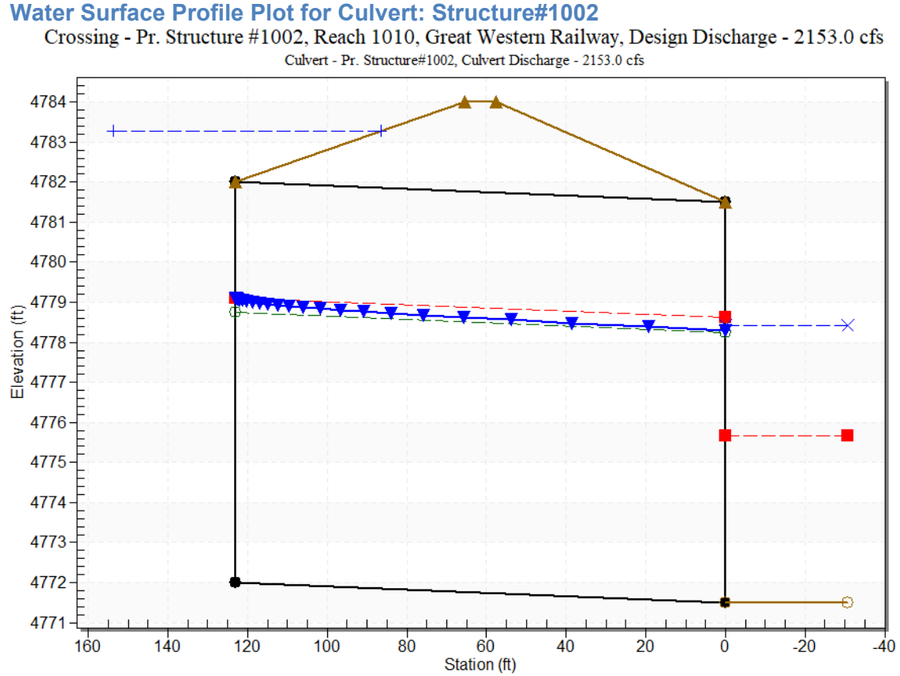
Culvert Summary Table: Structure#1002

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
Option2_100-Year	2004.70	2004.70	4782.65	10.65	8.703	5-S2n	6.37	6.78	6.45	6.66	15.55	5.65
Option4_100-Year	2153.00	2153.00	4783.27	11.27	9.405	5-S2n	6.74	7.11	6.80	6.92	15.83	5.77
Overtopping	3229.50	2562.65	4785.11	13.11	12.105	5-JS1t	7.73	7.99	8.65	8.65	14.81	6.52

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4772.00 ft
Outlet Elevation (invert): 4771.50 ft
Culvert Length: 123.00 ft
Culvert Slope: 0.00 ft/ft

Water Surface Profile Plot for Culvert: Structure#1002



Tailwater Data for Crossing: Structure#1002, Reach 1010

Downstream Channel Rating Curve (Crossing: Structure#1002, Reach 1010)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
2004.70	4778.16	5.65	6.66	2.08	0.43
2153.00	4778.42	5.77	6.92	2.16	0.43

Tailwater Channel Data - Structure#1002, Reach 1010

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 40.00 ft
Side Slope (H:V): 2.00 (_:1)
Channel Slope: 0.01 ft/ft
Channel Manning's n: 0.0550
Channel Invert Elevation: 4771.50 ft

Roadway Data for Crossing: Structure#1002, Reach 1010

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 200.00 ft
Crest Elevation: 4784.00 ft
Roadway Surface: Gravel
Roadway Top Width: 8.00 ft

Culvert Data: Structure#1003

Site Data - Structure#1003

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4807.90 ft
Outlet Station: 113.00 ft
Outlet Elevation: 4807.47 ft
Number of Barrels: 1

Culvert Data Summary - Structure#1003

Barrel Shape: Concrete Box
Barrel Span: 12.00 ft
Barrel Rise: 10.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0130
Culvert Type: Straight
Inlet Configuration: Square Edge (90 & 15º flare) Wingwall
Inlet Depression: None

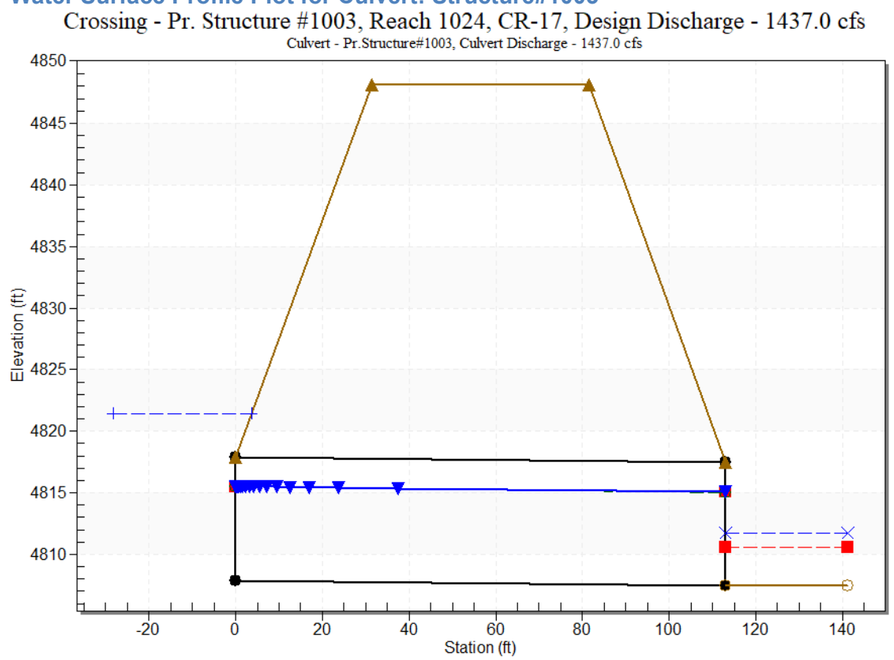
Culvert Summary Table: Structure#1003

Names	Discharge (cfs)	Discharge (cfs)	Elevation (ft)	Control Depth (ft)	Control Depth (ft)	Type	Depth (ft)	Depth (ft)	Depth (ft)	Depth (ft)	Velocity (ft/s)	Velocity (ft/s)
Option2_100-Year	1264.00	1264.00	4820.03	12.13	9.415	5-S2n	6.86	7.01	6.88	3.95	15.31	5.73
Option4_100-Year	1437.00	1437.00	4821.42	13.52	12.052	5-S2n	7.57	7.64	7.59	4.24	15.79	5.95
Overtopping	3592.50	3355.31	4848.64	40.74	29.544	6-FFc	10.00	10.00	10.00	6.86	27.96	7.76

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4807.90 ft
Outlet Elevation (invert): 4807.47 ft
Culvert Length: 113.00 ft
Culvert Slope: 0.00 ft/ft

Water Surface Profile Plot for Culvert: Structure#1003



Tailwater Data for Crossing: Structure#1003, Reach 1024

Downstream Channel Rating Curve (Crossing: Structure#1003, Reach 1024)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
1264.00	4811.42	5.73	3.95	2.52	0.57
1437.00	4811.71	5.95	4.24	2.70	0.58

Tailwater Channel Data - Structure#1003, Reach 1024

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 40.00 ft
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.01 ft/ft
Channel Manning's n: 0.0550
Channel Invert Elevation: 4807.47 ft

Roadway Data for Crossing: Structure#1003, Reach 1024

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 200.00 ft
Crest Elevation: 4848.10 ft
Roadway Surface: Paved
Roadway Top Width: 50.00 ft

Culvert Data: Structure#1005

Site Data - Structure#1005

Site Data Option: Culvert Invert Data
Inlet Station: 149.00 ft
Inlet Elevation: 4851.00 ft
Outlet Station: 100.00 ft
Outlet Elevation: 4850.50 ft
Number of Barrels: 1

Culvert Data Summary - Structure#1005

Barrel Shape: Concrete Box
Barrel Span: 14.00 ft
Barrel Rise: 8.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (30-75º flare) Wingwall (Ke=0.4)
Inlet Depression: None

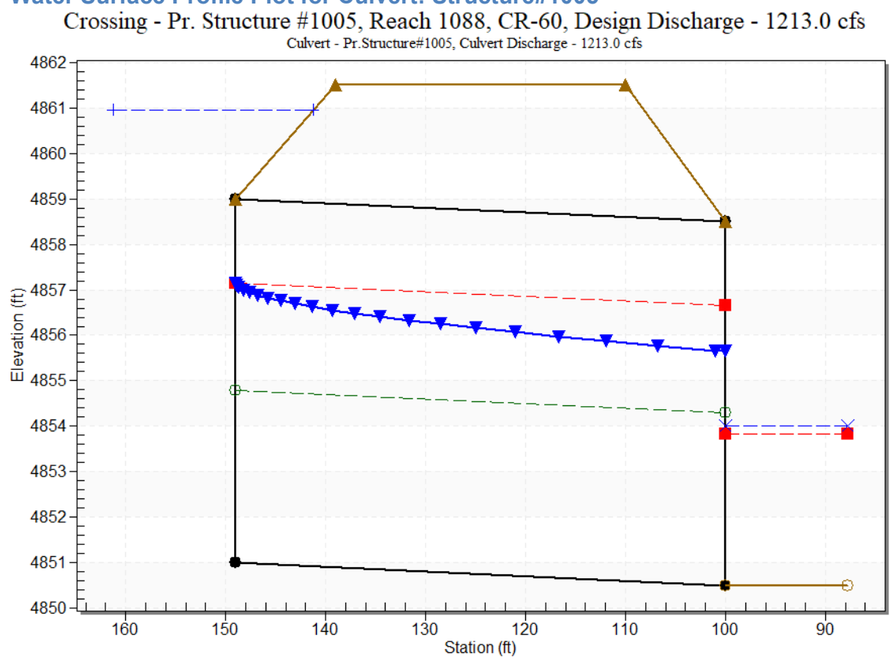
Culvert Summary Table: Structure#1005

Names	Discharge (cfs)	Discharge (cfs)	Elevation (ft)	Control Depth (ft)	Control Depth (ft)	Type	Depth (ft)	Depth (ft)	Depth (ft)	Depth (ft)	Velocity (ft/s)	Velocity (ft/s)
Option4_100-Year	901.00	901.00	4858.83	7.83	6.014	1-S2n	3.09	5.05	4.14	3.01	15.53	7.46
Option2_100-Year	1213.00	1213.00	4860.94	9.94	9.234	5-S2n	3.79	6.15	5.15	3.51	16.83	8.11
Overtopping	1819.50	1329.96	4861.82	10.82	9.966	5-S2n	4.05	6.54	5.50	4.31	17.26	9.08

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4851.00 ft
Outlet Elevation (invert): 4850.50 ft
Culvert Length: 49.00 ft
Culvert Slope: 0.01 ft/ft

Water Surface Profile Plot for Culvert: Structure#1005



Tailwater Data for Crossing: Structure#1005, Reach 1088

Downstream Channel Rating Curve (Crossing: Structure#1005, Reach 1088)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
901.00	4853.51	7.46	3.01	3.27	0.89
1213.00	4854.01	8.11	3.51	3.81	0.91

Tailwater Channel Data - Structure#1005, Reach 1088

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 25.00 ft
Side Slope (H:V): 5.00 (_:1)
Channel Slope: 0.02 ft/ft
Channel Manning's n: 0.0440
Channel Invert Elevation: 4850.50 ft

Roadway Data for Crossing: Structure#1005, Reach 1088

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 1000.00 ft
Crest Elevation: 4861.50 ft
Roadway Surface: Gravel
Roadway Top Width: 29.00 ft

Culvert Data: Ex. Structure#1103

Site Data – Ex. Structure#1103

Site Data Option: Culvert Invert Data
Inlet Station: 193.00 ft
Inlet Elevation: 4878.00 ft
Outlet Station: 0.00 ft
Outlet Elevation: 4876.50 ft
Number of Barrels: 2

Culvert Data Summary – Ex. Structure#1103

Barrel Shape: Elliptical
Barrel Span: 68.00 in
Barrel Rise: 43.00 in
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall
Inlet Depression: None

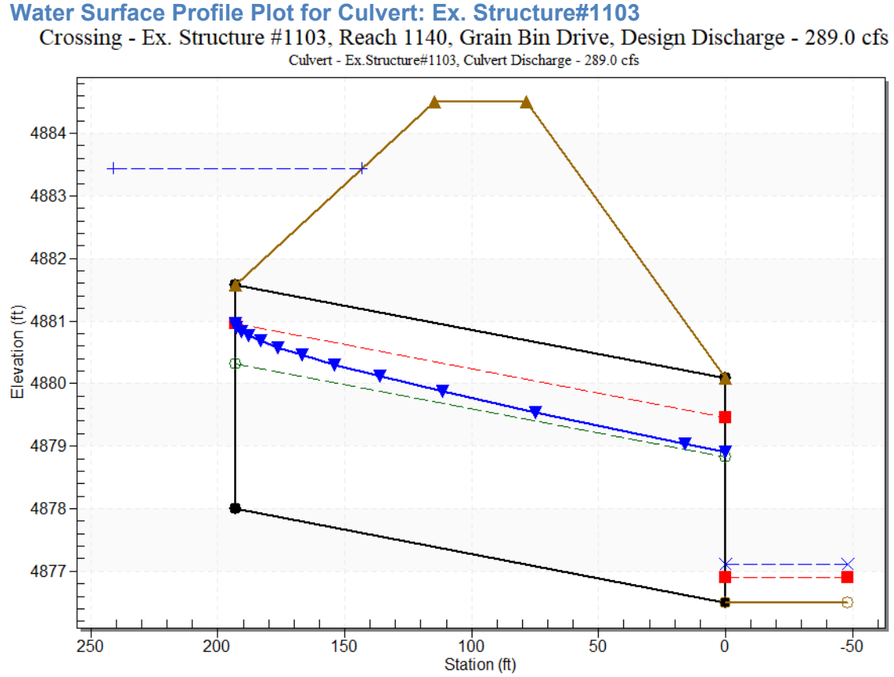
Culvert Summary Table: Ex. Structure#1103

Names	Discharge (cfs)	Discharge (cfs)	Elevation (ft)	Control Depth (ft)	Control Depth (ft)	Type	Depth (ft)	Depth (ft)	Depth (ft)	Depth (ft)	Velocity (ft/s)	Velocity (ft/s)
Option2_100-Year	286.00	286.00	4883.37	5.37	4.393	5-S2n	2.30	2.94	2.38	0.60	12.47	2.31
Option_4100-Year	289.00	289.00	4883.43	5.43	4.456	5-S2n	2.32	2.96	2.40	0.60	12.51	2.32
Overtopping	433.50	341.32	4884.61	6.61	5.623	5-S2n	2.61	3.17	2.69	0.77	13.06	2.71

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4878.00 ft
Outlet Elevation (invert): 4876.50 ft
Culvert Length: 193.01 ft
Culvert Slope: 0.01 ft/ft

Water Surface Profile Plot for Culvert: Ex. Structure#1103



Tailwater Data for Crossing: Ex. Structure#1103, Reach 1140

Downstream Channel Rating Curve (Crossing: Structure#1103, Reach 1140)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
286.00	4877.10	2.31	0.60	0.56	0.53
289.00	4877.10	2.32	0.60	0.57	0.53

Tailwater Channel Data – Ex. Structure#1103, Reach 1140

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 200.00 ft
Side Slope (H:V): 10.00 (_:1)
Channel Slope: 0.01 ft/ft
Channel Manning's n: 0.0550
Channel Invert Elevation: 4876.50 ft

Roadway Data for Crossing: Ex. Structure#1103, Reach 1140

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 1000.00 ft
Crest Elevation: 4884.50 ft
Roadway Surface: Paved
Roadway Top Width: 36.00 ft

Culvert Data: Structure#1301

Site Data - Structure#1301

Site Data Option: Culvert Invert Data
Inlet Station: 48.00 ft
Inlet Elevation: 4892.00 ft
Outlet Station: 0.00 ft
Outlet Elevation: 4891.00 ft
Number of Barrels: 3

Culvert Data Summary - Structure#1301

Barrel Shape: Concrete Box
Barrel Span: 10.00 ft
Barrel Rise: 4.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (30-75º flare) Wingwall
Inlet Depression: None

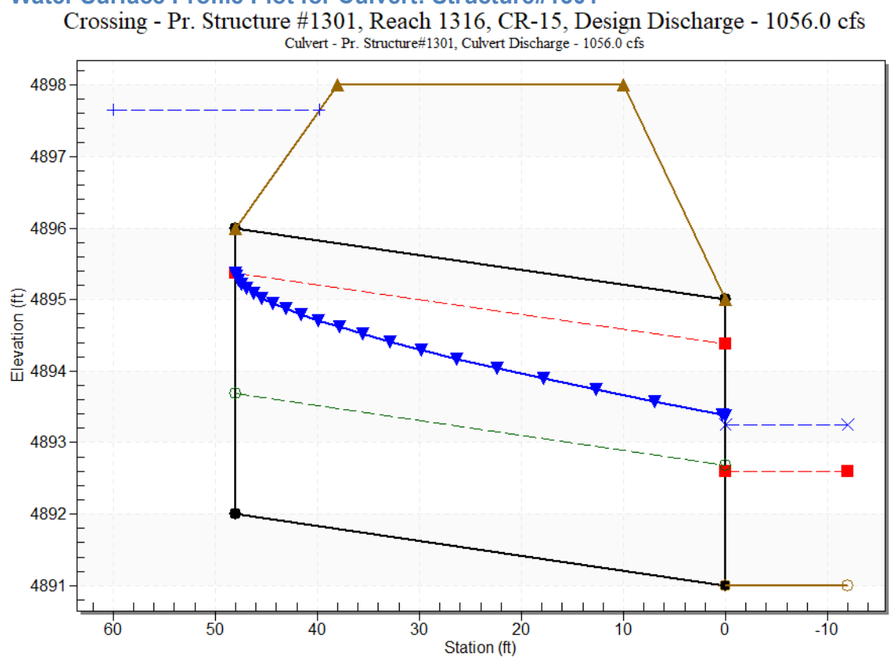
Culvert Summary Table: Structure#1301

Names	Discharge (cfs)	Discharge (cfs)	Elevation (ft)	Control Depth (ft)	Control Depth (ft)	Type	Depth (ft)	Depth (ft)	Depth (ft)	Depth (ft)	Velocity (ft/s)	Velocity (ft/s)
Option4_100-Year	958.00	958.00	4897.14	5.14	4.091	5-S2n	1.58	3.16	2.20	2.12	14.49	4.68
Option2_100-Year	1056.00	1056.00	4897.65	5.65	4.521	5-S2n	1.68	3.38	2.37	2.25	14.83	4.85
Overtopping	1584.00	1169.13	4898.29	6.29	5.054	5-S2n	1.80	3.61	2.57	2.86	15.18	5.63

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4892.00 ft
Outlet Elevation (invert): 4891.00 ft
Culvert Length: 48.01 ft
Culvert Slope: 0.02 ft/ft

Water Surface Profile Plot for Culvert: Structure#1301



Tailwater Data for Crossing: Structure#1301, Reach 1316

Downstream Channel Rating Curve (Crossing: Structure#1301, Reach 1316)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
958.00	4893.12	4.68	2.12	1.60	0.58
1056.00	4893.25	4.85	2.25	1.70	0.59

Tailwater Channel Data - Structure#1301, Reach 1316

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 90.00 ft
Side Slope (H:V): 3.00 (_:1)
Channel Slope: 0.01 ft/ft
Channel Manning's n: 0.0550
Channel Invert Elevation: 4891.00 ft

Roadway Data for Crossing: Structure#1301, Reach 1316

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 1000.00 ft
Crest Elevation: 4898.00 ft
Roadway Surface: Gravel
Roadway Top Width: 28.00 ft

Culvert Data: Structure#1004

Site Data - Structure#1004

Site Data Option: Culvert Invert Data
Inlet Station: 143.00 ft
Inlet Elevation: 4843.00 ft
Outlet Station: 100.00 ft
Outlet Elevation: 4842.00 ft
Number of Barrels: 2

Culvert Data Summary - Structure#1004

Barrel Shape: Concrete Box
Barrel Span: 8.00 ft
Barrel Rise: 5.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (30-75º flare) Wingwall
Inlet Depression: None

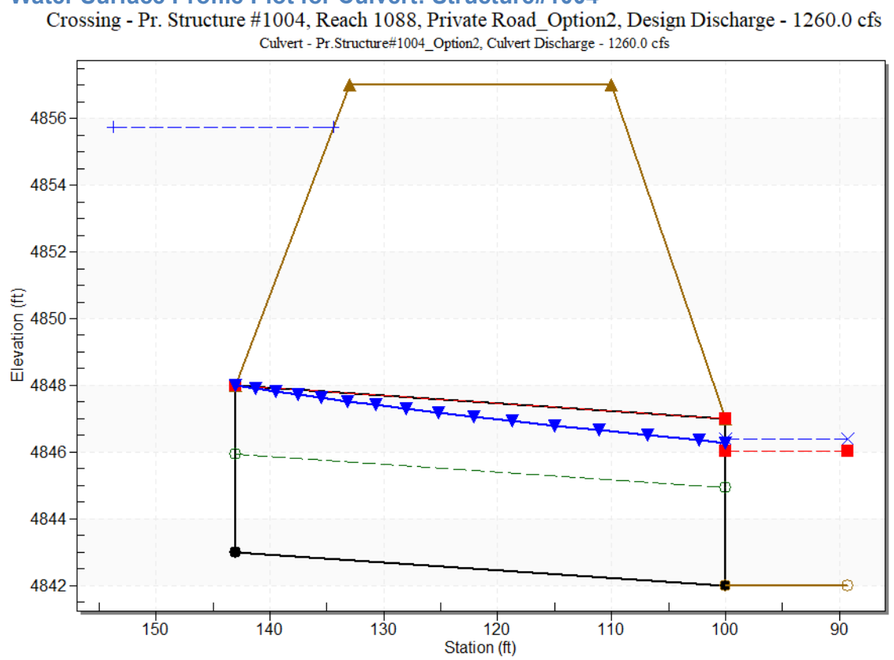
Culvert Summary Table: Structure#1004

Names	Discharge (cfs)	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
Option2_100-Year	1260.00	1260.00	4855.72	12.72	9.782	5-S2n	2.93	5.00	4.28	4.39	18.41	8.67
Overtopping	1890.00	1361.75	4857.31	14.31	11.143	5-S2n	3.10	5.00	4.43	5.39	19.20	9.69

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4843.00 ft
Outlet Elevation (invert): 4842.00 ft
Culvert Length: 43.01 ft
Culvert Slope: 0.02 ft/ft

Water Surface Profile Plot for Culvert: Structure#1004



Tailwater Data for Crossing: Structure#1004, Reach 1088

Downstream Channel Rating Curve (Crossing: Structure#1004, Reach 1088)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
1260.00	4846.36	8.67	4.36	6.38	0.86

Tailwater Channel Data - Structure#1004, Reach 1088

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 20.00 ft
Side Slope (H:V): 3.00 (_:1)
Channel Slope: 0.02 ft/ft
Channel Manning's n: 0.0550
Channel Invert Elevation: 4842.00 ft

Roadway Data for Crossing: Structure#1004, Reach 1088

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 1000.00 ft
Crest Elevation: 4857.00 ft
Roadway Surface: Paved
Roadway Top Width: 23.00 ft

Culvert Data: Ex. Structure#1004

Site Data – Ex. Structure#1004

Site Data Option: Culvert Invert Data
Inlet Station: 143.00 ft
Inlet Elevation: 4843.00 ft
Outlet Station: 100.00 ft
Outlet Elevation: 4842.00 ft
Number of Barrels: 2

Culvert Data Summary – Ex. Structure#1004

Barrel Shape: Concrete Box
Barrel Span: 7.00 ft
Barrel Rise: 5.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (30-75º flare) Wingwall
Inlet Depression: None

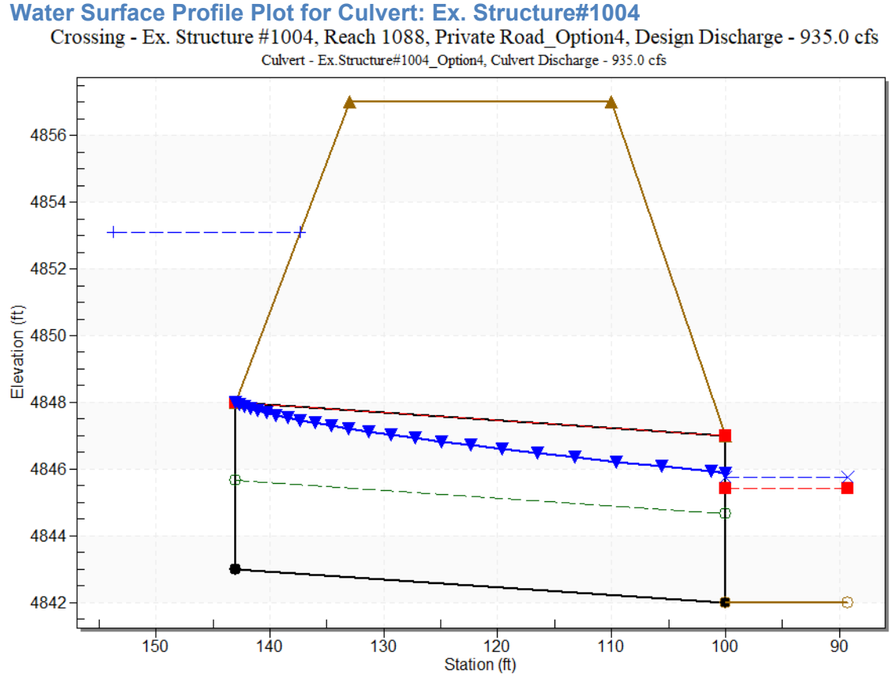
Culvert Summary Table: Ex. Structure#1004

Names	Discharge (cfs)	Discharge (cfs)	Elevation (ft)	Control Depth (ft)	Control Depth (ft)	Type	Depth (ft)	Depth (ft)	Depth (ft)	Depth (ft)	Velocity (ft/s)	Velocity (ft/s)
Option4_100-Year	935.00	935.00	4853.08	10.08	8.179	5-S2n	2.67	5.00	3.89	3.76	17.18	7.96
Overtopping	1402.50	1184.09	4857.18	14.18	10.703	5-S2n	3.18	5.00	4.44	4.63	19.04	8.93

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4843.00 ft
Outlet Elevation (invert): 4842.00 ft
Culvert Length: 43.01 ft
Culvert Slope: 0.02 ft/ft

Water Surface Profile Plot for Culvert: Ex. Structure#1004



Tailwater Data for Crossing: Ex. Structure#1004, Reach 1088

Downstream Channel Rating Curve (Crossing: Structure#1004, Reach 1088)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
935.00	4845.76	7.96	3.76	5.46	0.84

Tailwater Channel Data – Ex. Structure#1004, Reach 1088

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 20.00 ft
Side Slope (H:V): 3.00 (_:1)
Channel Slope: 0.02 ft/ft
Channel Manning's n: 0.0550
Channel Invert Elevation: 4842.00 ft

Roadway Data for Crossing: Ex. Structure#1004, Reach 1088

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 1000.00 ft
Crest Elevation: 4857.00 ft
Roadway Surface: Paved
Roadway Top Width: 23.00 ft

Culvert Data: Ex. Structure#1204

Site Data – Ex. Structure#1204

Site Data Option: Culvert Invert Data
Inlet Station: 1090.00 ft
Inlet Elevation: 4939.05 ft
Outlet Station: 1000.00 ft
Outlet Elevation: 4938.69 ft
Number of Barrels: 1

Culvert Data Summary – Ex. Structure#1204

Barrel Shape: Concrete Box
Barrel Diameter: 6.50 ft
Barrel Material: Corrugated Steel
Embedment: 0.00 in
Barrel Manning's n: 0.0110
Culvert Type: Straight
Inlet Configuration: Thin Edge Projecting
Inlet Depression: None

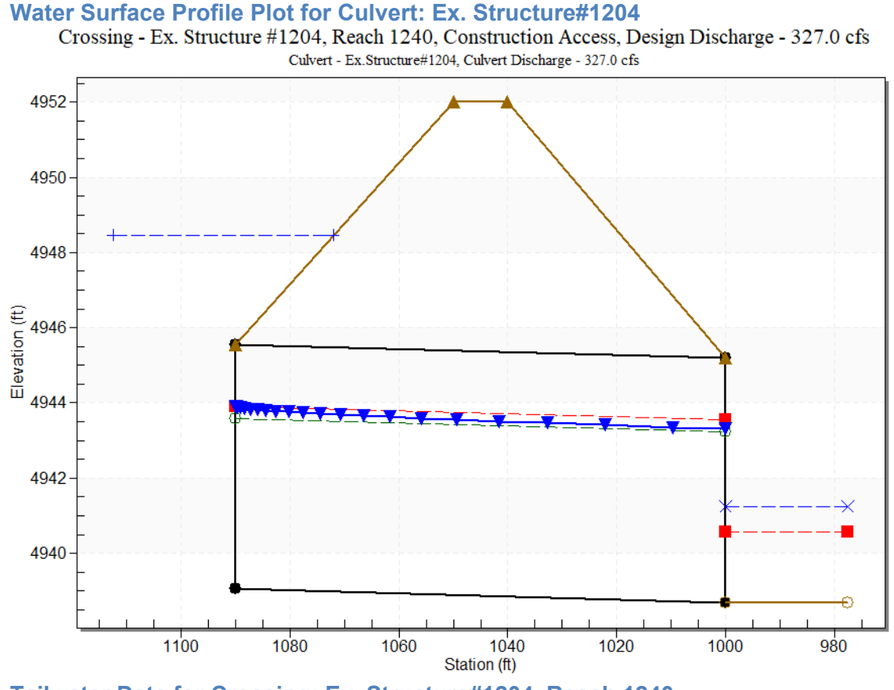
Culvert Summary Table: Ex. Structure#1204

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
Option4_100-Year	326.00	326.00	4948.43	9.38	7.582	5-S2n	4.52	4.85	4.61	2.56	12.97	4.52
Option1_100-Year	327.00	327.00	4948.46	9.41	7.608	5-S2n	4.53	4.85	4.61	2.56	12.98	4.52
Option2_100-Year	327.00	327.00	4948.46	9.41	7.608	5-S2n	4.53	4.85	4.61	2.56	12.98	4.52
Option3_100-Year	327.00	327.00	4948.46	9.41	7.608	5-S2n	4.53	4.85	4.61	2.56	12.98	4.52
Overtopping	490.50	427.83	4952.08	13.03	11.350	7-M2c	6.50	5.49	5.49	3.16	14.31	5.07

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4939.05 ft
Outlet Elevation (invert): 4938.69 ft
Culvert Length: 90.00 ft
Culvert Slope: 0.00 ft/ft

Water Surface Profile Plot for Culvert: Ex. Structure#1204



Tailwater Data for Crossing: Ex. Structure#1204, Reach 1240

Downstream Channel Rating Curve (Crossing: Structure#1204, Reach 1240)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
326.00	4841.25	4.52	2.56	0.80	0.58
327.00	4841.25	4.52	2.56	0.80	0.58

Tailwater Channel Data – Ex. Structure#1204, Reach 1240

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 18.00 ft
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.01 ft/ft
Channel Manning's n: 0.0350
Channel Invert Elevation: 4938.69 ft

Roadway Data for Crossing: Ex. Structure#1204, Reach 1240

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 1000.00 ft
Crest Elevation: 4952.00 ft
Roadway Surface: Gravel
Roadway Top Width: 10.00 ft

Culvert Data: Ex. Structure#1205

Site Data – Ex. Structure#1205

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4939.69 ft
Outlet Station: 65.54 ft
Outlet Elevation: 4939.36 ft
Number of Barrels: 2

Culvert Data Summary – Ex. Structure#1205

Barrel Shape: Circular
Barrel Diameter: 4.50 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Beveled Edge (1.5:1)
Inlet Depression: None

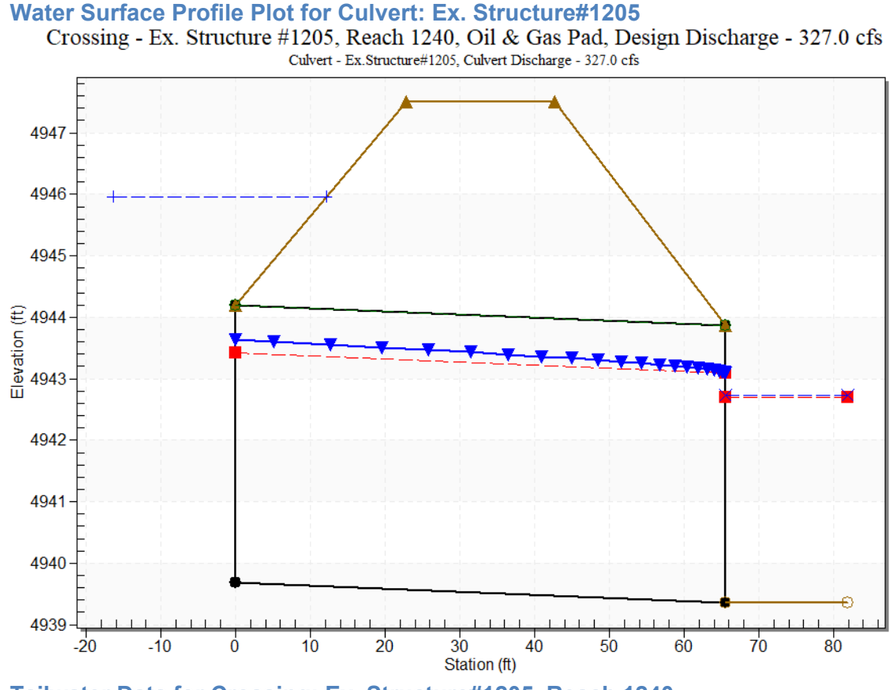
Culvert Summary Table: Ex. Structure#1205

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
Option4_100-Year	326.00	326.00	4945.94	6.25	6.213	7-M2c	4.50	3.73	3.73	3.36	11.57	7.21
Option1_100-Year	327.00	327.00	4945.95	6.26	6.227	7-M2c	4.50	3.73	3.73	3.37	11.59	7.21
Option2_100-Year	327.00	327.00	4945.95	6.26	6.227	7-M2c	4.50	3.73	3.73	3.37	11.59	7.21
Option3_100-Year	327.00	327.00	4945.95	6.26	6.227	7-M2c	4.50	3.73	3.73	3.37	11.59	7.21
Overtopping	490.50	417.80	4947.75	8.06	7.831	7-M2c	4.50	4.09	4.09	3.92	13.76	7.98

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4939.69 ft
Outlet Elevation (invert): 4939.36 ft
Culvert Length: 65.54 ft
Culvert Slope: 0.01 ft/ft

Water Surface Profile Plot for Culvert: Ex. Structure#1205



Tailwater Data for Crossing: Ex. Structure#1205, Reach 1240

Downstream Channel Rating Curve (Crossing: Structure#1205, Reach 1240)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
326.00	4942.72	7.21	3.36	3.15	0.98
327.00	4942.73	7.21	3.37	3.15	0.98

Tailwater Channel Data – Ex. Structure#1205, Reach 1240

Tailwater Channel Option: Triangular Channel
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.01 ft/ft
Channel Manning's n: 0.0350
Channel Invert Elevation: 4939.36 ft

Roadway Data for Crossing: Ex. Structure#1205, Reach 1240

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 200.00 ft
Crest Elevation: 4947.50 ft
Roadway Surface: Paved
Roadway Top Width: 20.00 ft

Culvert Data: Ex. Structure#1206

Site Data – Ex. Structure#1206

Site Data Option: Culvert Invert Data
Inlet Station: 61.00 ft
Inlet Elevation: 4953.50 ft
Outlet Station: 0.00 ft
Outlet Elevation: 4952.00 ft
Number of Barrels: 2

Culvert Data Summary – Ex. Structure#1206

Barrel Shape: Circular
Barrel Diameter: 4.50 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall
Inlet Depression: None

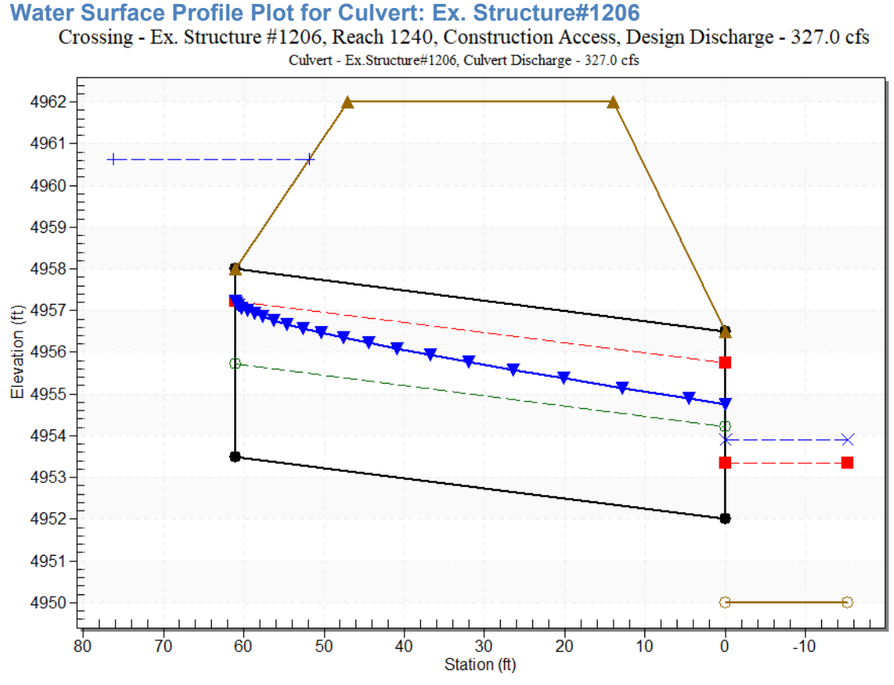
Culvert Summary Table: Ex. Structure#1206

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
Option4_100-Year	326.00	326.00	4960.60	7.10	5.416	5-S2n	2.22	3.73	2.76	3.90	15.97	5.36
Option1_100-Year	327.00	327.00	4960.63	7.13	5.436	5-S2n	2.22	3.73	2.76	3.90	15.98	5.36
Option2_100-Year	327.00	327.00	4960.63	7.13	5.436	5-S2n	2.22	3.73	2.76	3.90	15.98	5.36
Option3_100-Year	327.00	327.00	4960.63	7.13	5.436	5-S2n	2.22	3.73	2.76	3.90	15.98	5.36
Overtopping	408.75	378.75	4962.05	8.55	6.512	5-S2n	2.42	3.96	3.01	4.25	16.72	5.67

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4953.50 ft
Outlet Elevation (invert): 4952.00 ft
Culvert Length: 61.02 ft
Culvert Slope: 0.02 ft/ft

Water Surface Profile Plot for Culvert: Ex. Structure#1206



Tailwater Data for Crossing: Ex. Structure#1206, Reach 1240

Downstream Channel Rating Curve (Crossing: Structure#1206, Reach 1240)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
326.00	4953.90	5.36	3.90	1.22	0.68
327.00	4953.90	5.36	3.90	1.22	0.68

Tailwater Channel Data – Ex. Structure#1206, Reach 1240

Tailwater Channel Option: Triangular Channel
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.01 ft/ft
Channel Manning's n: 0.0300
Channel Invert Elevation: 4950.00 ft

Roadway Data for Crossing: Ex. Structure#1206, Reach 1240

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 1000.00 ft
Crest Elevation: 4962.00 ft
Roadway Surface: Gravel
Roadway Top Width: 33.00 ft

Culvert Data: Ex. Structure#1207

Site Data – Ex. Structure#1207

Site Data Option: Culvert Invert Data
Inlet Station: 1000.00 ft
Inlet Elevation: 4962.85 ft
Outlet Station: 1208.00 ft
Outlet Elevation: 4961.81 ft
Number of Barrels: 2

Culvert Data Summary – Ex. Structure#1207

Barrel Shape: Circular
Barrel Diameter: 5.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall
Inlet Depression: None

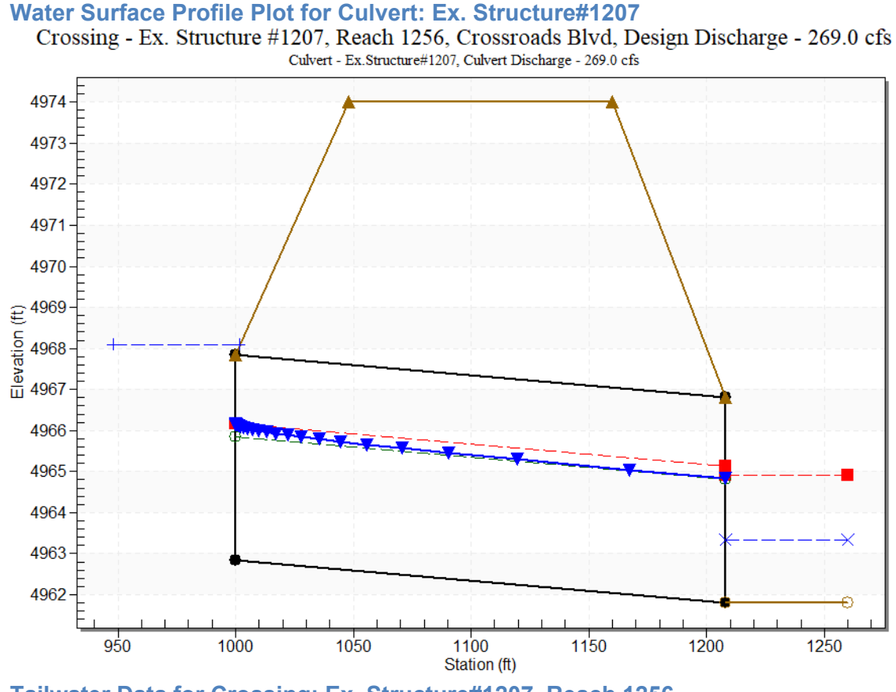
Culvert Summary Table: Ex. Structure#1207

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
Option4_100-Year	268.00	268.00	4968.07	5.22	3.825	5-S2n	3.00	3.31	3.01	1.53	10.84	28.69
Option1_100-Year	269.00	269.00	4968.08	5.23	3.843	5-S2n	3.00	3.32	3.02	1.53	10.85	28.72
Option2_100-Year	269.00	269.00	4968.08	5.23	3.843	5-S2n	3.00	3.32	3.02	1.53	10.85	28.72
Option3_100-Year	269.00	269.00	4968.08	5.23	3.843	5-S2n	3.00	3.32	3.02	1.53	10.85	28.72
Overtopping	605.25	554.29	4974.07	11.22	10.402	7-M2c	5.00	4.57	4.57	2.07	14.72	35.17

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4962.85 ft
Outlet Elevation (invert): 4961.81 ft
Culvert Length: 208.00 ft
Culvert Slope: 0.00 ft/ft

Water Surface Profile Plot for Culvert: Ex. Structure#1207



Tailwater Data for Crossing: Ex. Structure#1207, Reach 1256

Downstream Channel Rating Curve (Crossing: Structure#1207, Reach 1256)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
268.00	4963.34	28.69	1.53	47.68	5.78
269.00	4963.34	28.72	1.53	47.75	5.79

Tailwater Channel Data – Ex. Structure#1207, Reach 1256

Tailwater Channel Option: Triangular Channel
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.50 ft/ft
Channel Manning's n: 0.0300
Channel Invert Elevation: 4961.81 ft

Roadway Data for Crossing: Ex. Structure#1207, Reach 1256

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 1000.00 ft
Crest Elevation: 4974.00 ft
Roadway Surface: Paved
Roadway Top Width: 112.00 ft

Culvert Data: Ex. Structure#1208

Site Data – Ex. Structure#1208

Site Data Option: Culvert Invert Data
Inlet Station: 100.00 ft
Inlet Elevation: 4970.50 ft
Outlet Station: 0.00 ft
Outlet Elevation: 4970.00 ft
Number of Barrels: 1

Culvert Data Summary – Ex. Structure#1208

Barrel Shape: Circular
Barrel Diameter: 5.50 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall
Inlet Depression: None

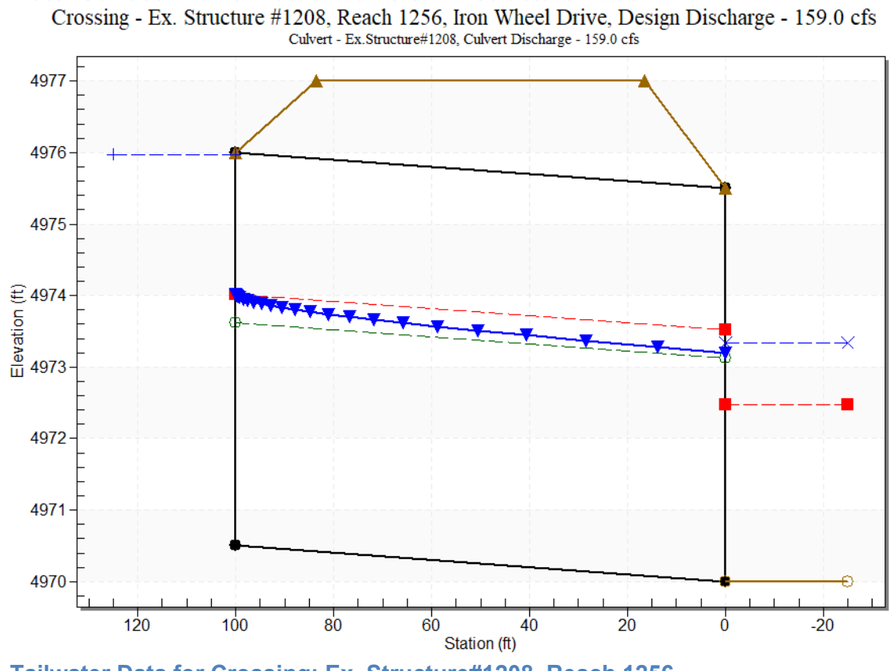
Culvert Summary Table: Ex. Structure#1208

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
Option1_100-Year	159.00	159.00	4975.97	5.47	4.254	1-S2n	3.12	3.52	3.20	3.34	11.09	4.46
Option2_100-Year	159.00	159.00	4975.97	5.47	4.254	1-S2n	3.12	3.52	3.20	3.34	11.09	4.46
Option3_100-Year	159.00	159.00	4975.97	5.47	4.254	1-S2n	3.12	3.52	3.20	3.34	11.09	4.46
Option4_100-Year	159.00	159.00	4975.97	5.47	4.254	1-S2n	3.12	3.52	3.20	3.34	11.09	4.46
Overtopping	238.50	201.32	4977.05	6.55	5.449	5-S2n	3.66	3.97	3.71	4.01	11.80	4.94

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4970.50 ft
Outlet Elevation (invert): 4970.00 ft
Culvert Length: 100.00 ft
Culvert Slope: 0.01 ft/ft

Water Surface Profile Plot for Culvert: Ex. Structure#1208



Tailwater Data for Crossing: Ex. Structure#1208, Reach 1256

Downstream Channel Rating Curve (Crossing: Structure#1208, Reach 1256)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
159.00	4973.34	4.46	3.34	1.56	0.55

Tailwater Channel Data – Ex. Structure#1208, Reach 1256

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 4.00 ft
Side Slope (H:V): 2.00 (_:1)
Channel Slope: 0.01 ft/ft
Channel Manning's n: 0.0440
Channel Invert Elevation: 4970.00 ft

Roadway Data for Crossing: Ex. Structure#1208, Reach 1256

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 1000.00 ft
Crest Elevation: 4977.00 ft
Roadway Surface: Paved
Roadway Top Width: 67.00 ft

APPENDIX E – 4
SWMM Inputs/Outputs

```
[TITLE]
;;Project Title/Notes
City of Greeley
Comprehensive Draingae Plan Oklahoma Basins
Alternatives Analysis - Option 1 Do Nothing
Matrix Design Group, Inc. 2025

[OPTIONS]
;;Option             Value
FLOW_UNITS           CFS
INFILTRATION         HORTON
FLOW_ROUTING         KINWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           01/01/2024
START_TIME           00:00:00
REPORT_START_DATE    01/01/2024
REPORT_START_TIME    00:00:00
END_DATE             01/02/2024
END_TIME             06:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:05:00
WET_STEP             00:05:00
DRY_STEP             01:00:00
ROUTING_STEP         0:00:20
RULE_STEP            00:00:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         12.566
MAX_TRIALS           8
HEAD_TOLERANCE       0.005
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              1

[FILES]
;;Interfacing Files
USE INFLOWS "R:\24.906.009 Greeley - Oklahoma Master Basin Study\200 Design\220 Drainage-WR\221 Models\01 CUHP_SWMM\01 CUHP\15_Fut_100yr_0mi^2_GOM_Outputs.txt"

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
CONSTANT         0.0
DRY_ONLY         NO

[JUNCTIONS]
;;Name           Elevation  MaxDepth   InitDepth  SurDepth   Aponded
;;-------------- ---------- ---------- ---------- ---------- ----------
1002             4757       0          0          0          0
1004             4768       0          0          0          0
1006_RR          4772       0          0          0          0
1008             4774       0          0          0          0
1010             4774.9     0          0          0          0
1012             4777.9     0          0          0          0
1014             4779       0          0          0          0
1016             4781       0          0          0          0
```

67	1018	4782	0	0	0	0
68	1020	4784	0	0	0	0
69	1022	4789	0	0	0	0
70	1024	4792	0	0	0	0
71	1026	4793	0	0	0	0
72	1028	4803.9	0	0	0	0
73	1030	4811.9	0	0	0	0
74	1032	4770	0	0	0	0
75	1034	4814.9	0	0	0	0
76	1036	4818	0	0	0	0
77	1038	4821	0	0	0	0
78	1040	4827.9	0	0	0	0
79	1042	4838	0	0	0	0
80	1044	4844	0	0	0	0
81	1046	4851	0	0	0	0
82	1048	4855	0	0	0	0
83	1050	4864	0	0	0	0
84	109	4779	0	0	0	0
85	110	4794	0	0	0	0
86	1108	4816	0	0	0	0
87	1110	4855	0	0	0	0
88	1115	4790	0	0	0	0
89	1116	4850	0	0	0	0
90	1123	4825	0	0	0	0
91	1124	4864	0	0	0	0
92	1125	4852	0	0	0	0
93	1126	4864	0	0	0	0
94	1127	4841	0	0	0	0
95	113	4784	0	0	0	0
96	1130	4854	0	0	0	0
97	1132	4874	0	0	0	0
98	1139	4857	10	0	0	0
99	114	4798	0	0	0	0
100	1140	4879	0	0	0	0
101	1141	4878	0	0	0	0
102	1142	4902	0	0	0	0
103	1144	4925	0	0	0	0
104	1147	4893	0	0	0	0
105	1148	4946	10	0	0	0
106	115	4816.7	0	0	0	0
107	1150	4955	0	0	0	0
108	1151	4941	0	0	0	0
109	1152	4966	0	0	0	0
110	1153	4943	0	0	0	0
111	1154	4976	0	0	0	0
112	1155	4898	0	0	0	0
113	1156	4935	0	0	0	0
114	1163	4953	0	0	0	0
115	1164	4958	0	0	0	0
116	117	4818	0	0	0	0
117	;Detention					
118	1170	4909	0	0	0	0
119	1172	4832	0	0	0	0
120	118	4830	0	0	0	0
121	1180	4838	0	0	0	0
122	119	4834	0	0	0	0
123	1208	4868	10	0	0	0
124	1209	4877	10	0	0	0
125	121	4835	0	0	0	0
126	1210	4889	0	0	0	0
127	1215	4868	0	0	0	0
128	1216	4882	0	0	0	0
129	1217	4873	0	0	0	0
130	122	4983	10	0	0	0
131	1223	4880	0	0	0	0
132	1224	4890	0	0	0	0

133	1226	4895	10	0	0	0
134	1228	4903	0	0	0	0
135	1230	4883	0	0	0	0
136	1231	4908	0	0	0	0
137	1232	4955	0	0	0	0
138	1233	4917	0	0	0	0
139	1233_Lake	4911	0	0	0	0
140	1234	4960	0	0	0	0
141	1235	4941	0	0	0	0
142	1236	4998	0	0	0	0
143	1237	4973	0	0	0	0
144	1238	5005	0	0	0	0
145	1239	4954	0	0	0	0
146	1239_Lake	4941	0	0	0	0
147	1240	4981	0	0	0	0
148	1247	4946	0	0	0	0
149	1248	4967	0	0	0	0
150	1249	4957	0	0	0	0
151	1255	4965	0	0	0	0
152	1256	4993	0	0	0	0
153	1257	4970	0	0	0	0
154	1258	4989	0	0	0	0
155	1259	4990	0	0	0	0
156	126	4999	0	0	0	0
157	1260	5019	0	0	0	0
158	1264	4876	0	0	0	0
159	1272	4880	0	0	0	0
160	1273	4959	0	0	0	0
161	1274	4978	0	0	0	0
162	129	4835	0	0	0	0
163	130	4910	0	0	0	0
164	1308	4891	0	0	0	0
165	1310	4912	0	0	0	0
166	1315	4893	0	0	0	0
167	1316	4904	0	0	0	0
168	1318	4923	0	0	0	0
169	1319	4929	0	0	0	0
170	1320	4970	0	0	0	0
171	1321	4931	0	0	0	0
172	1322	4975	0	0	0	0
173	1341	4957	0	0	0	0
174	1324	4975	0	0	0	0
175	1327	4984	0	0	0	0
176	1328	4989	0	0	0	0
177	133	4917	0	0	0	0
178	134	4945	0	0	0	0
179	1340	4946	0	0	0	0
180	1347	4949	0	0	0	0
181	1348	4981	0	0	0	0
182	1349	4952	0	0	0	0
183	1351	4979	0	0	0	0
184	1352	5019	0	0	0	0
185	1353	4985	0	0	0	0
186	1354	5028	0	0	0	0
187	1355	4971	0	0	0	0
188	1356	4989	0	0	0	0
189	1357	4981	0	0	0	0
190	1358	4993	0	0	0	0
191	1361	5024	0	0	0	0
192	1362	5035	0	0	0	0
193	1363	5038	0	0	0	0
194	1364	5058	0	0	0	0
195	1367	5033	0	0	0	0
196	1368	5059	0	0	0	0
197	1371	4971	0	0	0	0
198	1372	4988	0	0	0	0

199	138	4970	0	0	0	0
200	1382	4921	0	0	0	0
201	1386	4960	0	0	0	0
202	1387	4943	0	0	0	0
203	1388	4995	0	0	0	0
204	139	4817	0	0	0	0
205	1392	4938	0	0	0	0
206	1393	4940	0	0	0	0
207	1394	4997	0	0	0	0
208	1395	4947	0	0	0	0
209	1396	4969	0	0	0	0
210	1398	4972	0	0	0	0
211	141	4827	0	0	0	0
212	142	4820	0	0	0	0
213	146	4849	0	0	0	0
214	149	4869	0	0	0	0
215	150	4890	0	0	0	0
216	154	4904	0	0	0	0
217	210	4770	0	0	0	0
218	220	4777	0	0	0	0
219	221	4790.6	0	0	0	0
220	223	4793	0	0	0	0
221	224	4810	0	0	0	0
222	225	4840	0	0	0	0
223	226	4850	0	0	0	0
224	228	4864	0	0	0	0
225	231	4790.8	0	0	0	0
226	232	4810	0	0	0	0
227	235	4845	0	0	0	0
228	236	4847	0	0	0	0
229	237	4846	0	0	0	0
230	239	4850	0	0	0	0
231	240	4849	0	0	0	0
232	241	4862	0	0	0	0
233	243	4863	0	0	0	0
234	244	4894	0	0	0	0
235	245	4980	0	0	0	0
236	247	4981	0	0	0	0
237	248	4986	0	0	0	0
238	250	5015	0	0	0	0
239	252	4990	0	0	0	0
240	256	4851	0	0	0	0
241	259	4863	0	0	0	0
242	260	4905	0	0	0	0
243	263	4922	0	0	0	0
244	264	4991	0	0	0	0
245	268	4991	0	0	0	0
246	310	4778	0	0	0	0
247	314	4839	0	0	0	0
248	410	4793	0	0	0	0
249	414	4796	0	0	0	0
250	418	4802	0	0	0	0
251	422	4800	0	0	0	0
252	426	4810	0	0	0	0
253	510	4856	0	0	0	0
254	513	4880	0	0	0	0
255	514	4931	0	0	0	0
256	518	4940	0	0	0	0
257	610	4858	0	0	0	0
258	613	4888	0	0	0	0
259	614	4899	0	0	0	0
260	617	4942	0	0	0	0
261	618	4950	0	0	0	0
262	620	4920	0	0	0	0
263	622	4981	0	0	0	0
264	708	4851	0	0	0	0

```
709             4866       0          0          0          0
710             4871       0          0          0          0
711             4889       0          0          0          0
712             4915       0          0          0          0
713             4898       0          0          0          0
714             4864       0          0          0          0
804             4882       0          0          0          0
808             4885       0          0          0          0
809             4890       0          0          0          0
810             4925       0          0          0          0
811             4893       0          0          0          0
819             4901       0          0          0          0
820             4945       0          0          0          0
822             4932       0          0          0          0
823             4908       0          0          0          0
824             4961       0          0          0          0
829             4918       15         0          0          0
830             4972       0          0          0          0
831             4928.5     0          0          0          0
834             4932       0          0          0          0
838             4949       0          0          0          0
839             4965       0          0          0          0
840             4990       0          0          0          0
841             4967       0          0          0          0
842             5000       0          0          0          0
843             4959       0          0          0          0
844             4995       0          0          0          0
850             4990       0          0          0          0
910             4916       0          0          0          0
911             4913       0          0          0          0
912             4920       0          0          0          0
929             4922       0          0          0          0
930             4927       0          0          0          0
931             4954       0          0          0          0
940             4986       0          0          0          0
950             4977       0          0          0          0
960             4970       0          0          0          0
O_1107          4778       0          0          0          0
O_1263          4812       0          0          0          0
O_1307          4865       0          0          0          0
O_220           4772       0          0          0          0
O_300           4778       0          0          0          0
O_500           4826       0          0          0          0
O_600           4815       0          0          0          0
O_708           4828       0          0          0          0
O_803           4865       0          0          0          0
O_909           4865       0          0          0          0
1323            4966       0          0          0          0
CulvertOut_1233 4914       0          0          0          0

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
O_100           4778       FREE                        NO
O_1000          4756       FREE                        NO

[DIVIDERS]
;;Name           Elevation  Diverted Link    Type       Parameters
;;-------------- ---------- ---------------- ---------- ----------
836             4945       Overflow_836     OVERFLOW   0          0          0          0

[CONDUITS]
;;Name           From Node        To Node          Length     Roughness  InOffset   OutOffset  InitFlow   MaxFlow
;;-------------- ---------------- ---------------- ---------- ---------- ---------- ---------- ---------- ----------
Dummy_1032      1032             1002             400        0.035      0          0          0          0
Dummy_1050      1050             1048             381        0.035      0          0          0          0
```

331	Dummy_109	109	O_100	400	0.01	0	0	0	0
332	Dummy_110	110	109	400	0.01	0	0	0	0
333	Dummy_1107	O_1107	1012	400	0.01	0	0	0	0
334	Dummy_1108	1108	O_1107	400	0.035	0	0	0	0
335	Dummy_1110	1110	1115	400	0.035	0	0	0	0
336	Dummy_1116	1116	1115	400	0.035	0	0	0	0
337	Dummy_1124	1124	1123	400	0.035	0	0	0	0
338	Dummy_1126	1126	1125	400	0.035	0	0	0	0
339	Dummy_1132	1132	1130	400	0.035	0	0	0	0
340	Dummy_1139	1139	1130	300	0.013	0	0	0	0
341	Dummy_114	114	113	400	0.01	0	0	0	0
342	Dummy_1140	1140	1139	400	0.035	0	0	0	0
343	Dummy_1142	1142	1141	400	0.035	0	0	0	0
344	Dummy_1144	1144	1155	400	0.035	0	0	0	0
345	Dummy_1148	1148	1147	400	0.035	0	0	0	0
346	Dummy_1150	1150	1147	400	0.035	0	0	0	0
347	Dummy_1152	1152	1151	400	0.01	0	0	0	0
348	Dummy_1153	1153	1151	400	0.035	0	0	0	0
349	Dummy_1154	1154	1153	400	0.035	0	0	0	0
350	Dummy_1156	1156	1170	400	0.035	0	0	0	0
351	Dummy_1164	1164	1163	400	0.035	0	0	0	0
352	Dummy_1172	1172	1008	400	0.035	0	0	0	0
353	Dummy_118	118	117	400	0.01	0	0	0	0
354	Dummy_1180	1180	1016	400	0.035	0	0	0	0
355	Dummy_1208	1208	1024	400	0.035	0	0	0	0
356	Dummy_121	121	119	400	0.01	0	0	0	0
357	Dummy_1210	1210	1209	400	0.035	0	0	0	0
358	Dummy_1216	1216	1217	400	0.035	0	0	0	0
359	Dummy_122	122	121	400	0.01	0	0	0	0
360	Dummy_1224	1224	1223	400	0.035	0	0	0	0
361	Dummy_1226	1226	1223	400	0.035	0	0	0	0
362	Dummy_1228	1228	1223	400	0.035	0	0	0	0
363	Dummy_1230	1230	1223	400	0.035	0	0	0	0
364	Dummy_1232	1232	1231	400	0.035	0	0	0	0
365	Dummy_1233_Lake	1233_Lake	1231	400	0.01	0	0	0	0
366	Dummy_1234	1234	1233	400	0.01	0	0	0	0
367	Dummy_1236	1236	1235	400	0.01	0	0	0	0
368	Dummy_1238	1238	1237	400	0.01	0	0	0	0
369	Dummy_1239	1239_Lake	1231	400	0.01	0	0	0	0
370	Dummy_1240	1240	1239	400	0.01	0	0	0	0
371	Dummy_1248	1248	1247	400	0.01	0	0	0	0
372	Dummy_1249	1249	1247	400	0.01	0	0	0	0
373	Dummy_1256	1256	1255	400	0.01	0	0	0	0
374	Dummy_1258	1258	1257	400	0.01	0	0	0	0
375	Dummy_1260	1260	1259	400	0.01	0	0	0	0
376	Dummy_1263	O_1263	1030	400	0.01	0	0	0	0
377	Dummy_1264	1264	O_1263	400	0.035	0	0	0	0
378	Dummy_1272	1272	1038	400	0.035	0	0	0	0
379	Dummy_1274	1274	1273	400	0.01	0	0	0	0
380	Dummy_129	129	119	400	0.01	0	0	0	0
381	Dummy_130	130	129	400	0.01	0	0	0	0
382	Dummy_1307	O_1307	1048	400	0.01	0	0	0	0
383	Dummy_1308	1308	O_1307	400	0.01	0	0	0	0
384	Dummy_1310	1310	1315	400	0.01	0	0	0	0
385	Dummy_1318	1318	1315	400	0.01	0	0	0	0
386	Dummy_1320	1320	1319	400	0.01	0	0	0	0
387	Dummy_1322	1322	1321	400	0.01	0	0	0	0
388	Dummy_1341	1341	1340	400	0.01	0	0	0	0
389	Dummy_1328	1328	1327	400	0.01	0	0	0	0
390	Dummy_1337	1347	1340	400	0.01	0	0	0	0
391	Dummy_134	134	133	400	.01	0	0	0	0
392	Dummy_1348	1348	1347	400	0.01	0	0	0	0
393	Dummy_1349	1349	1340	400	0.01	0	0	0	0
394	Dummy_1352	1352	1351	400	0.01	0	0	0	0
395	Dummy_1354	1354	1353	400	0.01	0	0	0	0
396	Dummy_1356	1356	1355	400	0.01	0	0	0	0

397	Dummy_1358	1358	1357	400	0.01	0	0	0	0
398	Dummy_1362	1362	1361	400	0.01	0	0	0	0
399	Dummy_1364	1364	1363	400	0.01	0	0	0	0
400	Dummy_1368	1368	1367	400	0.01	0	0	0	0
401	Dummy_1372	1372	1371	400	0.01	0	0	0	0
402	Dummy_1382	1382	1044	400	0.01	0	0	0	0
403	Dummy_1386	1386	1340	400	0.01	0	0	0	0
404	Dummy_1388	1388	1387	400	0.01	0	0	0	0
405	Dummy_1392	1392	1315	400	0.01	0	0	0	0
406	Dummy_1394	1394	1393	400	0.01	0	0	0	0
407	Dummy_1396	1396	1395	400	0.01	0	0	0	0
408	Dummy_1398	1398	1395	400	0.01	0	0	0	0
409	Dummy_142	142	139	400	0.01	0	0	0	0
410	Dummy_150	150	149	400	0.01	0	0	0	0
411	Dummy_210	210	1002	400	0.035	0	0	0	0
412	Dummy_219	O_220	1004	400	0.035	0	0	0	0
413	Dummy_220	220	O_220	400	0.01	0	0	0	0
414	Dummy_223	223	221	400	0.01	0	0	0	0
415	Dummy_224	224	223	400	0.01	0	0	0	0
416	Dummy_226	226	225	400	0.01	0	0	0	0
417	Dummy_231	231	221	400	0.01	0	0	0	0
418	Dummy_232	232	231	400	0.01	0	0	0	0
419	Dummy_236	236	235	400	0.01	0	0	0	0
420	Dummy_237	237	235	400	0.01	0	0	0	0
421	Dummy_240	240	237	400	0.01	0	0	0	0
422	Dummy_243	243	241	400	0.01	0	0	0	0
423	Dummy_244	244	243	400	0.01	0	0	0	0
424	Dummy_247	247	245	400	0.01	0	0	0	0
425	Dummy_248	248	247	400	0.01	0	0	0	0
426	Dummy_252	252	245	400	0.01	0	0	0	0
427	Dummy_256	256	239	400	0.01	0	0	0	0
428	Dummy_259	259	241	400	0.01	0	0	0	0
429	Dummy_260	260	259	400	0.01	0	0	0	0
430	Dummy_264	264	263	400	0.01	0	0	0	0
431	Dummy_300	O_300	1010	400	0.01	0	0	0	0
432	Dummy_310	310	O_300	400	0.035	0	0	0	0
433	Dummy_410	410	1014	400	0.01	0	0	0	0
434	Dummy_414	414	1018	400	0.01	0	0	0	0
435	Dummy_418	418	1020	400	0.01	0	0	0	0
436	Dummy_422	422	1022	400	0.01	0	0	0	0
437	Dummy_426	426	1026	400	0.01	0	0	0	0
438	Dummy_500	O_500	1028	400	0.01	0	0	0	0
439	Dummy_510	510	O_500	400	0.01	0	0	0	0
440	Dummy_514	514	513	400	0.01	0	0	0	0
441	Dummy_518	518	513	400	0.01	0	0	0	0
442	Dummy_600	O_600	1030	400	0.01	0	0	0	0
443	Dummy_610	610	O_600	400	0.01	0	0	0	0
444	Dummy_614	614	613	400	0.01	0	0	0	0
445	Dummy_618	618	617	400	0.01	0	0	0	0
446	Dummy_620	620	1036	400	0.01	0	0	0	0
447	Dummy_708	O_708	1040	400	0.01	0	0	0	0
448	Dummy_714	714	1042	400	0.01	0	0	0	0
449	Dummy_803	O_803	1050	400	0.01	0	0	0	0
450	Dummy_804	804	O_803	400	0.01	0	0	0	0
451	Dummy_810	810	809	400	0.01	0	0	0	0
452	Dummy_820	820	819	400	0.01	0	0	0	0
453	Dummy_830	830	829	400	0.01	0	0	0	0
454	Dummy_840	840	839	400	0.01	0	0	0	0
455	Dummy_842	842	841	400	0.01	0	0	0	0
456	Dummy_844	844	843	400	0.01	0	0	0	0
457	Dummy_909	O_909	1050	400	0.01	0	0	0	0
458	Dummy_910	910	O_909	400	0.035	0	0	0	0
459	Dummy_929	929	912	75	0.013	0	0	0	0
460	Dummy_930	930	929	400	0.01	0	0	0	0
461	Dummy_940	940	931	400	0.035	0	0	0	0
462	Dummy_950	950	931	400	0.035	0	0	0	0

463	Dummy_960	960	931	400	0.035	0	0	0	0
464	Dummy_1002	1002	O_1000	400	0.044	0	0	0	0
465	L_1004	1004	1002	1497	0.075	0	0	0	0
466	L_1006	1006_RR	1004	461	0.055	0	0	0	0
467	L_1008	1008	1006_RR	473	0.044	0	0	0	0
468	L_1010	1010	1008	378	0.04	0	0	0	0
469	L_1012	1012	1010	896	0.075	0	0	0	0
470	L_1014	1014	1012	536	0.075	0	0	0	0
471	L_1016	1016	1014	319	0.055	0	0	0	0
472	L_1018	1018	1016	433	0.044	0	0	0	0
473	L_1020	1020	1018	373	0.044	0	0	0	0
474	L_1022	1022	1020	784	0.055	0	0	0	0
475	L_1024	1024	1022	543	0.055	0	0	0	0
476	L_1026	1026	1024	134	0.055	0	0	0	0
477	L_1028	1028	1026	1068	0.055	0	0	0	0
478	L_1030	1030	1028	474	0.055	0	0	0	0
479	L_1034	1034	1030	510	.055	0	0	0	0
480	L_1036	1036	1034	372	0.055	0	0	0	0
481	L_1038	1038	1036	567	0.055	0	0	0	0
482	L_1040	1040	1038	743	0.055	0	0	0	0
483	L_1042	1042	1040	601	0.055	0	0	0	0
484	L_1044	1044	1042	477	0.055	0	0	0	0
485	L_1046	1046	1044	402	0.044	0	0	0	0
486	L_1048	1048	1046	359	0.044	0	0	0	0
487	L_1115	1115	O_1107	432	0.055	0	0	0	0
488	L_1123	1123	1115	1593	0.055	0	0	0	0
489	L_1125	1125	1127	105	0.044	0	0	0	0
490	L_1127	1127	1123	873	0.055	0	0	0	0
491	L_1130	1130	1127	640	0.075	0	0	0	0
492	L_114	113	109	144	.035	0	0	0	0
493	L_1141	1141	1139	1900	0.055	0	0	0	0
494	L_1147	1147	1141	973	0.044	0	0	0	0
495	L_115	115	113	3260	.035	0	0	0	0
496	L_1151	1151	1155	2508	0.044	0	0	0	0
497	L_1156	1155	1147	1050	0.044	0	0	0	0
498	L_1163	1163	1153	1100	0.044	0	0	0	0
499	L_117	117	115	86	.035	0	0	0	0
500	L_1170	1170	1155	600	0.035	0	0	0	0
501	L_119	119	117	1087	.035	0	0	0	0
502	L_1209	1209	1217	930	0.044	0	0	0	0
503	Dummy_1215	1215	O_1263	1937.8	.01	0	0	0	0
504	L_1217	1217	1215	1800	0.044	0	0	0	0
505	L_1223	1223	1217	1649	0.044	0	0	0	0
506	L_1231	1231	1223	4880	0.044	0	0	0	0
507	L_1233	CulvertOut_1233	1233_Lake	315	0.044	0	0	0	0
508	L_1235	1235	1233	960	0.044	0	0	0	0
509	L_1237	1237	1249	920	0.020	0	0	0	0
510	L_1239	1239	1239_Lake	560	0.035	0	0	0	0
511	L_1247	1247	1233	1640	0.044	1	0	0	0
512	L_1255	1255	1273	650	0.055	0	0	0	0
513	L_1257	1257	1255	1580	.044	0	0	0	0
514	L_1259	1259	1257	2600	0.020	0	0	0	0
515	L_126	126	121	5178	.035	0	0	0	0
516	L_1273	1273	1239	795	0.075	0	0	0	0
517	L_1315	1315	O_1307	2154	0.055	0	0	0	0
518	L_1316	1316	1315	1157	0.055	0	0	0	0
519	L_1319	1319	1316	1841	0.044	0	0	0	0
520	L_1321	1321	1316	1813	0.044	0	0	0	0
521	L_1323	1323	1341	568	0.044	0	0	0	0
522	L_1327	1327	1349	2582	.020	0	0	0	0
523	L_133	133	129	2743	.035	0	0	0	0
524	L_1340	1340	1316	2275	.044	0	0	0	0
525	L_1351	1351	1349	2108.97	.044	0	0	0	0
526	L_1353	1353	1351	1021.71	.044	0	0	0	0
527	L_1355	1355	1349	957.73	0.044	0	0	0	0
528	L_1357	1357	1355	1049.12	0.044	0	0	0	0

L_1361	1361	1357	3566	0.044	0	0	0	0
L_1363	1363	1361	1016.32	0.020	0	0	0	0
L_1367	1367	1353	2810.21	0.044	0	0	0	0
L_1371	1371	1347	1116.44	0.044	0	0	0	0
L_138	138	133	2426	.035	0	0	0	0
L_1387	1387	1315	2272	.044	0	0	0	0
L_139	139	115	73	.035	0	0	0	0
L_1393	1393	1315	2179	.044	0	0	0	0
L_1395	1395	1315	3616	0.044	0	0	0	0
L_141	141	139	542	.035	0	0	0	0
L_146	146	141	165	.035	0	0	0	0
L_149	149	141	1479	.035	0	0	0	0
L_154	154	149	1625	.035	0	0	0	0
L_221	221	O_220	2511	.035	0	0	0	0
L_225	225	223	1810	.035	0	0	0	0
L_228	228	225	847	.035	0	0	0	0
L_235	235	231	3274	.035	0	0	0	0
L_239	239	237	288	.035	0	0	0	0
L_241	241	239	1092	.035	0	0	0	0
L_245	245	243	4101	.035	0	0	0	0
L_250	250	247	2063	.035	0	0	0	0
L_263	263	259	2459	.035	0	0	0	0
L_268	268	263	1464	.035	0	0	0	0
L_314	314	O_300	2623	.035	0	0	0	0
L_513	513	O_500	3358	.035	0	0	0	0
L_613	613	O_600	3854	.035	0	0	0	0
L_617	617	613	2214	.035	0	0	0	0
L_622	622	617	1661	.035	0	0	0	0
L_708	708	O_708	202	0.035	0	0	0	0
L_709	709	708	560.2	.03	0	0	0	0
L_710	710	709	154.3	.04	0	0	0	0
L_711	711	710	615.3	.04	0	0	0	0
L_712	712	713	485.4	.04	0	0	0	0
L_713	713	711	338.1	.07	0	0	0	0
L_808	808	O_803	1197	.07	0	0	0	0
L_809	809	808	90	.013	0	0	0	0
L_811	811	809	183	.045	0	0	0	0
L_819	819	811	761	0.07	0	0	0	0
L_822	822	819	671	0.04	0	0	0	0
L_823	823	819	943	0.04	0	0	0	0
L_824	824	822	1270	0.035	0	0	0	0
L_829	829	823	290	0.035	0	0	0	0
L_831	831	829	105	0.04	0	0	0	0
L_834	834	831	1040	.04	0	0	0	0
L_836	836	834	442	0.013	0	0	0	0
L_838	838	836	314.88	.048	0	0	0	0
L_839	839	843	541	.048	0	0	0	0
L_841	841	839	190	.044	0	0	0	0
L_843	843	838	304	0.035	0	0	0	0
L_850	850	841	1740	.044	0	0	0	0
L_911	911	O_909	2561	0.055	0	0	0	0
L_912	912	911	522	0.044	0	0	0	0
L_931	931	929	2763	0.044	0	0	0	0
Overflow_836	836	834	442	0.035	0	0	0	0
Dummy_1324	1324	1323	400	0.01	0	0	0	0
Dummy_1233	1233	CulvertOut_1233	400	0.035	0	0	0	0

[XSECTIONS]

;;Link	Shape	Geom1	Geom2	Geom3	Geom4	Barrels	Culvert
Dummy_1032	DUMMY	0	0	0	0	1	
Dummy_1050	DUMMY	0	0	0	0	1	
Dummy_109	DUMMY	0	0	0	0	1	
Dummy_110	DUMMY	0	0	0	0	1	
Dummy_1107	DUMMY	0	0	0	0	1	
Dummy_1108	DUMMY	0	0	0	0	1	

595	Dummy_1110	DUMMY	0	0	0	0	1
596	Dummy_1116	DUMMY	0	0	0	0	1
597	Dummy_1124	DUMMY	0	0	0	0	1
598	Dummy_1126	DUMMY	0	0	0	0	1
599	Dummy_1132	DUMMY	0	0	0	0	1
600	Dummy_1139	DUMMY	0	0	0	0	1
601	Dummy_114	DUMMY	0	0	0	0	1
602	Dummy_1140	DUMMY	0	0	0	0	1
603	Dummy_1142	DUMMY	0	0	0	0	1
604	Dummy_1144	DUMMY	0	0	0	0	1
605	Dummy_1148	DUMMY	0	0	0	0	1
606	Dummy_1150	DUMMY	0	0	0	0	1
607	Dummy_1152	DUMMY	0	0	0	0	1
608	Dummy_1153	DUMMY	0	0	0	0	1
609	Dummy_1154	DUMMY	0	0	0	0	1
610	Dummy_1156	DUMMY	0	0	0	0	1
611	Dummy_1164	DUMMY	0	0	0	0	1
612	Dummy_1172	DUMMY	0	0	0	0	1
613	Dummy_118	DUMMY	0	0	0	0	1
614	Dummy_1180	DUMMY	0	0	0	0	1
615	Dummy_1208	DUMMY	0	0	0	0	1
616	Dummy_121	DUMMY	0	0	0	0	1
617	Dummy_1210	DUMMY	0	0	0	0	1
618	Dummy_1216	DUMMY	0	0	0	0	1
619	Dummy_122	DUMMY	0	0	0	0	1
620	Dummy_1224	DUMMY	0	0	0	0	1
621	Dummy_1226	DUMMY	0	0	0	0	1
622	Dummy_1228	DUMMY	0	0	0	0	1
623	Dummy_1230	DUMMY	0	0	0	0	1
624	Dummy_1232	DUMMY	0	0	0	0	1
625	Dummy_1233_Lake	DUMMY	0	0	0	0	1
626	Dummy_1234	DUMMY	0	0	0	0	1
627	Dummy_1236	DUMMY	0	0	0	0	1
628	Dummy_1238	DUMMY	0	0	0	0	1
629	Dummy_1239	DUMMY	0	0	0	0	1
630	Dummy_1240	DUMMY	0	0	0	0	1
631	Dummy_1248	DUMMY	0	0	0	0	1
632	Dummy_1249	DUMMY	0	0	0	0	1
633	Dummy_1256	DUMMY	0	0	0	0	1
634	Dummy_1258	DUMMY	0	0	0	0	1
635	Dummy_1260	DUMMY	0	0	0	0	1
636	Dummy_1263	DUMMY	0	0	0	0	1
637	Dummy_1264	DUMMY	0	0	0	0	1
638	Dummy_1272	DUMMY	0	0	0	0	1
639	Dummy_1274	DUMMY	0	0	0	0	1
640	Dummy_129	DUMMY	0	0	0	0	1
641	Dummy_130	DUMMY	0	0	0	0	1
642	Dummy_1307	DUMMY	0	0	0	0	1
643	Dummy_1308	DUMMY	0	0	0	0	1
644	Dummy_1310	DUMMY	0	0	0	0	1
645	Dummy_1318	DUMMY	0	0	0	0	1
646	Dummy_1320	DUMMY	0	0	0	0	1
647	Dummy_1322	DUMMY	0	0	0	0	1
648	Dummy_1341	DUMMY	0	0	0	0	1
649	Dummy_1328	DUMMY	0	0	0	0	1
650	Dummy_1337	DUMMY	0	0	0	0	1
651	Dummy_134	DUMMY	0	0	0	0	1
652	Dummy_1348	DUMMY	0	0	0	0	1
653	Dummy_1349	DUMMY	0	0	0	0	1
654	Dummy_1352	DUMMY	0	0	0	0	1
655	Dummy_1354	DUMMY	0	0	0	0	1
656	Dummy_1356	DUMMY	0	0	0	0	1
657	Dummy_1358	DUMMY	0	0	0	0	1
658	Dummy_1362	DUMMY	0	0	0	0	1
659	Dummy_1364	DUMMY	0	0	0	0	1
660	Dummy_1368	DUMMY	0	0	0	0	1

661	Dummy_1372	DUMMY	0	0	0	0	1
662	Dummy_1382	DUMMY	0	0	0	0	1
663	Dummy_1386	DUMMY	0	0	0	0	1
664	Dummy_1388	DUMMY	0	0	0	0	1
665	Dummy_1392	DUMMY	0	0	0	0	1
666	Dummy_1394	DUMMY	0	0	0	0	1
667	Dummy_1396	DUMMY	0	0	0	0	1
668	Dummy_1398	DUMMY	0	0	0	0	1
669	Dummy_142	DUMMY	0	0	0	0	1
670	Dummy_150	DUMMY	0	0	0	0	1
671	Dummy_210	DUMMY	0	0	0	0	1
672	Dummy_219	DUMMY	0	0	0	0	1
673	Dummy_220	DUMMY	0	0	0	0	1
674	Dummy_223	DUMMY	0	0	0	0	1
675	Dummy_224	DUMMY	0	0	0	0	1
676	Dummy_226	DUMMY	0	0	0	0	1
677	Dummy_231	DUMMY	0	0	0	0	1
678	Dummy_232	DUMMY	0	0	0	0	1
679	Dummy_236	DUMMY	0	0	0	0	1
680	Dummy_237	DUMMY	0	0	0	0	1
681	Dummy_240	DUMMY	0	0	0	0	1
682	Dummy_243	DUMMY	0	0	0	0	1
683	Dummy_244	DUMMY	0	0	0	0	1
684	Dummy_247	DUMMY	0	0	0	0	1
685	Dummy_248	DUMMY	0	0	0	0	1
686	Dummy_252	DUMMY	0	0	0	0	1
687	Dummy_256	DUMMY	0	0	0	0	1
688	Dummy_259	DUMMY	0	0	0	0	1
689	Dummy_260	DUMMY	0	0	0	0	1
690	Dummy_264	DUMMY	0	0	0	0	1
691	Dummy_300	DUMMY	0	0	0	0	1
692	Dummy_310	DUMMY	0	0	0	0	1
693	Dummy_410	DUMMY	0	0	0	0	1
694	Dummy_414	DUMMY	0	0	0	0	1
695	Dummy_418	DUMMY	0	0	0	0	1
696	Dummy_422	DUMMY	0	0	0	0	1
697	Dummy_426	DUMMY	0	0	0	0	1
698	Dummy_500	DUMMY	0	0	0	0	1
699	Dummy_510	DUMMY	0	0	0	0	1
700	Dummy_514	DUMMY	0	0	0	0	1
701	Dummy_518	DUMMY	0	0	0	0	1
702	Dummy_600	DUMMY	0	0	0	0	1
703	Dummy_610	DUMMY	0	0	0	0	1
704	Dummy_614	DUMMY	0	0	0	0	1
705	Dummy_618	DUMMY	0	0	0	0	1
706	Dummy_620	DUMMY	0	0	0	0	1
707	Dummy_708	DUMMY	0	0	0	0	1
708	Dummy_714	DUMMY	0	0	0	0	1
709	Dummy_803	DUMMY	0	0	0	0	1
710	Dummy_804	DUMMY	0	0	0	0	1
711	Dummy_810	DUMMY	0	0	0	0	1
712	Dummy_820	DUMMY	0	0	0	0	1
713	Dummy_830	DUMMY	0	0	0	0	1
714	Dummy_840	DUMMY	0	0	0	0	1
715	Dummy_842	DUMMY	0	0	0	0	1
716	Dummy_844	DUMMY	0	0	0	0	1
717	Dummy_909	DUMMY	0	0	0	0	1
718	Dummy_910	DUMMY	0	0	0	0	1
719	Dummy_929	DUMMY	0	0	0	0	1
720	Dummy_930	DUMMY	0	0	0	0	1
721	Dummy_940	DUMMY	0	0	0	0	1
722	Dummy_950	DUMMY	0	0	0	0	1
723	Dummy_960	DUMMY	0	0	0	0	1
724	Dummy_1002	DUMMY	0	0	0	0	1
725	L_1004	TRAPEZOIDAL	20	64	1.5	1.5	1
726	L_1006	TRAPEZOIDAL	30	40	2	2	1

727	L_1008	TRAPEZOIDAL	20	25	3	3	1
728	L_1010	TRAPEZOIDAL	20	25	3	3	1
729	L_1012	TRAPEZOIDAL	30	25	3	3	1
730	L_1014	TRAPEZOIDAL	30	65	2.5	2.5	1
731	L_1016	TRAPEZOIDAL	20	65	2.5	2.5	1
732	L_1018	TRAPEZOIDAL	20	55	2.5	2.5	1
733	L_1020	TRAPEZOIDAL	20	55	2.5	2.5	1
734	L_1022	TRAPEZOIDAL	20	42	2	2	1
735	L_1024	TRAPEZOIDAL	20	60	2.5	2.5	1
736	L_1026	TRAPEZOIDAL	20	60	2.5	2.5	1
737	L_1028	TRAPEZOIDAL	20	50	1	1	1
738	L_1030	TRAPEZOIDAL	20	50	1	1	1
739	L_1034	TRAPEZOIDAL	20	40	1	1	1
740	L_1036	TRAPEZOIDAL	20	40	1	1	1
741	L_1038	TRAPEZOIDAL	20	30	2.5	2.5	1
742	L_1040	TRAPEZOIDAL	20	25	3	3	1
743	L_1042	TRAPEZOIDAL	20	20	3	3	1
744	L_1044	TRAPEZOIDAL	20	20	3	3	1
745	L_1046	TRAPEZOIDAL	20	25	5	5	1
746	L_1048	TRAPEZOIDAL	20	25	5	5	1
747	L_1115	TRAPEZOIDAL	10	10	1.5	1.5	1
748	L_1123	TRAPEZOIDAL	10	75	3	3	1
749	L_1125	TRAPEZOIDAL	10	15	3.5	3.5	1
750	L_1127	TRAPEZOIDAL	10	90	2.5	2.5	1
751	L_1130	TRAPEZOIDAL	10	90	2.5	2.5	1
752	L_114	TRIANGULAR	10	200	0	0	1
753	L_1141	TRAPEZOIDAL	10	200	10	10	1
754	L_1147	TRAPEZOIDAL	10	25	5	5	1
755	L_115	TRAPEZOIDAL	10	100	5	5	1
756	L_1151	TRAPEZOIDAL	10	10	3	3	1
757	L_1156	TRAPEZOIDAL	10	300	10	10	1
758	L_1163	TRAPEZOIDAL	10	70	3	3	1
759	L_117	TRAPEZOIDAL	10	10	2	2	1
760	L_1170	TRAPEZOIDAL	10	250	7.5	7.5	1
761	L_119	TRAPEZOIDAL	10	10	2	2	1
762	L_1209	TRAPEZOIDAL	10	.001	15	15	1
763	Dummy_1215	DUMMY	0	0	0	0	1
764	L_1217	TRAPEZOIDAL	10	20	3	3	1
765	L_1223	TRAPEZOIDAL	10	.001	15	15	1
766	L_1231	TRAPEZOIDAL	10	.001	15	15	1
767	L_1233	TRAPEZOIDAL	10	20	4	4	1
768	L_1235	TRAPEZOIDAL	10	4	4	4	1
769	L_1237	TRAPEZOIDAL	10	6	0	0	1
770	L_1239	TRAPEZOIDAL	10	.001	4	4	1
771	L_1247	TRAPEZOIDAL	10	5	4	4	1
772	L_1255	TRAPEZOIDAL	10	.001	4	4	1
773	L_1257	TRAPEZOIDAL	10	4	2	2	1
774	L_1259	TRAPEZOIDAL	10	40	15	15	1
775	L_126	TRAPEZOIDAL	10	30	2	2	1
776	L_1273	TRAPEZOIDAL	10	.001	4	4	1
777	L_1315	TRAPEZOIDAL	10	90	3	3	1
778	L_1316	TRAPEZOIDAL	10	.001	15	15	1
779	L_1319	TRAPEZOIDAL	10	.001	15	15	1
780	L_1321	TRAPEZOIDAL	10	.001	15	15	1
781	L_1323	TRAPEZOIDAL	10	.001	15	15	1
782	L_1327	TRAPEZOIDAL	1	40	2	2	1
783	L_133	TRAPEZOIDAL	10	75	8	8	1
784	L_1340	TRAPEZOIDAL	10	.001	15	15	1
785	L_1351	TRAPEZOIDAL	10	.001	15	15	1
786	L_1353	TRAPEZOIDAL	10	0.001	15	15	1
787	L_1355	TRAPEZOIDAL	10	.001	15	15	1
788	L_1357	TRAPEZOIDAL	10	.001	15	15	1
789	L_1361	TRAPEZOIDAL	10	.001	15	15	1
790	L_1363	TRAPEZOIDAL	10	40	2	2	1
791	L_1367	TRAPEZOIDAL	10	.001	15	15	1
792	L_1371	TRAPEZOIDAL	10	.001	15	15	1

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L_138            TRAPEZOIDAL  10              50         8          8          1
L_1387           TRAPEZOIDAL  10              30         5          5          1
L_139            TRAPEZOIDAL  10              20         2          2          1
L_1393           TRAPEZOIDAL  10              .001       15         15         1
L_1395           TRAPEZOIDAL  10              25         15         15         1
L_141            TRAPEZOIDAL  10              20         2          2          1
L_146            TRAPEZOIDAL  10              20         10         10         1
L_149            TRAPEZOIDAL  10              30         2          2          1
L_154            TRAPEZOIDAL  10              50         2          2          1
L_221            TRAPEZOIDAL  10              40         4          4          1
L_225            TRAPEZOIDAL  10              40         2          2          1
L_228            TRAPEZOIDAL  10              20         2          2          1
L_235            TRAPEZOIDAL  10              100        3          3          1
L_239            TRAPEZOIDAL  10              75         2          2          1
L_241            TRAPEZOIDAL  10              30         2          2          1
L_245            TRAPEZOIDAL  10              10         2          2          1
L_250            TRAPEZOIDAL  10              10         50         50         1
L_263            TRAPEZOIDAL  10              20         2          2          1
L_268            TRAPEZOIDAL  10              20         2          2          1
L_314            TRAPEZOIDAL  10              50         2          2          1
L_513            TRAPEZOIDAL  10              50         2          2          1
L_613            TRAPEZOIDAL  10              100        3          3          1
L_617            TRAPEZOIDAL  10              80         2          2          1
L_622            TRAPEZOIDAL  10              20         10         10         1
L_708            TRAPEZOIDAL  10              22         2          2          1
L_709            TRAPEZOIDAL  10              50         4          4          1
L_710            TRAPEZOIDAL  10              70         2          2          1
L_711            TRAPEZOIDAL  10              73         4          4          1
L_712            TRAPEZOIDAL  10              106        15         15         1
L_713            TRAPEZOIDAL  10              55         10         10         1
L_808            TRAPEZOIDAL  10              65         3          3          1
L_809            RECT_CLOSED  15              5          0          0          1
L_811            TRAPEZOIDAL  10              107        6          6          1
L_819            TRAPEZOIDAL  10              115        3          3          1
L_822            TRAPEZOIDAL  10              235        5          5          1
L_823            TRAPEZOIDAL  10              235        5          5          1
L_824            TRAPEZOIDAL  10              657        30         30         1
L_829            TRAPEZOIDAL  10              75         3.5        6.5        1
L_831            TRAPEZOIDAL  15              65         6          6          1
L_834            TRAPEZOIDAL  15              64         6          6          1
L_836            CIRCULAR     4               0          0          0          1
L_838            TRAPEZOIDAL  15              24         15         15         1
L_839            TRAPEZOIDAL  15              100        27         10         1
L_841            TRIANGULAR   10              200        0          0          1
L_843            CIRCULAR     15              0          0          0          1
L_850            TRAPEZOIDAL  10              20         12         12         1
L_911            TRAPEZOIDAL  10              85         4          4          1
L_912            TRAPEZOIDAL  10              .001       15         15         1
L_931            TRAPEZOIDAL  10              .001       15         15         1
Overflow_836     TRAPEZOIDAL  15              40         15         15         1
Dummy_1324       DUMMY        0               0          0          0          1
Dummy_1233       DUMMY        0               0          0          0          1

[REPORT]
;;Reporting Options
INPUT      YES
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]
Link       Dummy_1153       Dummy_1152

[MAP]
DIMENSIONS 3145393.000 1386770.000 3180780.000 1409658.000
Units      Feet
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[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
1002             3170619.149        1402564.338
1004             3169675.902        1401645.913
1006_RR          3169428.809        1401411.720
1008             3168851.250        1401189.918
1010             3168674.735        1401006.049
1012             3168039.211        1400554.818
1014             3167753.552        1400053.608
1016             3167742.617        1399994.737
1018             3167464.735        1399744.295
1020             3167206.542        1399579.227
1022             3166642.065        1399209.650
1024             3166345.932        1398969.986
1026             3166243.069        1398915.460
1028             3165721.676        1398175.698
1030             3165182.237        1397849.465
1032             3170291.764        1402598.774
1034             3164981.729        1397666.990
1036             3164734.293        1397340.880
1038             3164281.212        1397196.114
1040             3163554.937        1397152.211
1042             3162976.481        1397015.234
1044             3162506.853        1396951.740
1046             3162186.921        1396850.612
1048             3161914.795        1396591.357
1050             3161832.974        1396243.845
109              3172493.984        1401578.256
110              3173043.879        1401167.292
1108             3168014.254        1400672.563
1110             3167389.060        1401791.532
1115             3167772.078        1400732.774
1116             3167002.137        1400457.093
1123             3166576.791        1401482.270
1124             3165892.228        1401684.092
1125             3166242.512        1402334.051
1126             3166529.823        1402745.717
1127             3166181.400        1402195.122
113              3172464.883        1401459.245
1130             3165627.108        1402465.968
1132             3164987.475        1402037.559
1139             3165354.982        1402701.320
114              3172167.781        1400707.633
1140             3164034.092        1402675.928
1141             3163817.839        1403624.342
1142             3163815.859        1404392.551
1144             3163009.111        1405544.660
1147             3162688.718        1403824.464
1148             3162007.737        1403370.329
115              3173888.360        1398653.630
1150             3161990.346        1402766.892
1151             3159922.833        1404783.678
1152             3159447.152        1404354.176
1153             3159776.054        1404788.405
1154             3159355.340        1405109.370
1155             3162442.428        1404798.158
1156             3160414.028        1404986.553
1163             3159634.809        1405897.936
1164             3158849.608        1406407.727
117              3173880.064        1398564.270
1170             3161905.451        1405050.099
1172             3168596.213        1401742.560
118              3173540.426        1397983.668
1180             3167514.718        1400032.040
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925	119	3174325.889	1397711.087
926	1208	3165728.297	1399170.234
927	1209	3163919.886	1400320.218
928	121	3174321.334	1397296.283
929	1210	3163248.197	1401455.603
930	1215	3165126.655	1398419.867
931	1216	3163520.212	1398828.011
932	1217	3163868.402	1399430.293
933	122	3173547.646	1396590.755
934	1223	3162682.114	1399997.622
935	1224	3161001.796	1399832.688
936	1226	3161838.560	1400771.304
937	1228	3162600.045	1401680.060
938	1230	3162519.789	1399097.998
939	1231	3160070.878	1401221.136
940	1232	3159625.895	1400495.298
941	1233	3159542.835	1402283.661
942	1233_Lake	3159541.841	1401555.286
943	1234	3159086.367	1402604.291
944	1235	3159800.417	1402869.660
945	1236	3159039.870	1403440.456
946	1237	3156522.687	1403259.253
947	1238	3156929.190	1403998.708
948	1239	3157314.751	1401977.783
949	1239_Lake	3157831.632	1401981.044
950	1240	3156538.266	1401366.122
951	1247	3157771.959	1402312.639
952	1248	3157266.069	1402966.601
953	1249	3156883.302	1402547.683
954	1255	3155898.046	1402075.474
955	1256	3155685.602	1403011.436
956	1257	3154852.083	1402712.828
957	1258	3154316.384	1403685.347
958	1259	3152796.972	1402652.578
959	126	3175177.807	1392860.319
960	1260	3150086.735	1402714.626
961	1264	3164392.403	1398309.340
962	1272	3164007.677	1397483.113
963	1273	3156478.712	1402055.941
964	1274	3155826.533	1401770.234
965	129	3174515.175	1397463.621
966	130	3175024.012	1397213.094
967	1308	3160804.774	1396052.814
968	1310	3160242.230	1398705.345
969	1315	3159934.517	1396941.518
970	1316	3158833.347	1397434.801
971	1318	3159775.515	1398648.239
972	1319	3158330.271	1399075.426
973	1320	3157936.527	1399775.664
974	1321	3157712.138	1398616.006
975	1322	3156641.872	1400097.750
976	1341	3155638.438	1399342.483
977	1324	3155148.743	1401513.891
978	1327	3154755.683	1401616.430
979	1328	3154478.348	1401747.687
980	133	3175464.269	1395423.302
981	134	3176046.522	1395289.067
982	1340	3156642.822	1398565.551
983	1347	3154769.311	1398497.495
984	1348	3153791.786	1398067.739
985	1349	3154748.653	1399004.318
986	1351	3152674.464	1399549.808
987	1352	3150396.734	1400285.906
988	1353	3151953.756	1398758.487
989	1354	3150909.875	1398142.369
990	1355	3154031.417	1399715.290

991	1356	3154226.809	1400801.017
992	1357	3153310.143	1400207.459
993	1358	3152359.903	1400190.039
994	1361	3150350.361	1402083.521
995	1362	3149696.145	1401445.978
996	1363	3149352.158	1402071.015
997	1364	3147006.365	1402094.061
998	1367	3149312.708	1399099.909
999	1368	3148631.549	1400837.606
1000	1371	3153950.443	1397762.773
1001	1372	3153533.264	1396596.735
1002	138	3176551.687	1393911.435
1003	1382	3161448.977	1397769.125
1004	1386	3156582.485	1397690.432
1005	1387	3157599.393	1396856.128
1006	1388	3155482.211	1395998.927
1007	139	3174134.011	1398565.223
1008	1392	3159398.721	1396211.323
1009	1393	3158014.936	1396028.718
1010	1394	3157405.455	1395275.402
1011	1395	3159772.270	1393351.385
1012	1396	3159046.679	1393384.283
1013	1398	3158330.667	1392151.754
1014	141	3174496.025	1398349.144
1015	142	3174297.914	1398269.402
1016	146	3174839.133	1398440.554
1017	149	3175446.704	1397485.654
1018	150	3175725.937	1396655.858
1019	154	3176498.594	1396447.611
1020	210	3170690.309	1401930.818
1021	220	3169872.115	1400747.295
1022	221	3171056.287	1399499.718
1023	223	3171081.746	1399216.439
1024	224	3170483.894	1398942.244
1025	225	3170963.901	1397587.279
1026	226	3170034.862	1396684.770
1027	228	3171214.344	1396795.593
1028	231	3171281.556	1399242.427
1029	232	3171867.669	1398940.478
1030	235	3171942.755	1396376.089
1031	236	3172174.394	1396173.654
1032	237	3171836.304	1396218.308
1033	239	3171819.969	1396012.369
1034	240	3171465.769	1396047.353
1035	241	3171784.721	1395004.299
1036	243	3171603.976	1394740.098
1037	244	3170474.857	1393573.365
1038	245	3170953.011	1391537.235
1039	247	3170946.356	1391350.504
1040	248	3171725.770	1391016.584
1041	250	3171382.685	1389670.473
1042	252	3170076.201	1391227.161
1043	256	3171980.985	1396009.339
1044	259	3171945.493	1394701.859
1045	260	3172640.290	1393627.377
1046	263	3172027.210	1392879.765
1047	264	3172774.124	1392301.135
1048	268	3172567.091	1391586.184
1049	310	3168953.130	1400257.600
1050	314	3169136.183	1398444.247
1051	410	3168089.460	1399719.276
1052	414	3167712.276	1399364.914
1053	418	3167365.375	1399085.796
1054	422	3166914.751	1399053.119
1055	426	3166763.787	1398251.000
1056	510	3166117.900	1398031.442

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513              3167650.673        1395533.607
514              3168296.160        1393932.029
518              3169362.595        1394367.627
610              3165533.504        1397295.929
613              3166309.616        1394324.797
614              3166347.111        1393268.251
617              3167649.187        1392831.654
618              3168448.770        1392819.694
620              3164924.133        1396914.890
622              3168640.880        1391634.472
708              3163545.077        1396945.746
709              3163550.936        1396430.950
710              3163582.859        1396183.238
711              3163849.475        1395585.088
712              3164170.730        1394893.693
713              3164026.296        1395321.455
714              3163045.486        1396594.989
804              3162382.792        1396464.970
808              3162610.739        1395282.210
809              3162680.609        1395190.276
810              3162469.592        1394272.390
811              3162750.666        1395067.439
819              3163126.566        1394286.019
820              3164083.921        1393947.644
822              3163648.877        1393689.740
823              3163178.026        1393090.738
824              3165084.121        1392764.753
829              3163270.454        1392949.290
830              3162895.806        1391990.039
831              3163337.984        1392862.497
834              3164022.935        1391988.122
838              3164695.448        1391590.547
839              3165119.889        1391258.759
840              3168063.403        1389800.546
841              3165119.627        1391026.960
842              3167571.315        1387765.308
843              3164824.235        1391480.680
844              3164911.898        1389234.187
850              3166245.882        1389663.232
910              3161225.348        1395608.156
911              3161117.215        1394387.404
912              3161208.739        1393993.290
929              3161263.900        1393895.839
930              3161635.114        1393474.015
931              3161235.574        1391541.881
940              3161999.589        1390600.274
950              3160517.347        1390605.001
960              3159423.192        1391208.377
O_1107           3168039.352        1400578.156
O_1263           3165149.591        1397908.586
O_1307           3161737.362        1396517.809
O_220            3169737.387        1401574.286
O_300            3168738.081        1400926.155
O_500            3165794.745        1398081.909
O_600            3165200.073        1397783.747
O_708            3163559.256        1397095.344
O_803            3161952.489        1396183.168
O_909            3161899.167        1396072.847
1323             3155503.127        1399922.384
CulvertOut_1233  3159523.545        1402209.220
O_100            3172504.752        1401653.256
O_1000           3170676.148        1402586.402
836              3164431.711        1391798.762

[VERTICES]
;;Link           X-Coord            Y-Coord
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Dummy_1050       3161919.025        1396423.265
Dummy_1126       3166368.563        1402533.176
Dummy_1144       3162845.753        1405310.421
Dummy_1150       3162663.812        1403066.900
Dummy_118        3173863.043        1398495.625
Dummy_118        3173850.175        1398508.480
Dummy_1260       3150507.799        1402703.262
Dummy_1260       3150626.357        1402655.998
Dummy_1260       3150958.555        1402727.485
Dummy_1260       3151604.985        1402716.380
Dummy_1260       3151776.925        1402675.102
Dummy_1260       3152263.353        1402776.394
Dummy_1318       3159968.641        1398461.736
Dummy_1362       3150103.548        1401744.948
Dummy_1368       3149061.806        1399485.949
Dummy_1368       3149196.742        1399131.969
Dummy_260        3172073.946        1394857.871
Dummy_514        3167617.462        1394642.315
Dummy_514        3167540.795        1395192.423
Dummy_518        3168439.235        1395151.633
Dummy_518        3168094.922        1395389.332
Dummy_518        3167637.799        1395540.026
Dummy_810        3162504.273        1394740.838
Dummy_830        3163283.709        1392817.770
Dummy_840        3166938.664        1391078.963
Dummy_842        3165872.915        1388959.357
Dummy_844        3164953.929        1390984.328
Dummy_960        3159826.122        1391546.682
Dummy_960        3160354.259        1391540.858
Dummy_1002       3170670.373        1402576.937
L_1004           3169707.159        1401765.428
L_1004           3169730.143        1401868.394
L_1004           3169784.384        1401984.232
L_1004           3169993.995        1402069.731
L_1004           3170086.848        1402150.633
L_1004           3170197.170        1402210.390
L_1004           3170297.378        1402326.228
L_1004           3170395.748        1402470.565
L_1004           3170529.973        1402526.645
L_1006           3169563.828        1401496.313
L_1008           3168980.391        1401240.823
L_1008           3169131.680        1401257.077
L_1008           3169276.591        1401327.987
L_1008           3169397.337        1401374.754
L_1010           3168770.347        1401090.629
L_1010           3168823.669        1401188.079
L_1012           3168150.449        1400592.206
L_1012           3168308.356        1400688.915
L_1012           3168440.454        1400743.764
L_1012           3168575.446        1400860.793
L_1012           3168597.510        1400943.534
L_1012           3168666.132        1400966.034
L_1014           3167790.326        1400230.122
L_1014           3167880.422        1400316.541
L_1014           3167913.518        1400456.281
L_1018           3167609.008        1399837.991
L_1018           3167645.070        1399893.642
L_1018           3167683.682        1399945.126
L_1020           3167224.929        1399654.613
L_1022           3166702.741        1399301.585
L_1022           3166770.773        1399364.100
L_1022           3166871.065        1399418.864
L_1024           3166429.636        1398990.983
L_1024           3166500.527        1399066.632
L_1024           3166593.868        1399069.955
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1189	L_1028	3165823.189	1398310.828
1190	L_1028	3165968.191	1398384.998
1191	L_1028	3166068.145	1398494.510
1192	L_1028	3166127.232	1398652.527
1193	L_1028	3166191.586	1398818.009
1194	L_1030	3165206.390	1397863.964
1195	L_1030	3165309.297	1397889.066
1196	L_1030	3165428.542	1397969.642
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1198	L_1034	3165011.148	1397788.344
1199	L_1036	3164972.535	1397525.411
1200	L_1036	3164974.374	1397604.475
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1203	L_1038	3164728.999	1397331.766
1204	L_1040	3163645.002	1397185.254
1205	L_1040	3163753.484	1397218.350
1206	L_1040	3163903.222	1397207.292
1207	L_1040	3164073.797	1397202.665
1208	L_1042	3163112.894	1397037.559
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1210	L_1044	3162636.868	1396941.144
1211	L_1044	3162768.843	1396957.591
1212	L_1044	3162902.337	1397006.631
1213	L_1046	3162343.210	1396970.127
1214	L_1046	3162424.112	1396971.966
1215	L_1048	3162069.639	1396691.146
1216	L_1048	3162161.180	1396795.451
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1218	L_1115	3167909.001	1400662.714
1219	L_1115	3167986.250	1400627.408
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1223	L_1123	3166988.376	1401018.794
1224	L_1123	3167097.823	1400980.310
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1229	L_1127	3166271.447	1402085.829
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1232	L_1127	3166518.892	1401622.794
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1237	L_1141	3164893.086	1403098.179
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1254	L_115	3172979.229	1400609.206

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1264	L_1170	3162310.039	1404972.408
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1273	L_1239	3157852.454	1401993.882
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1277	L_1257	3155886.354	1402223.595
1278	L_1259	3153235.901	1402706.413
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1292	L_126	3174518.167	1395443.940
1293	L_126	3174602.202	1395669.395
1294	L_126	3174615.221	1395785.309
1295	L_126	3174589.560	1395888.300
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1301	L_126	3174461.383	1396519.158
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1303	L_126	3174410.037	1396705.825
1304	L_126	3174403.754	1396847.471
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1307	L_126	3174320.294	1397130.685
1308	L_1315	3160627.526	1396758.864
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1312	L_1327	3154771.683	1401516.644
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1320	L_133	3174894.728	1396865.249

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1327	L_1357	3153841.385	1399781.908
1328	L_1357	3153963.685	1399714.481
1329	L_1367	3150169.515	1398817.590
1330	L_1367	3150414.189	1398624.708
1331	L_1367	3151483.986	1398625.943
1332	L_138	3176361.308	1394407.310
1333	L_138	3176290.585	1394555.322
1334	L_138	3176174.706	1394664.649
1335	L_138	3176097.554	1394825.530
1336	L_138	3175904.268	1394870.378
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1338	L_138	3175659.790	1395237.108
1339	L_1393	3158829.456	1396867.039
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1341	L_149	3175105.117	1397823.442
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1343	L_149	3174763.824	1398061.284
1344	L_149	3174641.516	1398183.483
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1356	L_225	3171017.537	1398839.166
1357	L_228	3171051.264	1397197.878
1358	L_228	3171006.897	1397298.557
1359	L_228	3171045.607	1397440.810
1360	L_235	3171943.934	1396569.466
1361	L_235	3171705.886	1396923.327
1362	L_235	3171609.539	1397206.523
1363	L_235	3171526.168	1397567.003
1364	L_235	3171526.400	1397773.045
1365	L_235	3171513.823	1398049.900
1366	L_235	3171533.610	1398449.130
1367	L_235	3171488.636	1398571.415
1368	L_235	3171482.455	1398803.206
1369	L_241	3171854.499	1395220.900
1370	L_241	3171767.631	1395294.804
1371	L_241	3171767.787	1395433.156
1372	L_241	3171742.104	1395503.913
1373	L_241	3171790.795	1395845.024
1374	L_245	3170699.047	1392363.125
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1377	L_245	3170867.706	1393335.583
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1381	L_245	3171255.423	1394256.784
1382	L_245	3171261.991	1394366.250
1383	L_245	3171423.308	1394546.724
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1385	L_250	3171531.201	1389928.197
1386	L_250	3171454.835	1390784.474

1387	L_263	3171945.763	1392987.527
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1389	L_263	3171975.182	1393296.426
1390	L_263	3171997.246	1393483.973
1391	L_263	3171986.214	1393653.132
1392	L_263	3172008.322	1393814.704
1393	L_263	3172000.924	1393936.290
1394	L_263	3172040.895	1394123.806
1395	L_263	3172063.439	1394329.770
1396	L_263	3171931.905	1394625.909
1397	L_268	3172301.162	1391913.970
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1432	L_613	3165282.354	1397128.254
1433	L_613	3165194.097	1397426.122
1434	L_617	3167523.238	1392974.567
1435	L_617	3167278.461	1393077.308
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1437	L_617	3166806.627	1393469.263
1438	L_617	3166652.178	1393682.551
1439	L_617	3166597.017	1393910.549
1440	L_617	3166396.858	1394228.841
1441	L_622	3168553.129	1391881.156
1442	L_622	3168360.127	1392177.121
1443	L_622	3168224.996	1392357.253
1444	L_622	3168077.069	1392621.072
1445	L_622	3167626.199	1392839.473
1446	L_808	3162548.726	1395451.782
1447	L_808	3162358.869	1395580.263
1448	L_808	3162352.645	1395770.088
1449	L_819	3162977.717	1394783.213
1450	L_822	3163291.565	1393821.246
1451	L_823	3163152.532	1393328.805
1452	L_834	3163524.959	1392573.517

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L_911            3161372.649        1394755.073
L_911            3161826.698        1395069.642
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L_911            3161862.393        1395740.044
L_912            3161028.084        1394236.204
L_931            3160738.116        1392175.320
L_931            3161261.052        1393094.358
L_931            3161314.825        1393444.018
Overflow_836     3164268.225        1391934.133
Overflow_836     3164107.375        1391999.868

[Polygons]

[BACKDROP]
FILE       "R:\24.906.009 Greeley - Oklahoma Master Basin Study\200 Design\220 Drainage-WR\221 Models\01 CUHP_SWMM\02 SWMM\06 Alternatives\00 Background\2024_10_017 Subbasins.jpg"
DIMENSIONS 3145400.318 1386770.000 3180772.682 1409658.000

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EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)
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City of Greeley
Comprehensive Draingae Plan Oklahoma Basins
Alternatives Analysis - Option 1 Do Nothing
WARNING 04: minimum elevation drop used for Conduit Dummy_310

*************
Element Count
*************
Number of rain gages ...... 0
Number of subcatchments ... 0
Number of nodes ........... 257
Number of links ........... 256
Number of pollutants ...... 0
Number of land uses ....... 0


************
Node Summary
************
                                    Invert      Max.    Ponded    External
Name                 Type            Elev.     Depth      Area    Inflow
--------------------------------------------------------------------------
1002                 JUNCTION      4757.00     20.00       0.0
1004                 JUNCTION      4768.00     30.00       0.0
1006_RR              JUNCTION      4772.00     30.00       0.0
1008                 JUNCTION      4774.00     20.00       0.0
1010                 JUNCTION      4774.90     30.00       0.0
1012                 JUNCTION      4777.90     30.00       0.0
1014                 JUNCTION      4779.00     30.00       0.0
1016                 JUNCTION      4781.00     20.00       0.0
1018                 JUNCTION      4782.00     20.00       0.0
1020                 JUNCTION      4784.00     20.00       0.0
1022                 JUNCTION      4789.00     20.00       0.0
1024                 JUNCTION      4792.00     20.00       0.0
1026                 JUNCTION      4793.00     20.00       0.0
1028                 JUNCTION      4803.90     20.00       0.0
1030                 JUNCTION      4811.90     20.00       0.0
1032                 JUNCTION      4770.00      0.00       0.0
1034                 JUNCTION      4814.90     20.00       0.0
1036                 JUNCTION      4818.00     20.00       0.0
1038                 JUNCTION      4821.00     20.00       0.0
1040                 JUNCTION      4827.90     20.00       0.0
1042                 JUNCTION      4838.00     20.00       0.0
1044                 JUNCTION      4844.00     20.00       0.0
1046                 JUNCTION      4851.00     20.00       0.0
1048                 JUNCTION      4855.00     20.00       0.0
1050                 JUNCTION      4864.00      0.00       0.0
109                  JUNCTION      4779.00     10.00       0.0
110                  JUNCTION      4794.00      0.00       0.0
1108                 JUNCTION      4816.00      0.00       0.0
1110                 JUNCTION      4855.00      0.00       0.0
1115                 JUNCTION      4790.00     10.00       0.0
1116                 JUNCTION      4850.00      0.00       0.0
1123                 JUNCTION      4825.00     10.00       0.0
1124                 JUNCTION      4864.00      0.00       0.0
1125                 JUNCTION      4852.00     10.00       0.0
1126                 JUNCTION      4864.00      0.00       0.0
1127                 JUNCTION      4841.00     10.00       0.0
113                  JUNCTION      4784.00     10.00       0.0
1130                 JUNCTION      4854.00     10.00       0.0
1132                 JUNCTION      4874.00      0.00       0.0
1139                 JUNCTION      4857.00     10.00       0.0
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67	114	JUNCTION	4798.00	0.00	0.0
68	1140	JUNCTION	4879.00	0.00	0.0
69	1141	JUNCTION	4878.00	10.00	0.0
70	1142	JUNCTION	4902.00	0.00	0.0
71	1144	JUNCTION	4925.00	0.00	0.0
72	1147	JUNCTION	4893.00	10.00	0.0
73	1148	JUNCTION	4946.00	10.00	0.0
74	115	JUNCTION	4816.70	10.00	0.0
75	1150	JUNCTION	4955.00	0.00	0.0
76	1151	JUNCTION	4941.00	10.00	0.0
77	1152	JUNCTION	4966.00	0.00	0.0
78	1153	JUNCTION	4943.00	10.00	0.0
79	1154	JUNCTION	4976.00	0.00	0.0
80	1155	JUNCTION	4898.00	10.00	0.0
81	1156	JUNCTION	4935.00	0.00	0.0
82	1163	JUNCTION	4953.00	10.00	0.0
83	1164	JUNCTION	4958.00	0.00	0.0
84	117	JUNCTION	4818.00	10.00	0.0
85	1170	JUNCTION	4909.00	10.00	0.0
86	1172	JUNCTION	4832.00	0.00	0.0
87	118	JUNCTION	4830.00	0.00	0.0
88	1180	JUNCTION	4838.00	0.00	0.0
89	119	JUNCTION	4834.00	10.00	0.0
90	1208	JUNCTION	4868.00	10.00	0.0
91	1209	JUNCTION	4877.00	10.00	0.0
92	121	JUNCTION	4835.00	10.00	0.0
93	1210	JUNCTION	4889.00	0.00	0.0
94	1215	JUNCTION	4868.00	10.00	0.0
95	1216	JUNCTION	4882.00	0.00	0.0
96	1217	JUNCTION	4873.00	10.00	0.0
97	122	JUNCTION	4983.00	10.00	0.0
98	1223	JUNCTION	4880.00	10.00	0.0
99	1224	JUNCTION	4890.00	0.00	0.0
100	1226	JUNCTION	4895.00	10.00	0.0
101	1228	JUNCTION	4903.00	0.00	0.0
102	1230	JUNCTION	4883.00	0.00	0.0
103	1231	JUNCTION	4908.00	10.00	0.0
104	1232	JUNCTION	4955.00	0.00	0.0
105	1233	JUNCTION	4917.00	10.00	0.0
106	1233_Lake	JUNCTION	4911.00	10.00	0.0
107	1234	JUNCTION	4960.00	0.00	0.0
108	1235	JUNCTION	4941.00	10.00	0.0
109	1236	JUNCTION	4998.00	0.00	0.0
110	1237	JUNCTION	4973.00	10.00	0.0
111	1238	JUNCTION	5005.00	0.00	0.0
112	1239	JUNCTION	4954.00	10.00	0.0
113	1239_Lake	JUNCTION	4941.00	10.00	0.0
114	1240	JUNCTION	4981.00	0.00	0.0
115	1247	JUNCTION	4946.00	11.00	0.0
116	1248	JUNCTION	4967.00	0.00	0.0
117	1249	JUNCTION	4957.00	10.00	0.0
118	1255	JUNCTION	4965.00	10.00	0.0
119	1256	JUNCTION	4993.00	0.00	0.0
120	1257	JUNCTION	4970.00	10.00	0.0
121	1258	JUNCTION	4989.00	0.00	0.0
122	1259	JUNCTION	4990.00	10.00	0.0
123	126	JUNCTION	4999.00	10.00	0.0
124	1260	JUNCTION	5019.00	0.00	0.0
125	1264	JUNCTION	4876.00	0.00	0.0
126	1272	JUNCTION	4880.00	0.00	0.0
127	1273	JUNCTION	4959.00	10.00	0.0
128	1274	JUNCTION	4978.00	0.00	0.0
129	129	JUNCTION	4835.00	10.00	0.0
130	130	JUNCTION	4910.00	0.00	0.0
131	1308	JUNCTION	4891.00	0.00	0.0
132	1310	JUNCTION	4912.00	0.00	0.0

133	1315	JUNCTION	4893.00	10.00	0.0
134	1316	JUNCTION	4904.00	10.00	0.0
135	1318	JUNCTION	4923.00	0.00	0.0
136	1319	JUNCTION	4929.00	10.00	0.0
137	1320	JUNCTION	4970.00	0.00	0.0
138	1321	JUNCTION	4931.00	10.00	0.0
139	1322	JUNCTION	4975.00	0.00	0.0
140	1341	JUNCTION	4957.00	10.00	0.0
141	1324	JUNCTION	4975.00	0.00	0.0
142	1327	JUNCTION	4984.00	1.00	0.0
143	1328	JUNCTION	4989.00	0.00	0.0
144	133	JUNCTION	4917.00	10.00	0.0
145	134	JUNCTION	4945.00	0.00	0.0
146	1340	JUNCTION	4946.00	10.00	0.0
147	1347	JUNCTION	4949.00	10.00	0.0
148	1348	JUNCTION	4981.00	0.00	0.0
149	1349	JUNCTION	4952.00	10.00	0.0
150	1351	JUNCTION	4979.00	10.00	0.0
151	1352	JUNCTION	5019.00	0.00	0.0
152	1353	JUNCTION	4985.00	10.00	0.0
153	1354	JUNCTION	5028.00	0.00	0.0
154	1355	JUNCTION	4971.00	10.00	0.0
155	1356	JUNCTION	4989.00	0.00	0.0
156	1357	JUNCTION	4981.00	10.00	0.0
157	1358	JUNCTION	4993.00	0.00	0.0
158	1361	JUNCTION	5024.00	10.00	0.0
159	1362	JUNCTION	5035.00	0.00	0.0
160	1363	JUNCTION	5038.00	10.00	0.0
161	1364	JUNCTION	5058.00	0.00	0.0
162	1367	JUNCTION	5033.00	10.00	0.0
163	1368	JUNCTION	5059.00	0.00	0.0
164	1371	JUNCTION	4971.00	10.00	0.0
165	1372	JUNCTION	4988.00	0.00	0.0
166	138	JUNCTION	4970.00	10.00	0.0
167	1382	JUNCTION	4921.00	0.00	0.0
168	1386	JUNCTION	4960.00	0.00	0.0
169	1387	JUNCTION	4943.00	10.00	0.0
170	1388	JUNCTION	4995.00	0.00	0.0
171	139	JUNCTION	4817.00	10.00	0.0
172	1392	JUNCTION	4938.00	0.00	0.0
173	1393	JUNCTION	4940.00	10.00	0.0
174	1394	JUNCTION	4997.00	0.00	0.0
175	1395	JUNCTION	4947.00	10.00	0.0
176	1396	JUNCTION	4969.00	0.00	0.0
177	1398	JUNCTION	4972.00	0.00	0.0
178	141	JUNCTION	4827.00	10.00	0.0
179	142	JUNCTION	4820.00	0.00	0.0
180	146	JUNCTION	4849.00	10.00	0.0
181	149	JUNCTION	4869.00	10.00	0.0
182	150	JUNCTION	4890.00	0.00	0.0
183	154	JUNCTION	4904.00	10.00	0.0
184	210	JUNCTION	4770.00	0.00	0.0
185	220	JUNCTION	4777.00	0.00	0.0
186	221	JUNCTION	4790.60	10.00	0.0
187	223	JUNCTION	4793.00	10.00	0.0
188	224	JUNCTION	4810.00	0.00	0.0
189	225	JUNCTION	4840.00	10.00	0.0
190	226	JUNCTION	4850.00	0.00	0.0
191	228	JUNCTION	4864.00	10.00	0.0
192	231	JUNCTION	4790.80	10.00	0.0
193	232	JUNCTION	4810.00	0.00	0.0
194	235	JUNCTION	4845.00	10.00	0.0
195	236	JUNCTION	4847.00	0.00	0.0
196	237	JUNCTION	4846.00	10.00	0.0
197	239	JUNCTION	4850.00	10.00	0.0
198	240	JUNCTION	4849.00	0.00	0.0

199	241	JUNCTION	4862.00	10.00	0.0
200	243	JUNCTION	4863.00	10.00	0.0
201	244	JUNCTION	4894.00	0.00	0.0
202	245	JUNCTION	4980.00	10.00	0.0
203	247	JUNCTION	4981.00	10.00	0.0
204	248	JUNCTION	4986.00	0.00	0.0
205	250	JUNCTION	5015.00	10.00	0.0
206	252	JUNCTION	4990.00	0.00	0.0
207	256	JUNCTION	4851.00	0.00	0.0
208	259	JUNCTION	4863.00	10.00	0.0
209	260	JUNCTION	4905.00	0.00	0.0
210	263	JUNCTION	4922.00	10.00	0.0
211	264	JUNCTION	4991.00	0.00	0.0
212	268	JUNCTION	4991.00	10.00	0.0
213	310	JUNCTION	4778.00	0.00	0.0
214	314	JUNCTION	4839.00	10.00	0.0
215	410	JUNCTION	4793.00	0.00	0.0
216	414	JUNCTION	4796.00	0.00	0.0
217	418	JUNCTION	4802.00	0.00	0.0
218	422	JUNCTION	4800.00	0.00	0.0
219	426	JUNCTION	4810.00	0.00	0.0
220	510	JUNCTION	4856.00	0.00	0.0
221	513	JUNCTION	4880.00	10.00	0.0
222	514	JUNCTION	4931.00	0.00	0.0
223	518	JUNCTION	4940.00	0.00	0.0
224	610	JUNCTION	4858.00	0.00	0.0
225	613	JUNCTION	4888.00	10.00	0.0
226	614	JUNCTION	4899.00	0.00	0.0
227	617	JUNCTION	4942.00	10.00	0.0
228	618	JUNCTION	4950.00	0.00	0.0
229	620	JUNCTION	4920.00	0.00	0.0
230	622	JUNCTION	4981.00	10.00	0.0
231	708	JUNCTION	4851.00	10.00	0.0
232	709	JUNCTION	4866.00	10.00	0.0
233	710	JUNCTION	4871.00	10.00	0.0
234	711	JUNCTION	4889.00	10.00	0.0
235	712	JUNCTION	4915.00	10.00	0.0
236	713	JUNCTION	4898.00	10.00	0.0
237	714	JUNCTION	4864.00	0.00	0.0
238	804	JUNCTION	4882.00	0.00	0.0
239	808	JUNCTION	4885.00	15.00	0.0
240	809	JUNCTION	4890.00	15.00	0.0
241	810	JUNCTION	4925.00	0.00	0.0
242	811	JUNCTION	4893.00	10.00	0.0
243	819	JUNCTION	4901.00	10.00	0.0
244	820	JUNCTION	4945.00	0.00	0.0
245	822	JUNCTION	4932.00	10.00	0.0
246	823	JUNCTION	4908.00	10.00	0.0
247	824	JUNCTION	4961.00	10.00	0.0
248	829	JUNCTION	4918.00	15.00	0.0
249	830	JUNCTION	4972.00	0.00	0.0
250	831	JUNCTION	4928.50	15.00	0.0
251	834	JUNCTION	4932.00	15.00	0.0
252	838	JUNCTION	4949.00	15.00	0.0
253	839	JUNCTION	4965.00	15.00	0.0
254	840	JUNCTION	4990.00	0.00	0.0
255	841	JUNCTION	4967.00	10.00	0.0
256	842	JUNCTION	5000.00	0.00	0.0
257	843	JUNCTION	4959.00	15.00	0.0
258	844	JUNCTION	4995.00	0.00	0.0
259	850	JUNCTION	4990.00	10.00	0.0
260	910	JUNCTION	4916.00	0.00	0.0
261	911	JUNCTION	4913.00	10.00	0.0
262	912	JUNCTION	4920.00	10.00	0.0
263	929	JUNCTION	4922.00	10.00	0.0
264	930	JUNCTION	4927.00	0.00	0.0

931	JUNCTION	4954.00	10.00	0.0	
940	JUNCTION	4986.00	0.00	0.0	
950	JUNCTION	4977.00	0.00	0.0	
960	JUNCTION	4970.00	0.00	0.0	
O_1107	JUNCTION	4778.00	10.00	0.0	
O_1263	JUNCTION	4812.00	0.00	0.0	
O_1307	JUNCTION	4865.00	10.00	0.0	
O_220	JUNCTION	4772.00	10.00	0.0	
O_300	JUNCTION	4778.00	10.00	0.0	
O_500	JUNCTION	4826.00	10.00	0.0	
O_600	JUNCTION	4815.00	10.00	0.0	
O_708	JUNCTION	4828.00	10.00	0.0	
O_803	JUNCTION	4865.00	10.00	0.0	
O_909	JUNCTION	4865.00	10.00	0.0	
1323	JUNCTION	4966.00	10.00	0.0	
CulvertOut_1233	JUNCTION	4914.00	10.00	0.0	
O_100	OUTFALL	4778.00	0.00	0.0	
O_1000	OUTFALL	4756.00	0.00	0.0	
836	DIVIDER	4945.00	15.00	0.0	

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Link Summary
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Name	From Node	To Node	Type	Length	%Slope	Roughness
Dummy_1032	1032	1002	CONDUIT	400.0	3.2517	0.0350
Dummy_1050	1050	1048	CONDUIT	381.0	2.3629	0.0350
Dummy_109	109	O_100	CONDUIT	400.0	0.2500	0.0100
Dummy_110	110	109	CONDUIT	400.0	3.7526	0.0100
Dummy_1107	O_1107	1012	CONDUIT	400.0	0.0250	0.0100
Dummy_1108	1108	O_1107	CONDUIT	400.0	9.5432	0.0350
Dummy_1110	1110	1115	CONDUIT	400.0	16.4689	0.0350
Dummy_1116	1116	1115	CONDUIT	400.0	15.1717	0.0350
Dummy_1124	1124	1123	CONDUIT	400.0	9.7967	0.0350
Dummy_1126	1126	1125	CONDUIT	400.0	3.0014	0.0350
Dummy_1132	1132	1130	CONDUIT	400.0	5.0063	0.0350
Dummy_1139	1139	1130	CONDUIT	300.0	1.0001	0.0130
Dummy_114	114	113	CONDUIT	400.0	3.5021	0.0100
Dummy_1140	1140	1139	CONDUIT	400.0	5.5083	0.0350
Dummy_1142	1142	1141	CONDUIT	400.0	6.0108	0.0350
Dummy_1144	1144	1155	CONDUIT	400.0	6.7654	0.0350
Dummy_1148	1148	1147	CONDUIT	400.0	13.3679	0.0350
Dummy_1150	1150	1147	CONDUIT	400.0	15.6896	0.0350
Dummy_1152	1152	1151	CONDUIT	400.0	6.2622	0.0100
Dummy_1153	1153	1151	CONDUIT	400.0	0.5000	0.0350
Dummy_1154	1154	1153	CONDUIT	400.0	8.2782	0.0350
Dummy_1156	1156	1170	CONDUIT	400.0	6.5138	0.0350
Dummy_1164	1164	1163	CONDUIT	400.0	1.2501	0.0350
Dummy_1172	1172	1008	CONDUIT	400.0	14.6549	0.0350
Dummy_118	118	117	CONDUIT	400.0	3.0014	0.0100
Dummy_1180	1180	1016	CONDUIT	400.0	14.3969	0.0350
Dummy_1208	1208	1024	CONDUIT	400.0	19.3525	0.0350
Dummy_121	121	119	CONDUIT	400.0	0.2500	0.0100
Dummy_1210	1210	1209	CONDUIT	400.0	3.0014	0.0350
Dummy_1216	1216	1217	CONDUIT	400.0	2.2506	0.0350
Dummy_122	122	121	CONDUIT	400.0	39.8264	0.0100
Dummy_1224	1224	1223	CONDUIT	400.0	2.5008	0.0350
Dummy_1226	1226	1223	CONDUIT	400.0	3.7526	0.0350
Dummy_1228	1228	1223	CONDUIT	400.0	5.7595	0.0350
Dummy_1230	1230	1223	CONDUIT	400.0	0.7500	0.0350
Dummy_1232	1232	1231	CONDUIT	400.0	11.8320	0.0350
Dummy_1233_Lake	1233_Lake	1231	CONDUIT	400.0	0.7500	0.0100
Dummy_1234	1234	1233	CONDUIT	400.0	10.8127	0.0100
Dummy_1236	1236	1235	CONDUIT	400.0	14.3969	0.0100
Dummy_1238	1238	1237	CONDUIT	400.0	8.0257	0.0100

331	Dummy_1239	1239_Lake	1231	CONDUIT	400.0	8.2782	0.0100
332	Dummy_1240	1240	1239	CONDUIT	400.0	6.7654	0.0100
333	Dummy_1248	1248	1247	CONDUIT	400.0	5.2573	0.0100
334	Dummy_1249	1249	1247	CONDUIT	400.0	2.7510	0.0100
335	Dummy_1256	1256	1255	CONDUIT	400.0	7.0172	0.0100
336	Dummy_1258	1258	1257	CONDUIT	400.0	4.7554	0.0100
337	Dummy_1260	1260	1259	CONDUIT	400.0	7.2691	0.0100
338	Dummy_1263	O_1263	1030	CONDUIT	400.0	0.0250	0.0100
339	Dummy_1264	1264	O_1263	CONDUIT	400.0	16.2088	0.0350
340	Dummy_1272	1272	1038	CONDUIT	400.0	14.9131	0.0350
341	Dummy_1274	1274	1273	CONDUIT	400.0	4.7554	0.0100
342	Dummy_129	129	119	CONDUIT	400.0	0.2500	0.0100
343	Dummy_130	130	129	CONDUIT	400.0	19.0885	0.0100
344	Dummy_1307	O_1307	1048	CONDUIT	400.0	2.5008	0.0100
345	Dummy_1308	1308	O_1307	CONDUIT	400.0	6.5138	0.0100
346	Dummy_1310	1310	1315	CONDUIT	400.0	4.7554	0.0100
347	Dummy_1318	1318	1315	CONDUIT	400.0	7.5212	0.0100
348	Dummy_1320	1320	1319	CONDUIT	400.0	10.3043	0.0100
349	Dummy_1322	1322	1321	CONDUIT	400.0	11.0672	0.0100
350	Dummy_1341	1341	1340	CONDUIT	400.0	2.7510	0.0100
351	Dummy_1328	1328	1327	CONDUIT	400.0	1.2501	0.0100
352	Dummy_1337	1347	1340	CONDUIT	400.0	0.7500	0.0100
353	Dummy_134	134	133	CONDUIT	400.0	7.0172	0.0100
354	Dummy_1348	1348	1347	CONDUIT	400.0	8.0257	0.0100
355	Dummy_1349	1349	1340	CONDUIT	400.0	1.5002	0.0100
356	Dummy_1352	1352	1351	CONDUIT	400.0	10.0504	0.0100
357	Dummy_1354	1354	1353	CONDUIT	400.0	10.8127	0.0100
358	Dummy_1356	1356	1355	CONDUIT	400.0	4.5046	0.0100
359	Dummy_1358	1358	1357	CONDUIT	400.0	3.0014	0.0100
360	Dummy_1362	1362	1361	CONDUIT	400.0	2.7510	0.0100
361	Dummy_1364	1364	1363	CONDUIT	400.0	5.0063	0.0100
362	Dummy_1368	1368	1367	CONDUIT	400.0	6.5138	0.0100
363	Dummy_1372	1372	1371	CONDUIT	400.0	4.2538	0.0100
364	Dummy_1382	1382	1044	CONDUIT	400.0	19.6169	0.0100
365	Dummy_1386	1386	1340	CONDUIT	400.0	3.5021	0.0100
366	Dummy_1388	1388	1387	CONDUIT	400.0	13.1113	0.0100
367	Dummy_1392	1392	1315	CONDUIT	400.0	11.3219	0.0100
368	Dummy_1394	1394	1393	CONDUIT	400.0	14.3969	0.0100
369	Dummy_1396	1396	1395	CONDUIT	400.0	5.5083	0.0100
370	Dummy_1398	1398	1395	CONDUIT	400.0	6.2622	0.0100
371	Dummy_142	142	139	CONDUIT	400.0	0.7500	0.0100
372	Dummy_150	150	149	CONDUIT	400.0	5.2573	0.0100
373	Dummy_210	210	1002	CONDUIT	400.0	3.2517	0.0350
374	Dummy_219	O_220	1004	CONDUIT	400.0	1.0001	0.0350
375	Dummy_220	220	O_220	CONDUIT	400.0	1.2501	0.0100
376	Dummy_223	223	221	CONDUIT	400.0	0.6000	0.0100
377	Dummy_224	224	223	CONDUIT	400.0	4.2538	0.0100
378	Dummy_226	226	225	CONDUIT	400.0	2.5008	0.0100
379	Dummy_231	231	221	CONDUIT	400.0	0.0500	0.0100
380	Dummy_232	232	231	CONDUIT	400.0	4.8055	0.0100
381	Dummy_236	236	235	CONDUIT	400.0	0.5000	0.0100
382	Dummy_237	237	235	CONDUIT	400.0	0.2500	0.0100
383	Dummy_240	240	237	CONDUIT	400.0	0.7500	0.0100
384	Dummy_243	243	241	CONDUIT	400.0	0.2500	0.0100
385	Dummy_244	244	243	CONDUIT	400.0	7.7734	0.0100
386	Dummy_247	247	245	CONDUIT	400.0	0.2500	0.0100
387	Dummy_248	248	247	CONDUIT	400.0	1.2501	0.0100
388	Dummy_252	252	245	CONDUIT	400.0	2.5008	0.0100
389	Dummy_256	256	239	CONDUIT	400.0	0.2500	0.0100
390	Dummy_259	259	241	CONDUIT	400.0	0.2500	0.0100
391	Dummy_260	260	259	CONDUIT	400.0	10.5584	0.0100
392	Dummy_264	264	263	CONDUIT	400.0	17.5125	0.0100
393	Dummy_300	O_300	1010	CONDUIT	400.0	0.7750	0.0100
394	Dummy_310	310	O_300	CONDUIT	400.0	0.0003	0.0350
395	Dummy_410	410	1014	CONDUIT	400.0	3.5021	0.0100
396	Dummy_414	414	1018	CONDUIT	400.0	3.5021	0.0100

397	Dummy_418	418	1020	CONDUIT	400.0	4.5046	0.0100
398	Dummy_422	422	1022	CONDUIT	400.0	2.7510	0.0100
399	Dummy_426	426	1026	CONDUIT	400.0	4.2538	0.0100
400	Dummy_500	O_500	1028	CONDUIT	400.0	5.5335	0.0100
401	Dummy_510	510	O_500	CONDUIT	400.0	7.5212	0.0100
402	Dummy_514	514	513	CONDUIT	400.0	12.8549	0.0100
403	Dummy_518	518	513	CONDUIT	400.0	15.1717	0.0100
404	Dummy_600	O_600	1030	CONDUIT	400.0	0.7750	0.0100
405	Dummy_610	610	O_600	CONDUIT	400.0	10.8127	0.0100
406	Dummy_614	614	613	CONDUIT	400.0	2.7510	0.0100
407	Dummy_618	618	617	CONDUIT	400.0	2.0004	0.0100
408	Dummy_620	620	1036	CONDUIT	400.0	26.3718	0.0100
409	Dummy_708	O_708	1040	CONDUIT	400.0	0.0250	0.0100
410	Dummy_714	714	1042	CONDUIT	400.0	6.5138	0.0100
411	Dummy_803	O_803	1050	CONDUIT	400.0	0.2500	0.0100
412	Dummy_804	804	O_803	CONDUIT	400.0	4.2538	0.0100
413	Dummy_810	810	809	CONDUIT	400.0	8.7837	0.0100
414	Dummy_820	820	819	CONDUIT	400.0	11.0672	0.0100
415	Dummy_830	830	829	CONDUIT	400.0	13.6247	0.0100
416	Dummy_840	840	839	CONDUIT	400.0	6.2622	0.0100
417	Dummy_842	842	841	CONDUIT	400.0	8.2782	0.0100
418	Dummy_844	844	843	CONDUIT	400.0	9.0367	0.0100
419	Dummy_909	O_909	1050	CONDUIT	400.0	0.2500	0.0100
420	Dummy_910	910	O_909	CONDUIT	400.0	12.8549	0.0350
421	Dummy_929	929	912	CONDUIT	75.0	2.6676	0.0130
422	Dummy_930	930	929	CONDUIT	400.0	1.2501	0.0100
423	Dummy_940	940	931	CONDUIT	400.0	8.0257	0.0350
424	Dummy_950	950	931	CONDUIT	400.0	5.7595	0.0350
425	Dummy_960	960	931	CONDUIT	400.0	4.0032	0.0350
426	Dummy_1002	1002	O_1000	CONDUIT	400.0	0.2500	0.0440
427	L_1004	1004	1002	CONDUIT	1497.0	0.7348	0.0750
428	L_1006	1006_RR	1004	CONDUIT	461.0	0.8677	0.0550
429	L_1008	1008	1006_RR	CONDUIT	473.0	0.4228	0.0440
430	L_1010	1010	1008	CONDUIT	378.0	0.2381	0.0400
431	L_1012	1012	1010	CONDUIT	896.0	0.3348	0.0750
432	L_1014	1014	1012	CONDUIT	536.0	0.2052	0.0750
433	L_1016	1016	1014	CONDUIT	319.0	0.6270	0.0550
434	L_1018	1018	1016	CONDUIT	433.0	0.2309	0.0440
435	L_1020	1020	1018	CONDUIT	373.0	0.5362	0.0440
436	L_1022	1022	1020	CONDUIT	784.0	0.6378	0.0550
437	L_1024	1024	1022	CONDUIT	543.0	0.5525	0.0550
438	L_1026	1026	1024	CONDUIT	134.0	0.7463	0.0550
439	L_1028	1028	1026	CONDUIT	1068.0	1.0207	0.0550
440	L_1030	1030	1028	CONDUIT	474.0	1.6880	0.0550
441	L_1034	1034	1030	CONDUIT	510.0	0.5882	0.0550
442	L_1036	1036	1034	CONDUIT	372.0	0.8334	0.0550
443	L_1038	1038	1036	CONDUIT	567.0	0.5291	0.0550
444	L_1040	1040	1038	CONDUIT	743.0	0.9287	0.0550
445	L_1042	1042	1040	CONDUIT	601.0	1.6808	0.0550
446	L_1044	1044	1042	CONDUIT	477.0	1.2580	0.0550
447	L_1046	1046	1044	CONDUIT	402.0	1.7416	0.0440
448	L_1048	1048	1046	CONDUIT	359.0	1.1143	0.0440
449	L_1115	1115	O_1107	CONDUIT	432.0	2.7789	0.0550
450	L_1123	1123	1115	CONDUIT	1593.0	2.1976	0.0550
451	L_1125	1125	1127	CONDUIT	105.0	10.5342	0.0440
452	L_1127	1127	1123	CONDUIT	873.0	1.8331	0.0550
453	L_1130	1130	1127	CONDUIT	640.0	2.0317	0.0750
454	L_114	113	109	CONDUIT	144.0	3.4743	0.0350
455	L_1141	1141	1139	CONDUIT	1900.0	1.1053	0.0550
456	L_1147	1147	1141	CONDUIT	973.0	1.5418	0.0440
457	L_115	115	113	CONDUIT	3260.0	1.0031	0.0350
458	L_1151	1151	1155	CONDUIT	2508.0	1.7148	0.0440
459	L_1156	1155	1147	CONDUIT	1050.0	0.4762	0.0440
460	L_1163	1163	1153	CONDUIT	1100.0	0.9091	0.0440
461	L_117	117	115	CONDUIT	86.0	1.5118	0.0350
462	L_1170	1170	1155	CONDUIT	600.0	1.8336	0.0350

463	L_119	119	117	CONDUIT	1087.0	1.4721	0.0350
464	L_1209	1209	1217	CONDUIT	930.0	0.4301	0.0440
465	Dummy_1215	1215	O_1263	CONDUIT	1937.8	2.8911	0.0100
466	L_1217	1217	1215	CONDUIT	1800.0	0.2778	0.0440
467	L_1223	1223	1217	CONDUIT	1649.0	0.4245	0.0440
468	L_1231	1231	1223	CONDUIT	4880.0	0.5738	0.0440
469	L_1233	CulvertOut_1233	1233_Lake	CONDUIT	315.0	0.9524	0.0440
470	L_1235	1235	1233	CONDUIT	960.0	2.5008	0.0440
471	L_1237	1237	1249	CONDUIT	920.0	1.7394	0.0200
472	L_1239	1239	1239_Lake	CONDUIT	560.0	2.3221	0.0350
473	L_1247	1247	1233	CONDUIT	1640.0	1.8296	0.0440
474	L_1255	1255	1273	CONDUIT	650.0	0.9231	0.0550
475	L_1257	1257	1255	CONDUIT	1580.0	0.3165	0.0440
476	L_1259	1259	1257	CONDUIT	2600.0	0.7693	0.0200
477	L_126	126	121	CONDUIT	5178.0	3.1688	0.0350
478	L_1273	1273	1239	CONDUIT	795.0	0.6289	0.0750
479	L_1315	1315	O_1307	CONDUIT	2154.0	1.3000	0.0550
480	L_1316	1316	1315	CONDUIT	1157.0	0.9508	0.0550
481	L_1319	1319	1316	CONDUIT	1841.0	1.3581	0.0440
482	L_1321	1321	1316	CONDUIT	1813.0	1.4894	0.0440
483	L_1323	1323	1341	CONDUIT	568.0	1.5847	0.0440
484	L_1327	1327	1349	CONDUIT	2582.0	1.2394	0.0200
485	L_133	133	129	CONDUIT	2743.0	2.9908	0.0350
486	L_1340	1340	1316	CONDUIT	2275.0	1.8465	0.0440
487	L_1351	1351	1349	CONDUIT	2109.0	1.2804	0.0440
488	L_1353	1353	1351	CONDUIT	1021.7	0.5873	0.0440
489	L_1355	1355	1349	CONDUIT	957.7	1.9842	0.0440
490	L_1357	1357	1355	CONDUIT	1049.1	0.9532	0.0440
491	L_1361	1361	1357	CONDUIT	3566.0	1.2059	0.0440
492	L_1363	1363	1361	CONDUIT	1016.3	1.3776	0.0200
493	L_1367	1367	1353	CONDUIT	2810.2	1.7083	0.0440
494	L_1371	1371	1347	CONDUIT	1116.4	1.9709	0.0440
495	L_138	138	133	CONDUIT	2426.0	2.1852	0.0350
496	L_1387	1387	1315	CONDUIT	2272.0	2.2012	0.0440
497	L_139	139	115	CONDUIT	73.0	0.4110	0.0350
498	L_1393	1393	1315	CONDUIT	2179.0	2.1575	0.0440
499	L_1395	1395	1315	CONDUIT	3616.0	1.4935	0.0440
500	L_141	141	139	CONDUIT	542.0	1.8453	0.0350
501	L_146	146	141	CONDUIT	165.0	13.4535	0.0350
502	L_149	149	141	CONDUIT	1479.0	2.8409	0.0350
503	L_154	154	149	CONDUIT	1625.0	2.1543	0.0350
504	L_221	221	O_220	CONDUIT	2511.0	0.7408	0.0350
505	L_225	225	223	CONDUIT	1810.0	2.5976	0.0350
506	L_228	228	225	CONDUIT	847.0	2.8347	0.0350
507	L_235	235	231	CONDUIT	3274.0	1.6557	0.0350
508	L_239	239	237	CONDUIT	288.0	1.3890	0.0350
509	L_241	241	239	CONDUIT	1092.0	1.0990	0.0350
510	L_245	245	243	CONDUIT	4101.0	2.8541	0.0350
511	L_250	250	247	CONDUIT	2063.0	1.6483	0.0350
512	L_263	263	259	CONDUIT	2459.0	2.4000	0.0350
513	L_268	268	263	CONDUIT	1464.0	4.7184	0.0350
514	L_314	314	O_300	CONDUIT	2623.0	2.3262	0.0350
515	L_513	513	O_500	CONDUIT	3358.0	1.6083	0.0350
516	L_613	613	O_600	CONDUIT	3854.0	1.8945	0.0350
517	L_617	617	613	CONDUIT	2214.0	2.4398	0.0350
518	L_622	622	617	CONDUIT	1661.0	2.3486	0.0350
519	L_708	708	O_708	CONDUIT	202.0	11.4607	0.0350
520	L_709	709	708	CONDUIT	560.2	2.6786	0.0300
521	L_710	710	709	CONDUIT	154.3	3.2421	0.0400
522	L_711	711	710	CONDUIT	615.3	2.9267	0.0400
523	L_712	712	713	CONDUIT	485.4	3.5044	0.0400
524	L_713	713	711	CONDUIT	338.1	2.6629	0.0700
525	L_808	808	O_803	CONDUIT	1197.0	1.6711	0.0700
526	L_809	809	808	CONDUIT	90.0	5.5641	0.0130
527	L_811	811	809	CONDUIT	183.0	1.6396	0.0450
528	L_819	819	811	CONDUIT	761.0	1.0513	0.0700

L_822	822	819	CONDUIT	671.0	4.6249	0.0400
L_823	823	819	CONDUIT	943.0	0.7423	0.0400
L_824	824	822	CONDUIT	1270.0	2.2841	0.0350
L_829	829	823	CONDUIT	290.0	3.4503	0.0350
L_831	831	829	CONDUIT	105.0	10.0504	0.0400
L_834	834	831	CONDUIT	1040.0	0.3365	0.0400
L_836	836	834	CONDUIT	442.0	2.9424	0.0130
L_838	838	836	CONDUIT	314.9	1.2704	0.0480
L_839	839	843	CONDUIT	541.0	1.1091	0.0480
L_841	841	839	CONDUIT	190.0	1.0527	0.0440
L_843	843	838	CONDUIT	304.0	3.2913	0.0350
L_850	850	841	CONDUIT	1740.0	1.3220	0.0440
L_911	911	O_909	CONDUIT	2561.0	1.8746	0.0550
L_912	912	911	CONDUIT	522.0	1.3411	0.0440
L_931	931	929	CONDUIT	2763.0	1.1582	0.0440
Overflow_836	836	834	CONDUIT	442.0	2.9424	0.0350
Dummy_1324	1324	1323	CONDUIT	400.0	2.2506	0.0100
Dummy_1233	1233	CulvertOut_1233	CONDUIT	400.0	0.7500	0.0350

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Cross Section Summary
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Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
Dummy_1032	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1050	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_109	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_110	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1107	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1108	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1110	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1116	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1124	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1126	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1132	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1139	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_114	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1140	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1142	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1144	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1148	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1150	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1152	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1153	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1154	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1156	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1164	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1172	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_118	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1180	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1208	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_121	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1210	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1216	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_122	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1224	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1226	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1228	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1230	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1232	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1233_Lake	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1234	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1236	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1238	DUMMY	0.00	0.00	0.00	0.00	1	0.00

595	Dummy_1239	DUMMY	0.00	0.00	0.00	0.00	1	0.00
596	Dummy_1240	DUMMY	0.00	0.00	0.00	0.00	1	0.00
597	Dummy_1248	DUMMY	0.00	0.00	0.00	0.00	1	0.00
598	Dummy_1249	DUMMY	0.00	0.00	0.00	0.00	1	0.00
599	Dummy_1256	DUMMY	0.00	0.00	0.00	0.00	1	0.00
600	Dummy_1258	DUMMY	0.00	0.00	0.00	0.00	1	0.00
601	Dummy_1260	DUMMY	0.00	0.00	0.00	0.00	1	0.00
602	Dummy_1263	DUMMY	0.00	0.00	0.00	0.00	1	0.00
603	Dummy_1264	DUMMY	0.00	0.00	0.00	0.00	1	0.00
604	Dummy_1272	DUMMY	0.00	0.00	0.00	0.00	1	0.00
605	Dummy_1274	DUMMY	0.00	0.00	0.00	0.00	1	0.00
606	Dummy_129	DUMMY	0.00	0.00	0.00	0.00	1	0.00
607	Dummy_130	DUMMY	0.00	0.00	0.00	0.00	1	0.00
608	Dummy_1307	DUMMY	0.00	0.00	0.00	0.00	1	0.00
609	Dummy_1308	DUMMY	0.00	0.00	0.00	0.00	1	0.00
610	Dummy_1310	DUMMY	0.00	0.00	0.00	0.00	1	0.00
611	Dummy_1318	DUMMY	0.00	0.00	0.00	0.00	1	0.00
612	Dummy_1320	DUMMY	0.00	0.00	0.00	0.00	1	0.00
613	Dummy_1322	DUMMY	0.00	0.00	0.00	0.00	1	0.00
614	Dummy_1341	DUMMY	0.00	0.00	0.00	0.00	1	0.00
615	Dummy_1328	DUMMY	0.00	0.00	0.00	0.00	1	0.00
616	Dummy_1337	DUMMY	0.00	0.00	0.00	0.00	1	0.00
617	Dummy_134	DUMMY	0.00	0.00	0.00	0.00	1	0.00
618	Dummy_1348	DUMMY	0.00	0.00	0.00	0.00	1	0.00
619	Dummy_1349	DUMMY	0.00	0.00	0.00	0.00	1	0.00
620	Dummy_1352	DUMMY	0.00	0.00	0.00	0.00	1	0.00
621	Dummy_1354	DUMMY	0.00	0.00	0.00	0.00	1	0.00
622	Dummy_1356	DUMMY	0.00	0.00	0.00	0.00	1	0.00
623	Dummy_1358	DUMMY	0.00	0.00	0.00	0.00	1	0.00
624	Dummy_1362	DUMMY	0.00	0.00	0.00	0.00	1	0.00
625	Dummy_1364	DUMMY	0.00	0.00	0.00	0.00	1	0.00
626	Dummy_1368	DUMMY	0.00	0.00	0.00	0.00	1	0.00
627	Dummy_1372	DUMMY	0.00	0.00	0.00	0.00	1	0.00
628	Dummy_1382	DUMMY	0.00	0.00	0.00	0.00	1	0.00
629	Dummy_1386	DUMMY	0.00	0.00	0.00	0.00	1	0.00
630	Dummy_1388	DUMMY	0.00	0.00	0.00	0.00	1	0.00
631	Dummy_1392	DUMMY	0.00	0.00	0.00	0.00	1	0.00
632	Dummy_1394	DUMMY	0.00	0.00	0.00	0.00	1	0.00
633	Dummy_1396	DUMMY	0.00	0.00	0.00	0.00	1	0.00
634	Dummy_1398	DUMMY	0.00	0.00	0.00	0.00	1	0.00
635	Dummy_142	DUMMY	0.00	0.00	0.00	0.00	1	0.00
636	Dummy_150	DUMMY	0.00	0.00	0.00	0.00	1	0.00
637	Dummy_210	DUMMY	0.00	0.00	0.00	0.00	1	0.00
638	Dummy_219	DUMMY	0.00	0.00	0.00	0.00	1	0.00
639	Dummy_220	DUMMY	0.00	0.00	0.00	0.00	1	0.00
640	Dummy_223	DUMMY	0.00	0.00	0.00	0.00	1	0.00
641	Dummy_224	DUMMY	0.00	0.00	0.00	0.00	1	0.00
642	Dummy_226	DUMMY	0.00	0.00	0.00	0.00	1	0.00
643	Dummy_231	DUMMY	0.00	0.00	0.00	0.00	1	0.00
644	Dummy_232	DUMMY	0.00	0.00	0.00	0.00	1	0.00
645	Dummy_236	DUMMY	0.00	0.00	0.00	0.00	1	0.00
646	Dummy_237	DUMMY	0.00	0.00	0.00	0.00	1	0.00
647	Dummy_240	DUMMY	0.00	0.00	0.00	0.00	1	0.00
648	Dummy_243	DUMMY	0.00	0.00	0.00	0.00	1	0.00
649	Dummy_244	DUMMY	0.00	0.00	0.00	0.00	1	0.00
650	Dummy_247	DUMMY	0.00	0.00	0.00	0.00	1	0.00
651	Dummy_248	DUMMY	0.00	0.00	0.00	0.00	1	0.00
652	Dummy_252	DUMMY	0.00	0.00	0.00	0.00	1	0.00
653	Dummy_256	DUMMY	0.00	0.00	0.00	0.00	1	0.00
654	Dummy_259	DUMMY	0.00	0.00	0.00	0.00	1	0.00
655	Dummy_260	DUMMY	0.00	0.00	0.00	0.00	1	0.00
656	Dummy_264	DUMMY	0.00	0.00	0.00	0.00	1	0.00
657	Dummy_300	DUMMY	0.00	0.00	0.00	0.00	1	0.00
658	Dummy_310	DUMMY	0.00	0.00	0.00	0.00	1	0.00
659	Dummy_410	DUMMY	0.00	0.00	0.00	0.00	1	0.00
660	Dummy_414	DUMMY	0.00	0.00	0.00	0.00	1	0.00

661	Dummy_418	DUMMY	0.00	0.00	0.00	0.00	1	0.00
662	Dummy_422	DUMMY	0.00	0.00	0.00	0.00	1	0.00
663	Dummy_426	DUMMY	0.00	0.00	0.00	0.00	1	0.00
664	Dummy_500	DUMMY	0.00	0.00	0.00	0.00	1	0.00
665	Dummy_510	DUMMY	0.00	0.00	0.00	0.00	1	0.00
666	Dummy_514	DUMMY	0.00	0.00	0.00	0.00	1	0.00
667	Dummy_518	DUMMY	0.00	0.00	0.00	0.00	1	0.00
668	Dummy_600	DUMMY	0.00	0.00	0.00	0.00	1	0.00
669	Dummy_610	DUMMY	0.00	0.00	0.00	0.00	1	0.00
670	Dummy_614	DUMMY	0.00	0.00	0.00	0.00	1	0.00
671	Dummy_618	DUMMY	0.00	0.00	0.00	0.00	1	0.00
672	Dummy_620	DUMMY	0.00	0.00	0.00	0.00	1	0.00
673	Dummy_708	DUMMY	0.00	0.00	0.00	0.00	1	0.00
674	Dummy_714	DUMMY	0.00	0.00	0.00	0.00	1	0.00
675	Dummy_803	DUMMY	0.00	0.00	0.00	0.00	1	0.00
676	Dummy_804	DUMMY	0.00	0.00	0.00	0.00	1	0.00
677	Dummy_810	DUMMY	0.00	0.00	0.00	0.00	1	0.00
678	Dummy_820	DUMMY	0.00	0.00	0.00	0.00	1	0.00
679	Dummy_830	DUMMY	0.00	0.00	0.00	0.00	1	0.00
680	Dummy_840	DUMMY	0.00	0.00	0.00	0.00	1	0.00
681	Dummy_842	DUMMY	0.00	0.00	0.00	0.00	1	0.00
682	Dummy_844	DUMMY	0.00	0.00	0.00	0.00	1	0.00
683	Dummy_909	DUMMY	0.00	0.00	0.00	0.00	1	0.00
684	Dummy_910	DUMMY	0.00	0.00	0.00	0.00	1	0.00
685	Dummy_929	DUMMY	0.00	0.00	0.00	0.00	1	0.00
686	Dummy_930	DUMMY	0.00	0.00	0.00	0.00	1	0.00
687	Dummy_940	DUMMY	0.00	0.00	0.00	0.00	1	0.00
688	Dummy_950	DUMMY	0.00	0.00	0.00	0.00	1	0.00
689	Dummy_960	DUMMY	0.00	0.00	0.00	0.00	1	0.00
690	Dummy_1002	DUMMY	0.00	0.00	0.00	0.00	1	0.00
691	L_1004	TRAPEZOIDAL	20.00	1880.00	13.81	124.00	1	18381.59
692	L_1006	TRAPEZOIDAL	30.00	3000.00	17.23	160.00	1	50358.59
693	L_1008	TRAPEZOIDAL	20.00	1700.00	11.22	145.00	1	18712.97
694	L_1010	TRAPEZOIDAL	20.00	1700.00	11.22	145.00	1	15446.32
695	L_1012	TRAPEZOIDAL	30.00	3450.00	16.07	205.00	1	25184.10
696	L_1014	TRAPEZOIDAL	30.00	4200.00	18.54	215.00	1	26406.15
697	L_1016	TRAPEZOIDAL	20.00	2300.00	13.32	165.00	1	27645.60
698	L_1018	TRAPEZOIDAL	20.00	2100.00	12.91	155.00	1	18753.86
699	L_1020	TRAPEZOIDAL	20.00	2100.00	12.91	155.00	1	28575.76
700	L_1022	TRAPEZOIDAL	20.00	1640.00	12.48	122.00	1	19035.73
701	L_1024	TRAPEZOIDAL	20.00	2200.00	13.12	160.00	1	24575.19
702	L_1026	TRAPEZOIDAL	20.00	2200.00	13.12	160.00	1	28561.86
703	L_1028	TRAPEZOIDAL	20.00	1400.00	13.14	90.00	1	21275.96
704	L_1030	TRAPEZOIDAL	20.00	1400.00	13.14	90.00	1	27361.31
705	L_1034	TRAPEZOIDAL	20.00	1200.00	12.43	80.00	1	13340.75
706	L_1036	TRAPEZOIDAL	20.00	1200.00	12.43	80.00	1	15878.81
707	L_1038	TRAPEZOIDAL	20.00	1600.00	11.62	130.00	1	16131.15
708	L_1040	TRAPEZOIDAL	20.00	1700.00	11.22	145.00	1	22186.34
709	L_1042	TRAPEZOIDAL	20.00	1600.00	10.92	140.00	1	27589.00
710	L_1044	TRAPEZOIDAL	20.00	1600.00	10.92	140.00	1	23867.97
711	L_1046	TRAPEZOIDAL	20.00	2500.00	10.92	225.00	1	54839.61
712	L_1048	TRAPEZOIDAL	20.00	2500.00	10.92	225.00	1	43865.36
713	L_1115	TRAPEZOIDAL	10.00	250.00	5.43	40.00	1	3477.77
714	L_1123	TRAPEZOIDAL	10.00	1050.00	7.60	135.00	1	16249.85
715	L_1125	TRAPEZOIDAL	10.00	500.00	5.69	85.00	1	17477.64
716	L_1127	TRAPEZOIDAL	10.00	1150.00	7.99	140.00	1	16818.94
717	L_1130	TRAPEZOIDAL	10.00	1150.00	7.99	140.00	1	12984.86
718	L_114	TRIANGULAR	10.00	1000.00	4.98	200.00	1	23063.49
719	L_1141	TRAPEZOIDAL	10.00	3000.00	7.48	400.00	1	32596.92
720	L_1147	TRAPEZOIDAL	10.00	750.00	5.91	125.00	1	10276.82
721	L_115	TRAPEZOIDAL	10.00	1500.00	7.43	200.00	1	24279.48
722	L_1151	TRAPEZOIDAL	10.00	400.00	5.46	70.00	1	5485.90
723	L_1156	TRAPEZOIDAL	10.00	4000.00	7.98	500.00	1	37239.33
724	L_1163	TRAPEZOIDAL	10.00	1000.00	7.50	130.00	1	12343.65
725	L_117	TRAPEZOIDAL	10.00	300.00	5.48	50.00	1	4869.25
726	L_1170	TRAPEZOIDAL	10.00	3250.00	8.10	400.00	1	75349.61

727	L_119	TRAPEZOIDAL	10.00	300.00	5.48	50.00	1	4804.89
728	L_1209	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	9700.40
729	Dummy_1215	DUMMY	0.00	0.00	0.00	0.00	1	0.00
730	L_1217	TRAPEZOIDAL	10.00	500.00	6.01	80.00	1	2940.75
731	L_1223	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	9636.96
732	L_1231	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	11203.97
733	L_1233	TRAPEZOIDAL	10.00	600.00	5.86	100.00	1	6424.77
734	L_1235	TRAPEZOIDAL	10.00	440.00	5.09	84.00	1	6952.50
735	L_1237	TRAPEZOIDAL	10.00	60.00	2.31	6.00	1	1026.73
736	L_1239	TRAPEZOIDAL	10.00	400.01	4.85	80.00	1	7415.92
737	L_1247	TRAPEZOIDAL	10.00	450.00	5.15	85.00	1	6126.54
738	L_1255	TRAPEZOIDAL	10.00	400.01	4.85	80.00	1	2975.52
739	L_1257	TRAPEZOIDAL	10.00	240.00	4.93	44.00	1	1320.07
740	L_1259	TRAPEZOIDAL	10.00	1900.00	5.58	340.00	1	38939.80
741	L_126	TRAPEZOIDAL	10.00	500.00	6.69	70.00	1	13419.02
742	L_1273	TRAPEZOIDAL	10.00	400.01	4.85	80.00	1	1801.12
743	L_1315	TRAPEZOIDAL	10.00	1200.00	7.83	150.00	1	14577.20
744	L_1316	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	11537.95
745	L_1319	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	17237.03
746	L_1321	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	18051.21
747	L_1323	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	18619.74
748	L_1327	TRAPEZOIDAL	1.00	42.00	0.94	44.00	1	334.42
749	L_133	TRAPEZOIDAL	10.00	1550.00	6.56	235.00	1	39885.90
750	L_1340	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	20098.81
751	L_1351	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	16736.47
752	L_1353	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	11334.83
753	L_1355	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	20835.18
754	L_1357	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	14440.98
755	L_1361	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	16242.72
756	L_1363	TRAPEZOIDAL	10.00	600.00	7.08	80.00	1	19296.64
757	L_1367	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	19332.24
758	L_1371	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	20765.15
759	L_138	TRAPEZOIDAL	10.00	1300.00	6.15	210.00	1	27399.52
760	L_1387	TRAPEZOIDAL	10.00	800.00	6.06	130.00	1	13326.31
761	L_139	TRAPEZOIDAL	10.00	400.00	6.18	60.00	1	3666.51
762	L_1393	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	21725.52
763	L_1395	TRAPEZOIDAL	10.00	1750.00	5.37	325.00	1	22159.24
764	L_141	TRAPEZOIDAL	10.00	400.00	6.18	60.00	1	7769.44
765	L_146	TRAPEZOIDAL	10.00	1200.00	5.43	220.00	1	57731.32
766	L_149	TRAPEZOIDAL	10.00	500.00	6.69	70.00	1	12705.71
767	L_154	TRAPEZOIDAL	10.00	700.00	7.39	90.00	1	16550.33
768	L_221	TRAPEZOIDAL	10.00	800.00	6.53	120.00	1	10215.79
769	L_225	TRAPEZOIDAL	10.00	600.00	7.08	80.00	1	15141.09
770	L_228	TRAPEZOIDAL	10.00	400.00	6.18	60.00	1	9629.49
771	L_235	TRAPEZOIDAL	10.00	1300.00	7.96	160.00	1	28321.67
772	L_239	TRAPEZOIDAL	10.00	950.00	7.94	115.00	1	18911.69
773	L_241	TRAPEZOIDAL	10.00	500.00	6.69	70.00	1	7902.48
774	L_245	TRAPEZOIDAL	10.00	300.00	5.48	50.00	1	6690.39
775	L_250	TRAPEZOIDAL	10.00	5100.00	5.05	1010.00	1	81811.71
776	L_263	TRAPEZOIDAL	10.00	400.00	6.18	60.00	1	8860.57
777	L_268	TRAPEZOIDAL	10.00	400.00	6.18	60.00	1	12423.61
778	L_314	TRAPEZOIDAL	10.00	700.00	7.39	90.00	1	17197.82
779	L_513	TRAPEZOIDAL	10.00	700.00	7.39	90.00	1	14299.92
780	L_613	TRAPEZOIDAL	10.00	1300.00	7.96	160.00	1	30295.16
781	L_617	TRAPEZOIDAL	10.00	1000.00	8.02	120.00	1	26566.21
782	L_622	TRAPEZOIDAL	10.00	1200.00	5.43	220.00	1	24121.37
783	L_708	TRAPEZOIDAL	10.00	420.00	6.29	62.00	1	20580.76
784	L_709	TRAPEZOIDAL	10.00	900.00	6.79	130.00	1	26173.35
785	L_710	TRAPEZOIDAL	10.00	900.00	7.85	110.00	1	23769.29
786	L_711	TRAPEZOIDAL	10.00	1130.00	7.27	153.00	1	26947.94
787	L_712	TRAPEZOIDAL	10.00	2560.00	6.30	406.00	1	60698.05
788	L_713	TRAPEZOIDAL	10.00	1550.00	6.05	255.00	1	17837.15
789	L_808	TRAPEZOIDAL	10.00	950.00	7.41	125.00	1	9906.73
790	L_809	RECT_CLOSED	15.00	75.00	1.88	5.00	1	3074.94
791	L_811	TRAPEZOIDAL	10.00	1670.00	7.30	227.00	1	26581.36
792	L_819	TRAPEZOIDAL	10.00	1450.00	8.13	175.00	1	12765.94

L_822	TRAPEZOIDAL	10.00	2850.00	8.46	335.00	1	94518.19
L_823	TRAPEZOIDAL	10.00	2850.00	8.46	335.00	1	37867.18
L_824	TRAPEZOIDAL	10.00	9570.00	7.61	1257.00	1	237606.05
L_829	TRAPEZOIDAL	10.00	1250.00	7.06	175.00	1	36264.24
L_831	TRAPEZOIDAL	15.00	2325.00	9.39	245.00	1	121915.29
L_834	TRAPEZOIDAL	15.00	2310.00	9.37	244.00	1	22129.56
L_836	CIRCULAR	4.00	12.57	1.00	4.00	1	246.40
L_838	TRAPEZOIDAL	15.00	3735.00	7.86	474.00	1	51535.74
L_839	TRAPEZOIDAL	15.00	5662.50	8.63	655.00	1	77684.49
L_841	TRIANGULAR	10.00	1000.00	4.98	200.00	1	10098.48
L_843	CIRCULAR	15.00	176.71	3.75	15.00	1	3285.42
L_850	TRAPEZOIDAL	10.00	1400.00	5.37	260.00	1	16665.33
L_911	TRAPEZOIDAL	10.00	1250.00	7.46	165.00	1	17661.02
L_912	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	17129.02
L_931	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	15918.36
Overflow_836	TRAPEZOIDAL	15.00	3975.00	8.10	490.00	1	116720.41
Dummy_1324	DUMMY	0.00	0.00	0.00	0.00	1	0.00
Dummy_1233	DUMMY	0.00	0.00	0.00	0.00	1	0.00

```
****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ NO
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Flow Routing Method ...... KINWAVE
Starting Date ............ 01/01/2024 00:00:00
Ending Date .............. 01/02/2024 06:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:05:00
Routing Time Step ........ 20.00 sec
```

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	1369.325	446.215
External Outflow	1385.126	451.364
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume ..	0.000	0.000
Final Stored Volume	0.042	0.014
Continuity Error (%) ...	-1.157	

```
******************************
Highest Flow Instability Indexes
******************************
All links are stable.


************************
Routing Time Step Summary
************************
```

```
  Minimum Time Step           :    20.00 sec
  Average Time Step           :    20.00 sec
  Maximum Time Step           :    20.00 sec
  % of Time in Steady State   :     0.00
  Average Iterations per Step :     1.00
  % of Steps Not Converging   :     0.00


  ******************
  Node Depth Summary
  ******************

  --------------------------------------------------------------------------------
                                Average  Maximum  Maximum  Time of Max    Reported
                                  Depth    Depth      HGL   Occurrence   Max Depth
  Node                 Type        Feet     Feet     Feet  days hr:min        Feet
  --------------------------------------------------------------------------------
  1002                 JUNCTION    1.09    15.65  4772.65     0  01:13       15.62
  1004                 JUNCTION    1.08    15.66  4783.66     0  01:11       15.66
  1006_RR              JUNCTION    1.19    15.08  4787.08     0  01:11       15.06
  1008                 JUNCTION    1.31    16.42  4790.42     0  01:11       16.41
  1010                 JUNCTION    1.62    19.92  4794.82     0  01:10       19.92
  1012                 JUNCTION    1.61    19.93  4797.83     0  01:08       19.92
  1014                 JUNCTION    1.18    16.85  4795.85     0  01:08       16.84
  1016                 JUNCTION    0.92    13.18  4794.18     0  01:08       13.17
  1018                 JUNCTION    0.92    13.18  4795.18     0  01:07       13.15
  1020                 JUNCTION    0.90    13.04  4797.04     0  01:07       13.02
  1022                 JUNCTION    0.90    13.05  4802.05     0  01:06       13.04
  1024                 JUNCTION    0.77    11.32  4803.32     0  01:05       11.32
  1026                 JUNCTION    0.75    11.50  4804.50     0  01:05       11.50
  1028                 JUNCTION    0.74    11.50  4815.40     0  01:04       11.49
  1030                 JUNCTION    0.76    12.25  4824.15     0  01:02       12.21
  1032                 JUNCTION    0.00     0.00  4770.00     0  00:00        0.00
  1034                 JUNCTION    0.75    12.25  4827.15     0  01:02       12.22
  1036                 JUNCTION    0.80    12.05  4830.05     0  01:01       12.03
  1038                 JUNCTION    0.79    12.05  4833.05     0  01:00       12.04
  1040                 JUNCTION    0.71    10.62  4838.52     0  00:59       10.62
  1042                 JUNCTION    0.70    10.27  4848.27     0  00:59       10.27
  1044                 JUNCTION    0.70    10.27  4854.27     0  00:58       10.26
  1046                 JUNCTION    0.54     7.92  4858.92     0  00:58        7.91
  1048                 JUNCTION    0.54     7.92  4862.92     0  00:57        7.90
  1050                 JUNCTION    0.00     0.00  4864.00     0  00:00        0.00
  109                  JUNCTION    0.30     3.49  4782.49     0  00:54        3.48
  110                  JUNCTION    0.00     0.00  4794.00     0  00:00        0.00
  1108                 JUNCTION    0.00     0.00  4816.00     0  00:00        0.00
  1110                 JUNCTION    0.00     0.00  4855.00     0  00:00        0.00
  1115                 JUNCTION    0.43     6.70  4796.70     0  01:01        6.69
  1116                 JUNCTION    0.00     0.00  4850.00     0  00:00        0.00
  1123                 JUNCTION    0.14     2.47  4827.47     0  00:59        2.46
  1124                 JUNCTION    0.00     0.00  4864.00     0  00:00        0.00
  1125                 JUNCTION    0.03     1.16  4853.16     0  00:30        1.14
  1126                 JUNCTION    0.00     0.00  4864.00     0  00:00        0.00
  1127                 JUNCTION    0.15     2.62  4843.62     0  00:58        2.61
  113                  JUNCTION    0.31     3.49  4787.49     0  00:54        3.48
  1130                 JUNCTION    0.14     2.62  4856.62     0  00:56        2.61
  1132                 JUNCTION    0.00     0.00  4874.00     0  00:00        0.00
  1139                 JUNCTION    0.08     1.44  4858.44     0  00:58        1.44
  114                  JUNCTION    0.00     0.00  4798.00     0  00:00        0.00
  1140                 JUNCTION    0.00     0.00  4879.00     0  00:00        0.00
  1141                 JUNCTION    0.18     3.40  4881.40     0  00:51        3.39
  1142                 JUNCTION    0.00     0.00  4902.00     0  00:00        0.00
  1144                 JUNCTION    0.00     0.00  4925.00     0  00:00        0.00
  1147                 JUNCTION    0.17     3.40  4896.40     0  00:49        3.40
  1148                 JUNCTION    0.00     0.00  4946.00     0  00:00        0.00
  115                  JUNCTION    0.23     4.31  4821.01     0  00:47        4.29
  1150                 JUNCTION    0.00     0.00  4955.00     0  00:00        0.00
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925	1151	JUNCTION	0.16	3.53	4944.53	0	00:41	3.51
926	1152	JUNCTION	0.00	0.00	4966.00	0	00:00	0.00
927	1153	JUNCTION	0.05	1.23	4944.23	0	00:43	1.22
928	1154	JUNCTION	0.00	0.00	4976.00	0	00:00	0.00
929	1155	JUNCTION	0.16	3.50	4901.50	0	00:46	3.49
930	1156	JUNCTION	0.00	0.00	4935.00	0	00:00	0.00
931	1163	JUNCTION	0.05	1.24	4954.24	0	00:40	1.24
932	1164	JUNCTION	0.00	0.00	4958.00	0	00:00	0.00
933	117	JUNCTION	0.23	4.31	4822.31	0	00:47	4.29
934	1170	JUNCTION	0.01	0.26	4909.26	0	00:40	0.25
935	1172	JUNCTION	0.00	0.00	4832.00	0	00:00	0.00
936	118	JUNCTION	0.00	0.00	4830.00	0	00:00	0.00
937	1180	JUNCTION	0.00	0.00	4838.00	0	00:00	0.00
938	119	JUNCTION	0.22	4.20	4838.20	0	00:45	4.20
939	1208	JUNCTION	0.00	0.00	4868.00	0	00:00	0.00
940	1209	JUNCTION	0.13	1.60	4878.60	0	00:50	1.60
941	121	JUNCTION	0.02	0.28	4835.28	0	01:10	0.28
942	1210	JUNCTION	0.00	0.00	4889.00	0	00:00	0.00
943	1215	JUNCTION	0.55	6.99	4874.99	0	01:15	6.99
944	1216	JUNCTION	0.00	0.00	4882.00	0	00:00	0.00
945	1217	JUNCTION	0.60	7.00	4880.00	0	01:11	7.00
946	122	JUNCTION	0.00	0.00	4983.00	0	00:00	0.00
947	1223	JUNCTION	0.46	4.61	4884.61	0	01:05	4.61
948	1224	JUNCTION	0.00	0.00	4890.00	0	00:00	0.00
949	1226	JUNCTION	0.00	0.00	4895.00	0	00:00	0.00
950	1228	JUNCTION	0.00	0.00	4903.00	0	00:00	0.00
951	1230	JUNCTION	0.00	0.00	4883.00	0	00:00	0.00
952	1231	JUNCTION	0.34	4.18	4912.18	0	00:47	4.18
953	1232	JUNCTION	0.00	0.00	4955.00	0	00:00	0.00
954	1233	JUNCTION	0.15	2.55	4919.55	0	00:48	2.55
955	1233_Lake	JUNCTION	0.15	2.93	4913.93	0	00:47	2.92
956	1234	JUNCTION	0.00	0.00	4960.00	0	00:00	0.00
957	1235	JUNCTION	0.12	2.06	4943.06	0	00:45	2.06
958	1236	JUNCTION	0.00	0.00	4998.00	0	00:00	0.00
959	1237	JUNCTION	0.11	2.39	4975.39	0	00:45	2.39
960	1238	JUNCTION	0.00	0.00	5005.00	0	00:00	0.00
961	1239	JUNCTION	0.50	5.05	4959.05	0	01:03	5.05
962	1239_Lake	JUNCTION	0.30	3.10	4944.10	0	01:03	3.10
963	1240	JUNCTION	0.00	0.00	4981.00	0	00:00	0.00
964	1247	JUNCTION	1.14	3.56	4949.56	0	00:45	3.56
965	1248	JUNCTION	0.00	0.00	4967.00	0	00:00	0.00
966	1249	JUNCTION	0.11	2.39	4959.39	0	00:46	2.38
967	1255	JUNCTION	0.40	4.06	4969.06	0	00:58	4.06
968	1256	JUNCTION	0.00	0.00	4993.00	0	00:00	0.00
969	1257	JUNCTION	0.32	4.06	4974.06	0	00:58	4.05
970	1258	JUNCTION	0.00	0.00	4989.00	0	00:00	0.00
971	1259	JUNCTION	0.03	0.47	4990.47	0	00:55	0.47
972	126	JUNCTION	0.02	0.30	4999.30	0	00:45	0.30
973	1260	JUNCTION	0.00	0.00	5019.00	0	00:00	0.00
974	1264	JUNCTION	0.00	0.00	4876.00	0	00:00	0.00
975	1272	JUNCTION	0.00	0.00	4880.00	0	00:00	0.00
976	1273	JUNCTION	0.49	5.06	4964.06	0	00:59	5.06
977	1274	JUNCTION	0.00	0.00	4978.00	0	00:00	0.00
978	129	JUNCTION	0.03	0.88	4835.88	0	00:45	0.88
979	130	JUNCTION	0.00	0.00	4910.00	0	00:00	0.00
980	1308	JUNCTION	0.00	0.00	4891.00	0	00:00	0.00
981	1310	JUNCTION	0.00	0.00	4912.00	0	00:00	0.00
982	1315	JUNCTION	0.44	4.94	4897.94	0	01:03	4.93
983	1316	JUNCTION	0.44	4.94	4908.94	0	01:00	4.94
984	1318	JUNCTION	0.00	0.00	4923.00	0	00:00	0.00
985	1319	JUNCTION	0.07	1.58	4930.58	0	00:40	1.58
986	1320	JUNCTION	0.00	0.00	4970.00	0	00:00	0.00
987	1321	JUNCTION	0.10	1.47	4932.47	0	00:50	1.47
988	1322	JUNCTION	0.00	0.00	4975.00	0	00:00	0.00
989	1341	JUNCTION	0.08	1.30	4958.30	0	00:47	1.30
990	1324	JUNCTION	0.00	0.00	4975.00	0	00:00	0.00

991	1327	JUNCTION	0.01	0.10	4984.10	0	01:05	0.10
992	1328	JUNCTION	0.00	0.00	4989.00	0	00:00	0.00
993	133	JUNCTION	0.03	0.97	4917.97	0	00:40	0.97
994	134	JUNCTION	0.00	0.00	4945.00	0	00:00	0.00
995	1340	JUNCTION	0.35	3.71	4949.71	0	00:57	3.71
996	1347	JUNCTION	0.13	1.67	4950.67	0	00:54	1.67
997	1348	JUNCTION	0.00	0.00	4981.00	0	00:00	0.00
998	1349	JUNCTION	0.21	2.34	4954.34	0	00:59	2.34
999	1351	JUNCTION	0.18	2.29	4981.29	0	00:55	2.29
1000	1352	JUNCTION	0.00	0.00	5019.00	0	00:00	0.00
1001	1353	JUNCTION	0.15	2.10	4987.10	0	00:50	2.10
1002	1354	JUNCTION	0.00	0.00	5028.00	0	00:00	0.00
1003	1355	JUNCTION	0.22	2.34	4973.34	0	00:56	2.34
1004	1356	JUNCTION	0.00	0.00	4989.00	0	00:00	0.00
1005	1357	JUNCTION	0.21	2.33	4983.33	0	00:54	2.33
1006	1358	JUNCTION	0.00	0.00	4993.00	0	00:00	0.00
1007	1361	JUNCTION	0.13	1.86	5025.86	0	00:37	1.84
1008	1362	JUNCTION	0.00	0.00	5035.00	0	00:00	0.00
1009	1363	JUNCTION	0.02	0.65	5038.65	0	00:35	0.65
1010	1364	JUNCTION	0.00	0.00	5058.00	0	00:00	0.00
1011	1367	JUNCTION	0.07	1.34	5034.34	0	00:35	1.34
1012	1368	JUNCTION	0.00	0.00	5059.00	0	00:00	0.00
1013	1371	JUNCTION	0.12	1.67	4972.67	0	00:50	1.67
1014	1372	JUNCTION	0.00	0.00	4988.00	0	00:00	0.00
1015	138	JUNCTION	0.03	1.00	4971.00	0	00:35	1.00
1016	1382	JUNCTION	0.00	0.00	4921.00	0	00:00	0.00
1017	1386	JUNCTION	0.00	0.00	4960.00	0	00:00	0.00
1018	1387	JUNCTION	0.06	1.19	4944.19	0	00:45	1.19
1019	1388	JUNCTION	0.00	0.00	4995.00	0	00:00	0.00
1020	139	JUNCTION	0.17	3.39	4820.39	0	00:43	3.38
1021	1392	JUNCTION	0.00	0.00	4938.00	0	00:00	0.00
1022	1393	JUNCTION	0.12	1.55	4941.55	0	00:50	1.55
1023	1394	JUNCTION	0.00	0.00	4997.00	0	00:00	0.00
1024	1395	JUNCTION	0.08	1.75	4948.75	0	00:40	1.75
1025	1396	JUNCTION	0.00	0.00	4969.00	0	00:00	0.00
1026	1398	JUNCTION	0.00	0.00	4972.00	0	00:00	0.00
1027	141	JUNCTION	0.10	2.16	4829.16	0	00:42	2.15
1028	142	JUNCTION	0.00	0.00	4820.00	0	00:00	0.00
1029	146	JUNCTION	0.02	0.32	4849.32	0	00:55	0.32
1030	149	JUNCTION	0.06	1.43	4870.43	0	00:40	1.43
1031	150	JUNCTION	0.00	0.00	4890.00	0	00:00	0.00
1032	154	JUNCTION	0.03	1.00	4905.00	0	00:35	1.00
1033	210	JUNCTION	0.00	0.00	4770.00	0	00:00	0.00
1034	220	JUNCTION	0.00	0.00	4777.00	0	00:00	0.00
1035	221	JUNCTION	0.23	4.51	4795.11	0	00:50	4.51
1036	223	JUNCTION	0.05	1.04	4794.04	0	00:45	1.04
1037	224	JUNCTION	0.00	0.00	4810.00	0	00:00	0.00
1038	225	JUNCTION	0.05	1.04	4841.04	0	00:41	1.04
1039	226	JUNCTION	0.00	0.00	4850.00	0	00:00	0.00
1040	228	JUNCTION	0.05	0.99	4864.99	0	00:40	0.98
1041	231	JUNCTION	0.09	1.91	4792.71	0	00:50	1.91
1042	232	JUNCTION	0.00	0.00	4810.00	0	00:00	0.00
1043	235	JUNCTION	0.09	1.93	4846.93	0	00:45	1.93
1044	236	JUNCTION	0.00	0.00	4847.00	0	00:00	0.00
1045	237	JUNCTION	0.10	2.30	4848.30	0	00:45	2.30
1046	239	JUNCTION	0.17	3.81	4853.81	0	00:45	3.81
1047	240	JUNCTION	0.00	0.00	4849.00	0	00:00	0.00
1048	241	JUNCTION	0.17	3.81	4865.81	0	00:43	3.81
1049	243	JUNCTION	0.14	3.30	4866.30	0	00:43	3.29
1050	244	JUNCTION	0.00	0.00	4894.00	0	00:00	0.00
1051	245	JUNCTION	0.13	3.33	4983.33	0	00:40	3.33
1052	247	JUNCTION	0.04	0.89	4981.89	0	00:42	0.88
1053	248	JUNCTION	0.00	0.00	4986.00	0	00:00	0.00
1054	250	JUNCTION	0.03	0.93	5015.93	0	00:35	0.93
1055	252	JUNCTION	0.00	0.00	4990.00	0	00:00	0.00
1056	256	JUNCTION	0.00	0.00	4851.00	0	00:00	0.00

1057	259	JUNCTION	0.08	1.74	4864.74	0	00:44	1.74
1058	260	JUNCTION	0.00	0.00	4905.00	0	00:00	0.00
1059	263	JUNCTION	0.07	1.75	4923.75	0	00:41	1.74
1060	264	JUNCTION	0.00	0.00	4991.00	0	00:00	0.00
1061	268	JUNCTION	0.04	0.90	4991.90	0	00:40	0.90
1062	310	JUNCTION	0.00	0.00	4778.00	0	00:00	0.00
1063	314	JUNCTION	0.03	0.67	4839.67	0	00:40	0.67
1064	410	JUNCTION	0.00	0.00	4793.00	0	00:00	0.00
1065	414	JUNCTION	0.00	0.00	4796.00	0	00:00	0.00
1066	418	JUNCTION	0.00	0.00	4802.00	0	00:00	0.00
1067	422	JUNCTION	0.00	0.00	4800.00	0	00:00	0.00
1068	426	JUNCTION	0.00	0.00	4810.00	0	00:00	0.00
1069	510	JUNCTION	0.00	0.00	4856.00	0	00:00	0.00
1070	513	JUNCTION	0.06	1.36	4881.36	0	00:40	1.36
1071	514	JUNCTION	0.00	0.00	4931.00	0	00:00	0.00
1072	518	JUNCTION	0.00	0.00	4940.00	0	00:00	0.00
1073	610	JUNCTION	0.00	0.00	4858.00	0	00:00	0.00
1074	613	JUNCTION	0.05	1.24	4889.24	0	00:41	1.24
1075	614	JUNCTION	0.00	0.00	4899.00	0	00:00	0.00
1076	617	JUNCTION	0.06	1.50	4943.50	0	00:41	1.50
1077	618	JUNCTION	0.00	0.00	4950.00	0	00:00	0.00
1078	620	JUNCTION	0.00	0.00	4920.00	0	00:00	0.00
1079	622	JUNCTION	0.06	1.52	4982.52	0	00:35	1.50
1080	708	JUNCTION	0.04	0.69	4851.69	0	00:50	0.69
1081	709	JUNCTION	0.03	0.59	4866.59	0	00:49	0.59
1082	710	JUNCTION	0.03	0.55	4871.55	0	00:49	0.55
1083	711	JUNCTION	0.05	0.91	4889.91	0	00:47	0.90
1084	712	JUNCTION	0.02	0.41	4915.41	0	00:45	0.41
1085	713	JUNCTION	0.05	0.91	4898.91	0	00:46	0.90
1086	714	JUNCTION	0.00	0.00	4864.00	0	00:00	0.00
1087	804	JUNCTION	0.00	0.00	4882.00	0	00:00	0.00
1088	808	JUNCTION	0.33	9.66	4894.66	0	00:48	9.60
1089	809	JUNCTION	0.33	9.66	4899.66	0	00:48	9.60
1090	810	JUNCTION	0.00	0.00	4925.00	0	00:00	0.00
1091	811	JUNCTION	0.14	3.30	4896.30	0	00:48	3.29
1092	819	JUNCTION	0.14	3.31	4904.31	0	00:46	3.30
1093	820	JUNCTION	0.00	0.00	4945.00	0	00:00	0.00
1094	822	JUNCTION	0.01	0.22	4932.22	0	00:45	0.22
1095	823	JUNCTION	0.07	1.71	4909.71	0	00:44	1.71
1096	824	JUNCTION	0.00	0.14	4961.14	0	00:35	0.14
1097	829	JUNCTION	0.07	1.71	4919.71	0	00:44	1.71
1098	830	JUNCTION	0.00	0.00	4972.00	0	00:00	0.00
1099	831	JUNCTION	0.14	3.53	4932.03	0	00:45	3.53
1100	834	JUNCTION	0.25	4.00	4936.00	0	00:26	4.00
1101	838	JUNCTION	0.28	6.56	4955.56	0	00:41	6.55
1102	839	JUNCTION	0.19	3.57	4968.57	0	00:42	3.55
1103	840	JUNCTION	0.00	0.00	4990.00	0	00:00	0.00
1104	841	JUNCTION	0.19	3.57	4970.57	0	00:41	3.56
1105	842	JUNCTION	0.00	0.00	5000.00	0	00:00	0.00
1106	843	JUNCTION	0.28	6.56	4965.56	0	00:41	6.55
1107	844	JUNCTION	0.00	0.00	4995.00	0	00:00	0.00
1108	850	JUNCTION	0.07	1.78	4991.78	0	00:35	1.77
1109	910	JUNCTION	0.00	0.00	4916.00	0	00:00	0.00
1110	911	JUNCTION	0.24	2.85	4915.85	0	00:53	2.85
1111	912	JUNCTION	0.24	2.85	4922.85	0	00:52	2.84
1112	929	JUNCTION	0.21	2.39	4924.39	0	00:59	2.39
1113	930	JUNCTION	0.00	0.00	4927.00	0	00:00	0.00
1114	931	JUNCTION	0.19	2.41	4956.41	0	00:50	2.41
1115	940	JUNCTION	0.00	0.00	4986.00	0	00:00	0.00
1116	950	JUNCTION	0.00	0.00	4977.00	0	00:00	0.00
1117	960	JUNCTION	0.00	0.00	4970.00	0	00:00	0.00
1118	O_1107	JUNCTION	0.43	6.70	4784.70	0	01:01	6.68
1119	O_1263	JUNCTION	0.00	0.00	4812.00	0	00:00	0.00
1120	O_1307	JUNCTION	0.24	3.77	4868.77	0	01:03	3.76
1121	O_220	JUNCTION	0.24	4.49	4776.49	0	00:54	4.49
1122	O_300	JUNCTION	0.03	0.66	4778.66	0	00:47	0.65

O_500	JUNCTION	0.06	1.33	4827.33	0	00:47	1.32	
O_600	JUNCTION	0.05	1.20	4816.20	0	00:49	1.20	
O_708	JUNCTION	0.04	0.69	4828.69	0	00:50	0.69	
O_803	JUNCTION	0.18	4.16	4869.16	0	00:50	4.16	
O_909	JUNCTION	0.09	1.45	4866.45	0	00:59	1.45	
1323	JUNCTION	0.08	1.30	4967.30	0	00:45	1.30	
CulvertOut_1233	JUNCTION	0.15	2.93	4916.93	0	00:46	2.93	
O_100	OUTFALL	0.00	0.00	4778.00	0	00:00	0.00	
O_1000	OUTFALL	0.00	0.00	4756.00	0	00:00	0.00	
836	DIVIDER	0.25	4.00	4949.00	0	00:25	4.00	

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Node Inflow Summary
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Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
1002	JUNCTION	0.00	11827.16	0 01:13	0	407	0.000
1004	JUNCTION	0.00	11771.67	0 01:11	0	404	0.000
1006_RR	JUNCTION	0.00	9915.70	0 01:11	0	340	0.000
1008	JUNCTION	0.00	9916.98	0 01:11	0	340	0.000
1010	JUNCTION	0.00	9893.47	0 01:10	0	339	0.000
1012	JUNCTION	0.00	9692.75	0 01:08	0	331	0.000
1014	JUNCTION	0.00	8297.64	0 01:08	0	287	0.000
1016	JUNCTION	0.00	8281.74	0 01:08	0	286	0.000
1018	JUNCTION	0.00	8264.69	0 01:07	0	285	0.000
1020	JUNCTION	0.00	8249.22	0 01:07	0	285	0.000
1022	JUNCTION	0.00	8202.51	0 01:06	0	283	0.000
1024	JUNCTION	0.00	8201.97	0 01:05	0	283	0.000
1026	JUNCTION	0.00	8129.20	0 01:05	0	280	0.000
1028	JUNCTION	0.00	8082.29	0 01:04	0	278	0.000
1030	JUNCTION	0.00	7567.13	0 01:04	0	260	0.000
1032	JUNCTION	22.60	22.60	0 00:35	0.436	0.436	0.000
1034	JUNCTION	0.00	5553.94	0 01:02	0	181	0.000
1036	JUNCTION	0.00	5554.30	0 01:01	0	181	0.000
1038	JUNCTION	0.00	5518.62	0 01:00	0	179	0.000
1040	JUNCTION	0.00	5505.76	0 00:59	0	179	0.000
1042	JUNCTION	0.00	5343.97	0 00:59	0	174	0.000
1044	JUNCTION	0.00	5305.15	0 00:58	0	172	0.000
1046	JUNCTION	0.00	5219.57	0 00:58	0	168	0.000
1048	JUNCTION	0.00	5220.06	0 00:57	0	168	0.000
1050	JUNCTION	0.00	2751.38	0 00:51	0	73.5	0.000
109	JUNCTION	0.00	1459.58	0 00:54	0	43.9	0.000
110	JUNCTION	72.62	72.62	0 01:05	3.55	3.55	0.000
1108	JUNCTION	7.59	7.59	0 00:35	0.152	0.152	0.000
1110	JUNCTION	28.58	28.58	0 00:40	0.739	0.739	0.000
1115	JUNCTION	0.00	1507.07	0 01:01	0	44.4	0.000
1116	JUNCTION	144.71	144.71	0 00:40	3.21	3.21	0.000
1123	JUNCTION	0.00	1393.99	0 00:59	0	40.4	0.000
1124	JUNCTION	65.92	65.92	0 00:40	1.52	1.52	0.000
1125	JUNCTION	0.00	231.67	0 00:30	0	3.09	0.000
1126	JUNCTION	231.67	231.67	0 00:30	3.09	3.09	0.000
1127	JUNCTION	0.00	1348.41	0 00:57	0	38.9	0.000
113	JUNCTION	0.00	1389.07	0 00:54	0	40.4	0.000
1130	JUNCTION	0.00	1289.35	0 00:56	0	35.8	0.000
1132	JUNCTION	54.44	54.44	0 00:35	1.07	1.07	0.000
1139	JUNCTION	0.00	1254.85	0 00:57	0	34.7	0.000
114	JUNCTION	157.30	157.30	0 00:50	5.4	5.4	0.000
1140	JUNCTION	278.22	278.22	0 00:40	5.63	5.63	0.000
1141	JUNCTION	0.00	1108.83	0 00:51	0	28.8	0.000
1142	JUNCTION	48.51	48.51	0 00:35	1.11	1.11	0.000

1189	1144	JUNCTION	203.80	203.80	0	00:35	3.74	3.74	0.000
1190	1147	JUNCTION	0.00	1071.12	0	00:49	0	27.7	0.000
1191	1148	JUNCTION	194.50	194.50	0	00:40	5.12	5.12	0.000
1192	115	JUNCTION	0.00	1277.69	0	00:46	0	34.5	0.000
1193	1150	JUNCTION	44.33	44.33	0	00:55	2.02	2.02	0.000
1194	1151	JUNCTION	0.00	550.92	0	00:41	0	12.7	0.000
1195	1152	JUNCTION	77.44	77.44	0	00:35	1.46	1.46	0.000
1196	1153	JUNCTION	0.00	482.10	0	00:42	0	11.3	0.000
1197	1154	JUNCTION	164.54	164.54	0	00:40	3.9	3.9	0.000
1198	1155	JUNCTION	0.00	861.26	0	00:44	0	20.5	0.000
1199	1156	JUNCTION	148.41	148.41	0	00:40	3.98	3.98	0.000
1200	1163	JUNCTION	0.00	327.56	0	00:40	0	7.34	-0.000
1201	1164	JUNCTION	327.56	327.56	0	00:40	7.34	7.34	0.000
1202	117	JUNCTION	0.00	820.58	0	00:47	0	22.2	0.000
1203	1170	JUNCTION	0.00	148.41	0	00:40	0	3.98	0.000
1204	1172	JUNCTION	28.40	28.40	0	00:50	1.25	1.25	0.000
1205	118	JUNCTION	53.02	53.02	0	00:50	1.8	1.8	0.000
1206	1180	JUNCTION	25.72	25.72	0	00:40	0.701	0.701	0.000
1207	119	JUNCTION	0.00	769.18	0	00:45	0	20.4	-0.000
1208	1208	JUNCTION	109.25	109.25	0	00:40	2.63	2.63	0.000
1209	1209	JUNCTION	0.00	73.20	0	00:50	0	2.71	0.000
1210	121	JUNCTION	0.00	250.65	0	00:50	0	8.55	0.000
1211	1210	JUNCTION	73.20	73.20	0	00:50	2.71	2.71	0.000
1212	1215	JUNCTION	0.00	1379.66	0	01:15	0	53.7	0.000
1213	1216	JUNCTION	100.68	100.68	0	01:10	5.58	5.58	0.000
1214	1217	JUNCTION	0.00	1384.38	0	01:11	0	53.6	0.000
1215	122	JUNCTION	235.38	235.38	0	00:45	7.46	7.46	0.000
1216	1223	JUNCTION	0.00	1224.81	0	01:05	0	45.2	0.000
1217	1224	JUNCTION	97.13	97.13	0	00:55	4	4	0.000
1218	1226	JUNCTION	60.04	60.04	0	00:50	2.49	2.49	0.000
1219	1228	JUNCTION	37.67	37.67	0	00:55	1.68	1.68	0.000
1220	1230	JUNCTION	46.76	46.76	0	00:45	1.48	1.48	0.000
1221	1231	JUNCTION	0.00	1097.43	0	00:47	0	34.5	-0.000
1222	1232	JUNCTION	401.77	401.77	0	00:35	7.57	7.57	0.000
1223	1233	JUNCTION	0.00	503.57	0	00:46	0	14.5	0.000
1224	1233_Lake	JUNCTION	0.00	503.44	0	00:47	0	14.5	0.000
1225	1234	JUNCTION	132.99	132.99	0	00:35	2.94	2.94	0.000
1226	1235	JUNCTION	0.00	152.61	0	00:45	0	4.64	0.000
1227	1236	JUNCTION	152.61	152.61	0	00:45	4.64	4.64	0.000
1228	1237	JUNCTION	0.00	169.91	0	00:45	0	4.99	0.000
1229	1238	JUNCTION	169.91	169.91	0	00:45	4.99	4.99	0.000
1230	1239	JUNCTION	0.00	327.01	0	01:02	0	12.4	0.000
1231	1239_Lake	JUNCTION	0.00	326.98	0	01:03	0	12.4	0.000
1232	1240	JUNCTION	41.19	41.19	0	00:45	1.21	1.21	0.000
1233	1247	JUNCTION	0.00	232.62	0	00:45	0	6.92	0.000
1234	1248	JUNCTION	63.07	63.07	0	00:45	1.92	1.92	0.000
1235	1249	JUNCTION	0.00	169.71	0	00:46	0	4.99	0.000
1236	1255	JUNCTION	0.00	269.03	0	00:58	0	10.2	0.000
1237	1256	JUNCTION	141.99	141.99	0	00:40	3.75	3.75	0.000
1238	1257	JUNCTION	0.00	158.77	0	00:58	0	6.41	0.000
1239	1258	JUNCTION	89.11	89.11	0	00:45	3.01	3.01	0.000
1240	1259	JUNCTION	0.00	77.98	0	00:55	0	3.37	0.000
1241	126	JUNCTION	31.01	31.01	0	00:45	1.02	1.02	0.000
1242	1260	JUNCTION	77.98	77.98	0	00:55	3.37	3.37	0.000
1243	1264	JUNCTION	47.68	47.68	0	00:45	1.58	1.58	0.000
1244	1272	JUNCTION	15.89	15.89	0	00:50	0.624	0.624	0.000
1245	1273	JUNCTION	0.00	292.49	0	00:59	0	11.2	0.000
1246	1274	JUNCTION	24.44	24.44	0	00:50	1.02	1.02	0.000
1247	129	JUNCTION	0.00	522.01	0	00:45	0	11.8	0.000
1248	130	JUNCTION	65.49	65.49	0	00:50	2.47	2.47	0.000
1249	1308	JUNCTION	66.76	66.76	0	00:55	2.78	2.78	0.000
1250	1310	JUNCTION	45.31	45.31	0	00:50	1.77	1.77	0.000
1251	1315	JUNCTION	0.00	2640.29	0	01:00	0	91.5	0.000
1252	1316	JUNCTION	139.78	1761.75	0	01:00	4.95	62.1	0.000
1253	1318	JUNCTION	40.00	40.00	0	00:50	1.58	1.58	0.000
1254	1319	JUNCTION	0.00	125.09	0	00:40	0	2.66	0.000

1255	1320	JUNCTION	125.09	125.09	0	00:40	2.66	2.66	0.000
1256	1321	JUNCTION	0.00	108.62	0	00:50	0	3.68	0.000
1257	1322	JUNCTION	108.62	108.62	0	00:50	3.68	3.68	0.000
1258	1341	JUNCTION	0.00	80.91	0	00:47	0	2.56	0.000
1259	1324	JUNCTION	81.37	81.37	0	00:45	2.56	2.56	0.000
1260	1327	JUNCTION	0.00	7.46	0	01:05	0	0.431	0.000
1261	1328	JUNCTION	7.46	7.46	0	01:05	0.431	0.431	0.000
1262	133	JUNCTION	0.00	474.02	0	00:39	0	9.28	0.000
1263	134	JUNCTION	159.32	159.32	0	00:35	3.48	3.48	0.000
1264	1340	JUNCTION	286.91	1427.84	0	00:57	7.21	50.7	0.000
1265	1347	JUNCTION	0.00	281.44	0	00:52	0	9.99	0.000
1266	1348	JUNCTION	108.46	108.46	0	00:45	3.65	3.65	0.000
1267	1349	JUNCTION	52.09	807.59	0	01:00	1.79	29.1	0.000
1268	1351	JUNCTION	0.00	328.80	0	00:55	0	11.6	0.000
1269	1352	JUNCTION	154.57	154.57	0	00:55	6.1	6.1	0.000
1270	1353	JUNCTION	0.00	176.29	0	00:50	0	5.5	-0.000
1271	1354	JUNCTION	94.66	94.66	0	00:50	3.4	3.4	0.000
1272	1355	JUNCTION	0.00	432.23	0	00:56	0	15.2	0.000
1273	1356	JUNCTION	142.76	142.76	0	00:50	4.97	4.97	0.000
1274	1357	JUNCTION	0.00	296.16	0	00:54	0	10.2	0.000
1275	1358	JUNCTION	143.13	143.13	0	00:55	5.76	5.76	0.000
1276	1361	JUNCTION	0.00	182.74	0	00:37	0	4.27	0.000
1277	1362	JUNCTION	19.06	19.06	0	01:00	1.01	1.01	0.000
1278	1363	JUNCTION	0.00	171.04	0	00:35	0	3.26	0.000
1279	1364	JUNCTION	171.04	171.04	0	00:35	3.26	3.26	0.000
1280	1367	JUNCTION	0.00	91.55	0	00:35	0	2.07	0.000
1281	1368	JUNCTION	91.55	91.55	0	00:35	2.07	2.07	0.000
1282	1371	JUNCTION	0.00	176.16	0	00:50	0	6.33	0.000
1283	1372	JUNCTION	176.16	176.16	0	00:50	6.33	6.33	0.000
1284	138	JUNCTION	336.11	336.11	0	00:35	5.75	5.75	0.000
1285	1382	JUNCTION	86.77	86.77	0	01:05	4.36	4.36	0.000
1286	1386	JUNCTION	39.22	39.22	0	01:00	1.93	1.93	0.000
1287	1387	JUNCTION	0.00	215.50	0	00:45	0	6.18	-0.000
1288	1388	JUNCTION	215.50	215.50	0	00:45	6.18	6.18	0.000
1289	139	JUNCTION	0.00	464.94	0	00:43	0	12.4	0.000
1290	1392	JUNCTION	146.74	146.74	0	00:45	4.4	4.4	0.000
1291	1393	JUNCTION	0.00	150.85	0	00:50	0	5.78	0.000
1292	1394	JUNCTION	150.85	150.85	0	00:50	5.78	5.78	0.000
1293	1395	JUNCTION	0.00	405.87	0	00:40	0	9.44	0.000
1294	1396	JUNCTION	238.22	238.22	0	00:40	5.64	5.64	0.000
1295	1398	JUNCTION	170.85	170.85	0	00:35	3.8	3.8	0.000
1296	141	JUNCTION	0.00	443.51	0	00:42	0	11.4	0.000
1297	142	JUNCTION	23.12	23.12	0	00:50	1.01	1.01	0.000
1298	146	JUNCTION	48.81	48.81	0	00:55	2.28	2.28	0.000
1299	149	JUNCTION	0.00	401.01	0	00:40	0	9.08	0.000
1300	150	JUNCTION	99.87	99.87	0	00:45	3.26	3.26	0.000
1301	154	JUNCTION	316.19	316.19	0	00:35	5.8	5.8	0.000
1302	210	JUNCTION	90.08	90.08	0	00:45	2.43	2.43	0.000
1303	220	JUNCTION	134.31	134.31	0	00:50	4.78	4.78	0.000
1304	221	JUNCTION	0.00	2159.63	0	00:50	0	59.1	0.000
1305	223	JUNCTION	0.00	397.28	0	00:45	0	11	0.000
1306	224	JUNCTION	102.13	102.13	0	00:45	3.15	3.15	0.000
1307	225	JUNCTION	0.00	297.42	0	00:41	0	7.87	0.000
1308	226	JUNCTION	157.08	157.08	0	00:40	3.81	3.81	0.000
1309	228	JUNCTION	142.96	142.96	0	00:40	4.05	4.05	0.000
1310	231	JUNCTION	0.00	1771.84	0	00:50	0	48.1	0.000
1311	232	JUNCTION	138.79	138.79	0	00:55	5.26	5.26	0.000
1312	235	JUNCTION	0.00	1663.11	0	00:45	0	42.5	0.000
1313	236	JUNCTION	105.63	105.63	0	00:45	3.49	3.49	0.000
1314	237	JUNCTION	0.00	1557.59	0	00:45	0	39	0.000
1315	239	JUNCTION	0.00	1524.53	0	00:45	0	38	0.000
1316	240	JUNCTION	33.33	33.33	0	00:45	1.04	1.04	0.000
1317	241	JUNCTION	0.00	1343.38	0	00:43	0	32.4	0.000
1318	243	JUNCTION	0.00	900.77	0	00:43	0	20.4	0.000
1319	244	JUNCTION	237.04	237.04	0	00:40	5.92	5.92	0.000
1320	245	JUNCTION	0.00	680.47	0	00:40	0	14.4	0.000

1321	247	JUNCTION	0.00	509.02	0	00:39	0	9.99	0.000
1322	248	JUNCTION	372.42	372.42	0	00:35	7	7	0.000
1323	250	JUNCTION	181.64	181.64	0	00:35	2.96	2.96	0.000
1324	252	JUNCTION	172.98	172.98	0	00:40	4.43	4.43	0.000
1325	256	JUNCTION	182.91	182.91	0	00:45	5.55	5.55	0.000
1326	259	JUNCTION	0.00	444.89	0	00:45	0	12	0.000
1327	260	JUNCTION	98.74	98.74	0	00:50	3.33	3.33	0.000
1328	263	JUNCTION	0.00	350.78	0	00:41	0	8.68	0.000
1329	264	JUNCTION	195.65	195.65	0	00:40	4.78	4.78	0.000
1330	268	JUNCTION	158.12	158.12	0	00:40	3.89	3.89	0.000
1331	310	JUNCTION	110.61	110.61	0	00:50	3.8	3.8	0.000
1332	314	JUNCTION	168.04	168.04	0	00:40	3.88	3.88	0.000
1333	410	JUNCTION	19.09	19.09	0	00:45	0.65	0.65	0.000
1334	414	JUNCTION	19.85	19.85	0	00:45	0.579	0.579	0.000
1335	418	JUNCTION	53.79	53.79	0	00:50	1.97	1.97	0.000
1336	422	JUNCTION	2.89	2.89	0	00:40	0.0781	0.0781	0.000
1337	426	JUNCTION	52.54	52.54	0	00:50	1.97	1.97	0.000
1338	510	JUNCTION	174.84	174.84	0	00:50	6.55	6.55	0.000
1339	513	JUNCTION	0.00	456.02	0	00:40	0	11.1	0.000
1340	514	JUNCTION	229.26	229.26	0	00:40	6	6	0.000
1341	518	JUNCTION	226.75	226.75	0	00:40	5.15	5.15	0.000
1342	610	JUNCTION	145.90	145.90	0	00:50	5.68	5.68	0.000
1343	613	JUNCTION	0.00	846.72	0	00:41	0	17.8	0.000
1344	614	JUNCTION	321.94	321.94	0	00:35	6.49	6.49	0.000
1345	617	JUNCTION	0.00	550.30	0	00:38	0	11.2	0.000
1346	618	JUNCTION	216.70	216.70	0	00:35	3.84	3.84	0.000
1347	620	JUNCTION	37.16	37.16	0	01:00	1.89	1.89	0.000
1348	622	JUNCTION	359.48	359.48	0	00:35	7.38	7.38	0.000
1349	708	JUNCTION	0.00	172.28	0	00:50	0	5.23	0.000
1350	709	JUNCTION	0.00	172.38	0	00:49	0	5.22	0.000
1351	710	JUNCTION	0.00	172.39	0	00:49	0	5.22	0.000
1352	711	JUNCTION	0.00	172.62	0	00:47	0	5.21	0.000
1353	712	JUNCTION	173.25	173.25	0	00:45	5.21	5.21	0.000
1354	713	JUNCTION	0.00	172.84	0	00:46	0	5.21	0.000
1355	714	JUNCTION	51.50	51.50	0	00:40	1.18	1.18	0.000
1356	804	JUNCTION	25.42	25.42	0	00:40	0.602	0.602	0.000
1357	808	JUNCTION	0.00	2057.59	0	00:48	0	46.8	0.000
1358	809	JUNCTION	0.00	2057.58	0	00:48	0	46.8	0.000
1359	810	JUNCTION	189.76	189.76	0	00:40	4.7	4.7	0.000
1360	811	JUNCTION	0.00	1882.17	0	00:48	0	42.1	0.000
1361	819	JUNCTION	0.00	1887.34	0	00:46	0	42.1	-0.000
1362	820	JUNCTION	331.20	331.20	0	00:35	5.64	5.64	0.000
1363	822	JUNCTION	0.00	146.07	0	00:45	0	3.24	0.000
1364	823	JUNCTION	0.00	1511.25	0	00:44	0	33.1	0.000
1365	824	JUNCTION	164.89	164.89	0	00:35	3.18	3.18	0.000
1366	829	JUNCTION	0.00	1511.40	0	00:44	0	33.1	0.000
1367	830	JUNCTION	293.93	293.93	0	00:35	4.86	4.86	0.000
1368	831	JUNCTION	0.00	1290.07	0	00:45	0	28.3	0.000
1369	834	JUNCTION	0.00	1299.30	0	00:42	0	28.2	0.000
1370	838	JUNCTION	0.00	1300.31	0	00:41	0	28.2	0.000
1371	839	JUNCTION	0.00	845.95	0	00:41	0	19	0.000
1372	840	JUNCTION	199.86	199.86	0	00:40	4.63	4.63	0.000
1373	841	JUNCTION	0.00	649.41	0	00:41	0	14.4	-0.000
1374	842	JUNCTION	353.28	353.28	0	00:40	7.79	7.79	0.000
1375	843	JUNCTION	0.00	1300.42	0	00:41	0	28.2	0.000
1376	844	JUNCTION	523.46	523.46	0	00:35	9.24	9.24	0.000
1377	850	JUNCTION	316.04	316.04	0	00:35	6.53	6.53	0.000
1378	910	JUNCTION	140.59	140.59	0	00:50	5.08	5.08	0.000
1379	911	JUNCTION	0.00	601.74	0	00:53	0	20.9	0.000
1380	912	JUNCTION	0.00	602.04	0	00:52	0	20.9	0.000
1381	929	JUNCTION	0.00	602.04	0	00:52	0	20.9	0.000
1382	930	JUNCTION	334.77	334.77	0	00:40	7.52	7.52	0.000
1383	931	JUNCTION	0.00	359.16	0	00:50	0	13.2	0.000
1384	940	JUNCTION	137.30	137.30	0	00:50	5.01	5.01	0.000
1385	950	JUNCTION	145.62	145.62	0	00:55	6.1	6.1	0.000
1386	960	JUNCTION	85.75	85.75	0	00:40	2.11	2.11	0.000

O_1107	JUNCTION	0.00	1511.21	0	01:01	0	44.6	0.000
O_1263	JUNCTION	0.00	1414.86	0	01:15	0	55.3	0.000
O_1307	JUNCTION	0.00	2696.95	0	01:03	0	94.5	0.000
O_220	JUNCTION	0.00	2273.28	0	00:54	0	64	0.000
O_300	JUNCTION	0.00	269.56	0	00:49	0	7.72	0.000
O_500	JUNCTION	0.00	609.28	0	00:48	0	17.8	0.000
O_600	JUNCTION	0.00	945.45	0	00:49	0	23.7	0.000
O_708	JUNCTION	0.00	172.27	0	00:50	0	5.23	0.000
O_803	JUNCTION	0.00	2071.87	0	00:50	0	47.5	0.000
O_909	JUNCTION	0.00	727.72	0	00:59	0	26.1	0.000
1323	JUNCTION	0.00	81.37	0	00:45	0	2.56	0.000
CulvertOut_1233	JUNCTION	0.00	503.57	0	00:46	0	14.5	0.000
O_100	OUTFALL	0.00	1459.58	0	00:54	0	43.9	0.000
O_1000	OUTFALL	0.00	11827.16	0	01:13	0	407	0.000
836	DIVIDER	0.00	1299.70	0	00:41	0	28.2	0.000

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Node Flooding Summary
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No nodes were flooded.

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Outfall Loading Summary
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Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
O_100	55.48	98.00	1459.58	43.926
O_1000	99.70	505.81	11827.16	407.405
System	77.59	603.82	12997.95	451.330

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Link Flow Summary
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Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days	hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
Dummy_1032	DUMMY	22.60	0	00:35			
Dummy_1050	DUMMY	2751.38	0	00:51			
Dummy_109	DUMMY	1459.58	0	00:54			
Dummy_110	DUMMY	72.62	0	01:05			
Dummy_1107	DUMMY	1511.21	0	01:01			
Dummy_1108	DUMMY	7.59	0	00:35			
Dummy_1110	DUMMY	28.58	0	00:40			
Dummy_1116	DUMMY	144.71	0	00:40			
Dummy_1124	DUMMY	65.92	0	00:40			
Dummy_1126	DUMMY	231.67	0	00:30			
Dummy_1132	DUMMY	54.44	0	00:35			
Dummy_1139	DUMMY	1254.85	0	00:57			
Dummy_114	DUMMY	157.30	0	00:50			
Dummy_1140	DUMMY	278.22	0	00:40			
Dummy_1142	DUMMY	48.51	0	00:35			
Dummy_1144	DUMMY	203.80	0	00:35			
Dummy_1148	DUMMY	194.50	0	00:40			
Dummy_1150	DUMMY	44.33	0	00:55			

1453	Dummy_1152	DUMMY	77.44	0	00:35
1454	Dummy_1153	DUMMY	482.10	0	00:42
1455	Dummy_1154	DUMMY	164.54	0	00:40
1456	Dummy_1156	DUMMY	148.41	0	00:40
1457	Dummy_1164	DUMMY	327.56	0	00:40
1458	Dummy_1172	DUMMY	28.40	0	00:50
1459	Dummy_118	DUMMY	53.02	0	00:50
1460	Dummy_1180	DUMMY	25.72	0	00:40
1461	Dummy_1208	DUMMY	109.25	0	00:40
1462	Dummy_121	DUMMY	250.65	0	00:50
1463	Dummy_1210	DUMMY	73.20	0	00:50
1464	Dummy_1216	DUMMY	100.68	0	01:10
1465	Dummy_122	DUMMY	235.38	0	00:45
1466	Dummy_1224	DUMMY	97.13	0	00:55
1467	Dummy_1226	DUMMY	60.04	0	00:50
1468	Dummy_1228	DUMMY	37.67	0	00:55
1469	Dummy_1230	DUMMY	46.76	0	00:45
1470	Dummy_1232	DUMMY	401.77	0	00:35
1471	Dummy_1233_Lake	DUMMY	503.44	0	00:47
1472	Dummy_1234	DUMMY	132.99	0	00:35
1473	Dummy_1236	DUMMY	152.61	0	00:45
1474	Dummy_1238	DUMMY	169.91	0	00:45
1475	Dummy_1239	DUMMY	326.98	0	01:03
1476	Dummy_1240	DUMMY	41.19	0	00:45
1477	Dummy_1248	DUMMY	63.07	0	00:45
1478	Dummy_1249	DUMMY	169.71	0	00:46
1479	Dummy_1256	DUMMY	141.99	0	00:40
1480	Dummy_1258	DUMMY	89.11	0	00:45
1481	Dummy_1260	DUMMY	77.98	0	00:55
1482	Dummy_1263	DUMMY	1414.86	0	01:15
1483	Dummy_1264	DUMMY	47.68	0	00:45
1484	Dummy_1272	DUMMY	15.89	0	00:50
1485	Dummy_1274	DUMMY	24.44	0	00:50
1486	Dummy_129	DUMMY	522.01	0	00:45
1487	Dummy_130	DUMMY	65.49	0	00:50
1488	Dummy_1307	DUMMY	2696.95	0	01:03
1489	Dummy_1308	DUMMY	66.76	0	00:55
1490	Dummy_1310	DUMMY	45.31	0	00:50
1491	Dummy_1318	DUMMY	40.00	0	00:50
1492	Dummy_1320	DUMMY	125.09	0	00:40
1493	Dummy_1322	DUMMY	108.62	0	00:50
1494	Dummy_1341	DUMMY	80.91	0	00:47
1495	Dummy_1328	DUMMY	7.46	0	01:05
1496	Dummy_1337	DUMMY	281.44	0	00:52
1497	Dummy_134	DUMMY	159.32	0	00:35
1498	Dummy_1348	DUMMY	108.46	0	00:45
1499	Dummy_1349	DUMMY	807.59	0	01:00
1500	Dummy_1352	DUMMY	154.57	0	00:55
1501	Dummy_1354	DUMMY	94.66	0	00:50
1502	Dummy_1356	DUMMY	142.76	0	00:50
1503	Dummy_1358	DUMMY	143.13	0	00:55
1504	Dummy_1362	DUMMY	19.06	0	01:00
1505	Dummy_1364	DUMMY	171.04	0	00:35
1506	Dummy_1368	DUMMY	91.55	0	00:35
1507	Dummy_1372	DUMMY	176.16	0	00:50
1508	Dummy_1382	DUMMY	86.77	0	01:05
1509	Dummy_1386	DUMMY	39.22	0	01:00
1510	Dummy_1388	DUMMY	215.50	0	00:45
1511	Dummy_1392	DUMMY	146.74	0	00:45
1512	Dummy_1394	DUMMY	150.85	0	00:50
1513	Dummy_1396	DUMMY	238.22	0	00:40
1514	Dummy_1398	DUMMY	170.85	0	00:35
1515	Dummy_142	DUMMY	23.12	0	00:50
1516	Dummy_150	DUMMY	99.87	0	00:45
1517	Dummy_210	DUMMY	90.08	0	00:45
1518	Dummy_219	DUMMY	2273.28	0	00:54

1519	Dummy_220	DUMMY	134.31	0	00:50			
1520	Dummy_223	DUMMY	397.28	0	00:45			
1521	Dummy_224	DUMMY	102.13	0	00:45			
1522	Dummy_226	DUMMY	157.08	0	00:40			
1523	Dummy_231	DUMMY	1771.84	0	00:50			
1524	Dummy_232	DUMMY	138.79	0	00:55			
1525	Dummy_236	DUMMY	105.63	0	00:45			
1526	Dummy_237	DUMMY	1557.59	0	00:45			
1527	Dummy_240	DUMMY	33.33	0	00:45			
1528	Dummy_243	DUMMY	900.77	0	00:43			
1529	Dummy_244	DUMMY	237.04	0	00:40			
1530	Dummy_247	DUMMY	509.02	0	00:39			
1531	Dummy_248	DUMMY	372.42	0	00:35			
1532	Dummy_252	DUMMY	172.98	0	00:40			
1533	Dummy_256	DUMMY	182.91	0	00:45			
1534	Dummy_259	DUMMY	444.89	0	00:45			
1535	Dummy_260	DUMMY	98.74	0	00:50			
1536	Dummy_264	DUMMY	195.65	0	00:40			
1537	Dummy_300	DUMMY	269.56	0	00:49			
1538	Dummy_310	DUMMY	110.61	0	00:50			
1539	Dummy_410	DUMMY	19.09	0	00:45			
1540	Dummy_414	DUMMY	19.85	0	00:45			
1541	Dummy_418	DUMMY	53.79	0	00:50			
1542	Dummy_422	DUMMY	2.89	0	00:40			
1543	Dummy_426	DUMMY	52.54	0	00:50			
1544	Dummy_500	DUMMY	609.28	0	00:48			
1545	Dummy_510	DUMMY	174.84	0	00:50			
1546	Dummy_514	DUMMY	229.26	0	00:40			
1547	Dummy_518	DUMMY	226.75	0	00:40			
1548	Dummy_600	DUMMY	945.45	0	00:49			
1549	Dummy_610	DUMMY	145.90	0	00:50			
1550	Dummy_614	DUMMY	321.94	0	00:35			
1551	Dummy_618	DUMMY	216.70	0	00:35			
1552	Dummy_620	DUMMY	37.16	0	01:00			
1553	Dummy_708	DUMMY	172.27	0	00:50			
1554	Dummy_714	DUMMY	51.50	0	00:40			
1555	Dummy_803	DUMMY	2071.87	0	00:50			
1556	Dummy_804	DUMMY	25.42	0	00:40			
1557	Dummy_810	DUMMY	189.76	0	00:40			
1558	Dummy_820	DUMMY	331.20	0	00:35			
1559	Dummy_830	DUMMY	293.93	0	00:35			
1560	Dummy_840	DUMMY	199.86	0	00:40			
1561	Dummy_842	DUMMY	353.28	0	00:40			
1562	Dummy_844	DUMMY	523.46	0	00:35			
1563	Dummy_909	DUMMY	727.72	0	00:59			
1564	Dummy_910	DUMMY	140.59	0	00:50			
1565	Dummy_929	DUMMY	602.04	0	00:52			
1566	Dummy_930	DUMMY	334.77	0	00:40			
1567	Dummy_940	DUMMY	137.30	0	00:50			
1568	Dummy_950	DUMMY	145.62	0	00:55			
1569	Dummy_960	DUMMY	85.75	0	00:40			
1570	Dummy_1002	DUMMY	11827.16	0	01:13			
1571	L_1004	CONDUIT	11756.97	0	01:13	8.61	0.64	0.78
1572	L_1006	CONDUIT	9914.56	0	01:12	10.92	0.20	0.45
1573	L_1008	CONDUIT	9915.70	0	01:11	9.36	0.53	0.75
1574	L_1010	CONDUIT	9892.44	0	01:11	8.11	0.64	0.82
1575	L_1012	CONDUIT	9682.39	0	01:10	5.75	0.38	0.66
1576	L_1014	CONDUIT	8293.63	0	01:10	4.60	0.31	0.56
1577	L_1016	CONDUIT	8281.29	0	01:08	8.52	0.30	0.53
1578	L_1018	CONDUIT	8263.62	0	01:08	7.13	0.44	0.66
1579	L_1020	CONDUIT	8248.71	0	01:07	9.62	0.29	0.53
1580	L_1022	CONDUIT	8200.27	0	01:07	9.24	0.43	0.65
1581	L_1024	CONDUIT	8200.53	0	01:06	8.21	0.33	0.57
1582	L_1026	CONDUIT	8129.04	0	01:05	9.10	0.28	0.52
1583	L_1028	CONDUIT	8080.16	0	01:05	11.44	0.38	0.57
1584	L_1030	CONDUIT	7566.75	0	01:04	13.31	0.28	0.48

1585	L_1034	CONDUIT	5553.10	0	01:02	8.68	0.42	0.61
1586	L_1036	CONDUIT	5553.94	0	01:02	9.81	0.35	0.55
1587	L_1038	CONDUIT	5517.21	0	01:01	7.62	0.34	0.60
1588	L_1040	CONDUIT	5504.12	0	01:00	9.12	0.25	0.53
1589	L_1042	CONDUIT	5343.23	0	00:59	11.34	0.19	0.48
1590	L_1044	CONDUIT	5304.46	0	00:59	10.17	0.22	0.51
1591	L_1046	CONDUIT	5219.30	0	00:58	12.03	0.10	0.36
1592	L_1048	CONDUIT	5219.57	0	00:58	10.20	0.12	0.40
1593	L_1115	CONDUIT	1506.85	0	01:01	11.22	0.43	0.67
1594	L_1123	CONDUIT	1388.27	0	01:01	6.88	0.09	0.25
1595	L_1125	CONDUIT	232.24	0	00:30	10.54	0.01	0.12
1596	L_1127	CONDUIT	1346.58	0	00:59	6.11	0.08	0.23
1597	L_1130	CONDUIT	1287.99	0	00:58	5.11	0.10	0.26
1598	L_114	CONDUIT	1389.04	0	00:54	11.43	0.06	0.35
1599	L_1141	CONDUIT	1071.53	0	00:58	3.53	0.03	0.14
1600	L_1147	CONDUIT	1069.65	0	00:51	7.52	0.10	0.34
1601	L_115	CONDUIT	1233.28	0	00:54	6.17	0.05	0.19
1602	L_1151	CONDUIT	541.66	0	00:46	7.67	0.10	0.35
1603	L_1156	CONDUIT	845.19	0	00:50	2.47	0.02	0.11
1604	L_1163	CONDUIT	322.16	0	00:43	3.58	0.03	0.12
1605	L_117	CONDUIT	820.56	0	00:47	10.23	0.17	0.43
1606	L_1170	CONDUIT	147.03	0	00:46	2.31	0.00	0.03
1607	L_119	CONDUIT	767.91	0	00:47	9.97	0.16	0.42
1608	L_1209	CONDUIT	72.02	0	00:57	1.93	0.01	0.16
1609	Dummy_1215	DUMMY	1379.66	0	01:15			
1610	L_1217	CONDUIT	1379.66	0	01:15	4.86	0.47	0.70
1611	L_1223	CONDUIT	1219.35	0	01:11	3.88	0.13	0.46
1612	L_1231	CONDUIT	1000.69	0	01:07	4.44	0.09	0.40
1613	L_1233	CONDUIT	503.44	0	00:47	5.42	0.08	0.29
1614	L_1235	CONDUIT	151.94	0	00:46	6.05	0.02	0.21
1615	L_1237	CONDUIT	169.71	0	00:46	11.87	0.17	0.24
1616	L_1239	CONDUIT	326.98	0	01:03	8.50	0.04	0.31
1617	L_1247	CONDUIT	231.38	0	00:48	6.00	0.04	0.26
1618	L_1255	CONDUIT	268.88	0	01:00	4.08	0.09	0.41
1619	L_1257	CONDUIT	157.73	0	01:06	3.27	0.12	0.40
1620	L_1259	CONDUIT	76.57	0	01:06	3.59	0.00	0.05
1621	L_126	CONDUIT	27.69	0	01:10	3.37	0.00	0.03
1622	L_1273	CONDUIT	291.91	0	01:03	2.87	0.16	0.51
1623	L_1315	CONDUIT	2632.60	0	01:03	6.92	0.18	0.38
1624	L_1316	CONDUIT	1758.12	0	01:03	4.82	0.15	0.49
1625	L_1319	CONDUIT	118.97	0	00:48	3.42	0.01	0.15
1626	L_1321	CONDUIT	106.66	0	00:56	3.38	0.01	0.15
1627	L_1323	CONDUIT	80.91	0	00:47	3.20	0.00	0.13
1628	L_1327	CONDUIT	7.19	0	01:18	1.82	0.02	0.10
1629	L_133	CONDUIT	457.65	0	00:45	6.49	0.01	0.09
1630	L_1340	CONDUIT	1421.96	0	01:01	6.96	0.07	0.37
1631	L_1351	CONDUIT	323.33	0	01:02	4.21	0.02	0.23
1632	L_1353	CONDUIT	174.24	0	00:55	2.69	0.02	0.21
1633	L_1355	CONDUIT	431.73	0	00:59	5.29	0.02	0.23
1634	L_1357	CONDUIT	295.27	0	00:57	3.67	0.02	0.23
1635	L_1361	CONDUIT	153.35	0	00:53	3.64	0.01	0.17
1636	L_1363	CONDUIT	168.62	0	00:37	6.37	0.01	0.06
1637	L_1367	CONDUIT	81.68	0	00:51	4.52	0.00	0.13
1638	L_1371	CONDUIT	174.91	0	00:54	4.21	0.01	0.17
1639	L_138	CONDUIT	316.28	0	00:40	5.79	0.01	0.10
1640	L_1387	CONDUIT	211.33	0	00:51	5.07	0.02	0.12
1641	L_139	CONDUIT	464.95	0	00:43	5.12	0.13	0.34
1642	L_1393	CONDUIT	148.46	0	00:58	4.21	0.01	0.15
1643	L_1395	CONDUIT	369.85	0	00:50	4.64	0.02	0.17
1644	L_141	CONDUIT	443.32	0	00:43	8.45	0.06	0.22
1645	L_146	CONDUIT	48.80	0	00:55	6.64	0.00	0.03
1646	L_149	CONDUIT	399.89	0	00:42	8.53	0.03	0.14
1647	L_154	CONDUIT	306.65	0	00:39	6.04	0.02	0.10
1648	L_221	CONDUIT	2139.31	0	00:54	8.30	0.21	0.45
1649	L_225	CONDUIT	295.21	0	00:45	6.78	0.02	0.10
1650	L_228	CONDUIT	142.74	0	00:45	6.61	0.01	0.10

1651	L_235	CONDUIT	1634.24	0	00:50	8.17	0.06	0.19
1652	L_239	CONDUIT	1524.30	0	00:45	8.33	0.08	0.23
1653	L_241	CONDUIT	1341.72	0	00:45	9.38	0.17	0.38
1654	L_245	CONDUIT	668.69	0	00:43	12.41	0.10	0.33
1655	L_250	CONDUIT	162.58	0	00:42	3.61	0.00	0.09
1656	L_263	CONDUIT	346.98	0	00:44	8.56	0.04	0.17
1657	L_268	CONDUIT	156.99	0	00:42	8.06	0.01	0.09
1658	L_314	CONDUIT	161.26	0	00:47	4.86	0.01	0.07
1659	L_513	CONDUIT	437.88	0	00:47	6.34	0.03	0.13
1660	L_613	CONDUIT	800.69	0	00:49	6.60	0.03	0.12
1661	L_617	CONDUIT	541.61	0	00:42	6.62	0.02	0.10
1662	L_622	CONDUIT	352.48	0	00:41	6.80	0.01	0.15
1663	L_708	CONDUIT	172.27	0	00:50	10.70	0.01	0.07
1664	L_709	CONDUIT	172.28	0	00:50	5.55	0.01	0.06
1665	L_710	CONDUIT	172.38	0	00:49	4.42	0.01	0.05
1666	L_711	CONDUIT	172.39	0	00:49	4.18	0.01	0.05
1667	L_712	CONDUIT	172.84	0	00:46	3.73	0.00	0.04
1668	L_713	CONDUIT	172.62	0	00:47	2.97	0.01	0.09
1669	L_808	CONDUIT	2049.42	0	00:50	6.39	0.21	0.42
1670	L_809	CONDUIT	2057.59	0	00:48	42.60	0.67	0.64
1671	L_811	CONDUIT	1881.96	0	00:48	6.82	0.07	0.23
1672	L_819	CONDUIT	1882.17	0	00:48	4.58	0.15	0.33
1673	L_822	CONDUIT	145.35	0	00:48	2.87	0.00	0.02
1674	L_823	CONDUIT	1503.55	0	00:47	4.14	0.04	0.15
1675	L_824	CONDUIT	146.07	0	00:45	1.72	0.00	0.01
1676	L_829	CONDUIT	1511.25	0	00:44	10.56	0.04	0.17
1677	L_831	CONDUIT	1289.92	0	00:45	13.28	0.01	0.09
1678	L_834	CONDUIT	1290.07	0	00:45	4.33	0.06	0.23
1679	L_836	CONDUIT	263.77	0	01:35	22.91	1.07	1.00
1680	L_838	CONDUIT	1299.70	0	00:41	5.46	0.03	0.22
1681	L_839	CONDUIT	843.86	0	00:43	3.95	0.01	0.11
1682	L_841	CONDUIT	649.22	0	00:42	5.09	0.06	0.36
1683	L_843	CONDUIT	1300.31	0	00:41	17.51	0.40	0.44
1684	L_850	CONDUIT	306.07	0	00:43	4.37	0.02	0.17
1685	L_911	CONDUIT	594.45	0	00:59	4.57	0.03	0.14
1686	L_912	CONDUIT	601.74	0	00:53	4.95	0.04	0.28
1687	L_931	CONDUIT	349.34	0	00:59	4.18	0.02	0.24
1688	Overflow_836	CONDUIT	1052.90	0	00:42	8.64	0.01	0.12
1689	Dummy_1324	DUMMY	81.37	0	00:45			
1690	Dummy_1233	DUMMY	503.57	0	00:46			
1691								
1692								
1693	************************							
1694	Conduit Surcharge Summary							
1695	************************							
1696								
1697	----------							
1698						Hours	Hours	
1699		--------- Hours Full --------				Above Full	Capacity	
1700	Conduit	Both Ends	Upstream	Dnstream		Normal Flow	Limited	
1701	----------							
1702	L_836	1.20	1.20	1.20		1.20	1.20	
1703								
1704								
1705	Analysis begun on: Wed May 7 10:48:07 2025							
1706	Analysis ended on: Wed May 7 10:48:07 2025							
1707	Total elapsed time: < 1 sec							

APPENDIX E – 5
CUHP – Option 4

								Depression Storage		Horton's Infiltration Parameters			DCIA Level and Fractions			
Catchment Name/ID	SWMM Node/ID	Raingage Name/ID	Area (sq.mi.)	Dist. to Centroid (miles)	Length (miles)	Slope (ft./ft.)	Percent Imperv.	Pervious (inches)	Imperv. (inches)	Initial Rate (in./hr.)	Final Rate (in.hr.)	Decay Coeff. (1/sec.)	DCIA Level	Dir. Con'ct Imperv. Fraction	Receiv. Perv. Fraction	Percent Eff. Imperv.
110	110	GOS GREELEY	0.111	0.506	0.975	0.027	4.8	0.35	0.10	3.00	0.50	0.0018	1	0.10	0.05	4.39
114	114	GOS GREELEY	0.175	0.346	0.914	0.031	3.8	0.40	0.10	3.00	0.50	0.0018	1	0.08	0.04	3.41
118	118	GOS GREELEY	0.059	0.278	0.474	0.048	2.0	0.40	0.10	3.00	0.50	0.0018	1	0.04	0.02	1.81
122	122	GOS GREELEY	0.192	0.486	1.184	0.027	39.3	0.35	0.10	3.00	0.50	0.0018	1	0.79	0.20	38.34
126	126	GOS GREELEY	0.032	0.133	0.286	0.013	21.2	0.40	0.10	4.50	0.60	0.0018	1	0.42	0.13	19.74
130	130	GOS GREELEY	0.073	0.318	0.607	0.038	14.3	0.35	0.10	3.00	0.50	0.0018	1	0.29	0.11	13.35
134	134	GOS GREELEY	0.084	0.217	0.593	0.028	53.9	0.35	0.10	3.00	0.50	0.0018	1	0.87	0.25	53.10
138	138	GOS GREELEY	0.130	0.176	0.483	0.017	69.3	0.35	0.10	3.00	0.50	0.0018	1	0.92	0.30	68.69
142	142	GOS GREELEY	0.031	0.233	0.500	0.034	11.9	0.40	0.10	3.00	0.50	0.0018	1	0.24	0.11	11.03
146	146	GOS GREELEY	0.062	0.463	0.831	0.033	28.7	0.35	0.10	3.00	0.50	0.0018	1	0.57	0.16	27.49
150	150	GOS GREELEY	0.093	0.272	0.641	0.040	20.1	0.35	0.10	3.00	0.50	0.0018	1	0.40	0.13	19.00
154	154	GOS GREELEY	0.139	0.231	0.515	0.027	53.0	0.35	0.10	3.00	0.50	0.0018	1	0.86	0.24	52.16
210	210	GOS GREELEY	0.076	0.155	0.506	0.042	4.6	0.35	0.10	3.00	0.50	0.0018	1	0.09	0.05	4.19
220	220	GOS GREELEY	0.156	0.410	0.800	0.034	2.2	0.40	0.10	3.00	0.50	0.0018	1	0.04	0.02	1.99
224	224	GOS GREELEY	0.100	0.239	0.642	0.041	2.8	0.35	0.10	3.00	0.50	0.0018	1	0.06	0.03	2.54
226	226	GOS GREELEY	0.095	0.307	0.593	0.034	44.6	0.35	0.10	3.00	0.50	0.0018	1	0.82	0.21	43.72
228	228	GOS GREELEY	0.103	0.359	0.664	0.026	40.9	0.35	0.10	3.00	0.50	0.0018	1	0.80	0.20	39.98
232	232	GOS GREELEY	0.166	0.432	0.945	0.034	3.6	0.35	0.10	3.00	0.50	0.0018	1	0.07	0.04	3.29
236	236	GOS GREELEY	0.094	0.355	0.753	0.036	31.5	0.35	0.10	3.00	0.50	0.0018	1	0.63	0.17	30.34
240	240	GOS GREELEY	0.034	0.160	0.395	0.051	2.2	0.40	0.10	3.00	0.50	0.0018	1	0.04	0.02	1.99
244	244	GOS GREELEY	0.141	0.480	0.830	0.038	53.9	0.35	0.10	3.00	0.50	0.0018	1	0.87	0.25	53.04
248	248	GOS GREELEY	0.151	0.284	0.543	0.016	75.5	0.35	0.10	3.00	0.50	0.0018	1	0.93	0.32	74.88
250	250	GOS GREELEY	0.068	0.120	0.339	0.022	66.1	0.35	0.10	3.00	0.50	0.0018	1	0.91	0.29	65.38
252	252	GOS GREELEY	0.098	0.393	0.739	0.021	68.6	0.35	0.10	3.00	0.50	0.0018	1	0.92	0.30	67.96
256	256	GOS GREELEY	0.146	0.554	0.954	0.032	43.8	0.35	0.10	4.50	0.60	0.0018	1	0.82	0.21	42.69
260	260	GOS GREELEY	0.101	0.321	0.670	0.050	9.8	0.35	0.10	3.00	0.50	0.0018	1	0.20	0.10	9.05
264	264	GOS GREELEY	0.107	0.331	0.854	0.024	66.3	0.35	0.10	3.00	0.50	0.0018	1	0.91	0.29	65.65
268	268	GOS GREELEY	0.092	0.287	0.637	0.018	57.0	0.35	0.10	3.00	0.50	0.0018	1	0.88	0.26	56.21
310	310	GOS GREELEY	0.138	0.389	0.760	0.038	2.4	0.40	0.10	4.50	0.60	0.0018	1	0.05	0.02	2.14
314	314	GOS GREELEY	0.108	0.245	0.526	0.038	35.0	0.35	0.10	4.50	0.60	0.0018	1	0.70	0.18	33.61
410	410	GOS GREELEY	0.021	0.189	0.311	0.073	4.8	0.40	0.10	3.00	0.50	0.0018	1	0.10	0.05	4.41
414	414	GOS GREELEY	0.019	0.143	0.263	0.087	2.9	0.40	0.10	3.00	0.50	0.0018	1	0.06	0.03	2.67
418	418	GOS GREELEY	0.062	0.276	0.605	0.047	3.7	0.35	0.10	3.00	0.50	0.0018	1	0.07	0.04	3.35

								Depression Storage		Horton's Infiltration Parameters			DCIA Level and Fractions			
Catchment Name/ID	SWMM Node/ID	Raingage Name/ID	Area (sq.mi.)	Dist. to Centroid (miles)	Length (miles)	Slope (ft./ft.)	Percent Imperv.	Pervious (inches)	Imperv. (inches)	Initial Rate (in./hr.)	Final Rate (in.hr.)	Decay Coeff. (1/sec.)	DCIA Level	Dir. Con'ct Imperv. Fraction	Receiv. Perv. Fraction	Percent Eff. Imperv.
422	422	GOS GREELEY	0.006	0.102	0.196	0.097	4.0	0.40	0.10	5.00	1.00	0.0007	1	0.08	0.04	3.16
426	426	GOS GREELEY	0.068	0.320	0.635	0.046	4.7	0.35	0.10	4.50	0.60	0.0018	1	0.09	0.05	4.13
510	510	GOS GREELEY	0.193	0.483	0.920	0.033	14.9	0.35	0.10	3.00	0.50	0.0018	1	0.30	0.11	13.94
514	514	GOS GREELEY	0.138	0.457	0.927	0.025	60.9	0.35	0.10	3.00	0.50	0.0018	1	0.90	0.27	60.16
518	518	GOS GREELEY	0.125	0.298	0.642	0.024	51.8	0.35	0.10	3.00	0.50	0.0018	1	0.86	0.24	51.00
610	610	GOS GREELEY	0.166	0.452	0.971	0.032	16.8	0.35	0.10	3.00	0.50	0.0018	1	0.34	0.12	15.79
614	614	GOS GREELEY	0.157	0.330	0.607	0.036	52.4	0.35	0.10	3.00	0.50	0.0018	1	0.86	0.24	51.55
618	618	GOS GREELEY	0.084	0.185	0.446	0.026	76.9	0.35	0.10	3.00	0.50	0.0018	1	0.93	0.32	76.31
620	620	GREELEY	0.053	0.272	0.598	0.008	23.5	0.35	0.10	3.00	0.50	0.0018	1	0.47	0.14	22.34
622	622	GOS GREELEY	0.161	0.336	0.673	0.019	74.5	0.35	0.10	3.00	0.50	0.0018	1	0.93	0.31	73.87
712	712	GREELEY	0.140	0.346	0.764	0.033	30.2	0.35	0.10	3.00	0.50	0.0018	1	0.60	0.17	29.00
714	714	GREELEY	0.035	0.091	0.212	0.030	12.5	0.35	0.10	3.00	0.50	0.0018	1	0.25	0.11	11.63
804	804	GREELEY	0.040	0.085	0.381	0.018	10.0	0.35	0.10	5.00	1.00	0.0007	1	0.20	0.10	8.08
810	810	GREELEY	0.115	0.242	0.599	0.011	48.1	0.35	0.10	3.00	0.50	0.0018	1	0.84	0.22	47.23
820	820	GREELEY	0.127	0.170	0.537	0.021	69.8	0.35	0.10	3.00	0.50	0.0018	1	0.92	0.30	69.13
824	824	GREELEY	0.068	0.192	0.421	0.017	78.0	0.35	0.10	3.00	0.50	0.0018	1	0.94	0.32	77.40
830	830	GREELEY	0.111	0.121	0.541	0.019	67.8	0.35	0.10	3.00	0.50	0.0018	1	0.92	0.29	67.16
840	840	GREELEY	0.100	0.339	0.674	0.023	76.5	0.35	0.10	3.00	0.50	0.0018	1	0.93	0.32	75.96
842	842	GREELEY	0.173	0.312	0.834	0.016	68.6	0.35	0.10	3.00	0.50	0.0018	1	0.92	0.30	67.93
844	844	GREELEY	0.198	0.278	0.542	0.016	76.2	0.35	0.10	3.00	0.50	0.0018	1	0.93	0.32	75.62
850	850	GREELEY	0.156	0.361	0.569	0.023	60.1	0.35	0.10	4.50	0.60	0.0018	1	0.90	0.27	59.16
910	910	GREELEY	0.159	0.415	0.843	0.019	27.8	0.35	0.10	4.30	0.70	0.0014	1	0.56	0.16	26.02
930	930	GREELEY	0.164	0.350	0.704	0.011	76.2	0.35	0.10	3.50	0.60	0.0016	1	0.93	0.32	75.45
940	940	GREELEY	0.142	0.346	0.667	0.015	22.5	0.35	0.10	3.70	0.50	0.0018	1	0.45	0.14	21.28
950	950	GREELEY	0.173	0.439	0.819	0.011	22.7	0.35	0.10	3.70	0.50	0.0018	1	0.45	0.14	21.46
960	960	GREELEY	0.059	0.083	0.394	0.014	26.6	0.35	0.10	3.40	0.50	0.0018	1	0.53	0.16	25.39
1032	1032	GREELEY	0.015	0.070	0.215	0.022	47.3	0.35	0.10	5.00	1.00	0.0007	1	0.84	0.22	45.30
1108	1108	GREELEY	0.006	0.064	0.152	0.080	35.3	0.35	0.10	5.00	1.00	0.0007	1	0.71	0.19	32.82
1110	1110	GREELEY	0.027	0.183	0.364	0.036	41.0	0.35	0.10	5.00	1.00	0.0007	1	0.80	0.20	38.93
1116	1116	GREELEY	0.094	0.202	0.577	0.025	43.7	0.35	0.10	4.20	0.80	0.0011	1	0.82	0.21	42.17
1124	1124	GREELEY	0.046	0.115	0.500	0.017	46.2	0.35	0.10	4.40	0.90	0.0010	1	0.83	0.22	44.55
1132	1132	GREELEY	0.040	0.129	0.294	0.028	40.7	0.35	0.10	5.00	1.00	0.0007	1	0.80	0.20	38.64
1126	1126	GREELEY	0.094	0.053	0.406	0.019	56.9	0.35	0.10	5.00	1.00	0.0007	1	0.88	0.26	55.20
1140	1140	GREELEY	0.188	0.216	0.637	0.016	44.8	0.35	0.10	4.90	1.00	0.0008	1	0.82	0.21	42.86
1142	1142	GREELEY	0.029	0.158	0.370	0.018	67.1	0.35	0.10	4.90	1.00	0.0007	1	0.91	0.29	65.61
1144	1144	GREELEY	0.127	0.074	0.702	0.009	41.0	0.35	0.10	4.70	0.90	0.0008	1	0.81	0.20	39.21
1148	1148	GREELEY	0.170	0.376	0.793	0.016	44.8	0.35	0.10	4.90	1.00	0.0008	1	0.82	0.21	42.87

								Depression Storage		Horton's Infiltration Parameters			DCIA Level and Fractions			
Catchment Name/ID	SWMM Node/ID	Raingage Name/ID	Area (sq.mi.)	Dist. to Centroid (miles)	Length (miles)	Slope (ft./ft.)	Percent Imperv.	Pervious (inches)	Imperv. (inches)	Initial Rate (in./hr.)	Final Rate (in.hr.)	Decay Coeff. (1/sec.)	DCIA Level	Dir. Con'ct Imperv. Fraction	Receiv. Perv. Fraction	Percent Eff. Imperv.
1150	1150	GREELEY	0.088	0.262	0.862	0.010	12.0	0.35	0.10	4.70	0.90	0.0011	1	0.24	0.11	10.31
1152	1152	GREELEY	0.033	0.142	0.303	0.028	68.2	0.35	0.10	3.00	0.50	0.0018	1	0.92	0.29	67.55
1154	1154	GREELEY	0.085	0.390	0.513	0.019	75.8	0.35	0.10	3.50	0.60	0.0016	1	0.93	0.32	75.14
1156	1156	GREELEY	0.121	0.378	0.684	0.018	47.5	0.35	0.10	4.80	0.90	0.0009	1	0.84	0.22	45.75
1164	1164	GREELEY	0.184	0.339	0.558	0.017	45.1	0.35	0.10	3.60	0.50	0.0018	1	0.83	0.22	44.17
1172	1172	GREELEY	0.077	0.464	0.708	0.026	12.6	0.35	0.10	4.90	1.00	0.0007	1	0.25	0.11	10.43
1180	1180	GREELEY	0.021	0.153	0.401	0.035	43.6	0.35	0.10	4.30	0.80	0.0011	1	0.82	0.21	42.10
1208	1208	GREELEY	0.099	0.242	0.585	0.029	36.0	0.35	0.10	4.80	1.00	0.0008	1	0.72	0.19	33.75
1210	1210	GREELEY	0.152	0.280	0.852	0.009	13.3	0.35	0.10	5.00	1.00	0.0008	1	0.27	0.11	11.14
1216	1216	GREELEY	0.201	0.643	0.873	0.005	12.7	0.35	0.10	4.10	0.70	0.0013	1	0.25	0.11	11.34
1224	1224	GREELEY	0.126	0.300	0.851	0.013	15.8	0.35	0.10	4.20	0.60	0.0018	1	0.32	0.12	14.51
1226	1226	GREELEY	0.071	0.345	0.619	0.013	29.8	0.35	0.10	4.30	0.60	0.0018	1	0.60	0.17	28.33
1228	1228	GREELEY	0.057	0.233	0.623	0.012	15.1	0.35	0.10	4.60	0.70	0.0016	1	0.30	0.12	13.64
1230	1230	GREELEY	0.049	0.143	0.443	0.022	12.0	0.35	0.10	4.50	0.60	0.0017	1	0.24	0.11	10.83
1232	1232	GREELEY	0.195	0.209	0.603	0.019	46.4	0.35	0.10	4.10	0.60	0.0018	1	0.83	0.22	45.30
1234	1234	GREELEY	0.076	0.147	0.501	0.016	45.3	0.35	0.10	3.90	0.60	0.0018	1	0.83	0.22	44.21
1236	1236	GREELEY	0.119	0.414	0.752	0.014	46.4	0.35	0.10	3.50	0.60	0.0017	1	0.83	0.22	45.36
1238	1238	GREELEY	0.124	0.207	0.519	0.002	45.0	0.35	0.10	3.20	0.50	0.0018	1	0.83	0.22	44.10
1240	1240	GREELEY	0.039	0.139	0.244	0.015	14.2	0.35	0.10	4.20	0.60	0.0018	1	0.28	0.11	12.97
1248	1248	GREELEY	0.047	0.284	0.466	0.015	48.1	0.35	0.10	3.20	0.50	0.0018	1	0.84	0.22	47.17
1256	1256	GREELEY	0.092	0.319	0.557	0.011	55.6	0.35	0.10	4.30	0.60	0.0018	1	0.88	0.25	54.59
1258	1258	GREELEY	0.088	0.171	0.420	0.007	16.3	0.35	0.10	3.30	0.50	0.0018	1	0.33	0.12	15.24
1260	1260	GREELEY	0.099	0.286	0.709	0.011	15.7	0.35	0.10	3.30	0.50	0.0018	1	0.31	0.12	14.66
1264	1264	GREELEY	0.062	0.215	0.527	0.028	12.2	0.35	0.10	4.70	0.80	0.0013	1	0.24	0.11	10.64
1272	1272	GREELEY	0.036	0.253	0.484	0.029	11.6	0.35	0.10	5.00	1.00	0.0008	1	0.23	0.10	9.64
1274	1274	GREELEY	0.031	0.165	0.408	0.012	20.3	0.35	0.10	3.80	0.60	0.0018	1	0.41	0.13	18.91
1308	1308	GREELEY	0.098	0.378	0.680	0.019	11.3	0.35	0.10	4.50	0.70	0.0016	1	0.23	0.10	10.08
1310	1310	GREELEY	0.057	0.241	0.486	0.017	13.0	0.35	0.10	4.10	0.60	0.0018	1	0.26	0.11	11.88
1316	1316	GREELEY	0.159	0.339	0.650	0.014	13.0	0.35	0.10	4.20	0.60	0.0018	1	0.26	0.11	11.83
1318	1318	GREELEY	0.051	0.228	0.406	0.012	12.5	0.35	0.10	4.40	0.60	0.0018	1	0.25	0.11	11.29
1320	1320	GREELEY	0.087	0.094	0.369	0.023	12.1	0.35	0.10	4.50	0.60	0.0018	1	0.24	0.11	10.92
1322	1322	GREELEY	0.111	0.234	0.582	0.016	12.0	0.35	0.10	3.50	0.50	0.0018	1	0.24	0.11	11.06
1324	1324	GREELEY	0.082	0.182	0.397	0.011	12.0	0.35	0.10	3.80	0.60	0.0018	1	0.24	0.11	10.92
1328	1328	GREELEY	0.012	0.167	0.289	0.006	20.8	0.35	0.10	3.00	0.50	0.0018	1	0.42	0.13	19.69
1340	1340	GREELEY	0.178	0.227	1.029	0.008	53.8	0.35	0.10	4.20	0.60	0.0018	1	0.87	0.25	52.76

								Depression Storage		Horton's Infiltration Parameters			DCIA Level and Fractions			
Catchment Name/ID	SWMM Node/ID	Raingage Name/ID	Area (sq.mi.)	Dist. to Centroid (miles)	Length (miles)	Slope (ft./ft.)	Percent Imperv.	Pervious (inches)	Imperv. (inches)	Initial Rate (in./hr.)	Final Rate (in.hr.)	Decay Coeff. (1/sec.)	DCIA Level	Dir. Con'ct Imperv. Fraction	Receiv. Perv. Fraction	Percent Eff. Imperv.
1348	1348	GREELEY	0.109	0.234	0.535	0.015	13.7	0.35	0.10	3.40	0.50	0.0018	1	0.27	0.11	12.67
1349	1349	GREELEY	0.054	0.159	0.399	0.013	13.3	0.35	0.10	3.40	0.50	0.0018	1	0.27	0.11	12.36
1352	1352	GREELEY	0.184	0.396	0.801	0.013	12.0	0.35	0.10	3.50	0.50	0.0018	1	0.24	0.11	11.06
1354	1354	GREELEY	0.102	0.237	0.660	0.018	12.0	0.35	0.10	3.50	0.50	0.0018	1	0.24	0.11	11.06
1356	1356	GREELEY	0.148	0.269	0.586	0.010	14.3	0.35	0.10	3.60	0.50	0.0018	1	0.29	0.11	13.30
1358	1358	GREELEY	0.173	0.440	0.675	0.012	13.3	0.35	0.10	3.60	0.50	0.0018	1	0.27	0.11	12.33
1368	1368	GREELEY	0.046	0.184	0.389	0.013	69.4	0.35	0.10	3.00	0.50	0.0018	1	0.92	0.30	68.72
1364	1364	GREELEY	0.070	0.113	0.457	0.007	77.1	0.35	0.10	3.40	0.50	0.0018	1	0.93	0.32	76.54
1372	1372	GREELEY	0.190	0.306	0.504	0.005	12.5	0.35	0.10	3.40	0.50	0.0018	1	0.25	0.11	11.51
1362	1362	GREELEY	0.030	0.265	0.400	0.009	16.1	0.35	0.10	3.50	0.50	0.0018	1	0.32	0.12	15.01
1382	1382	GREELEY	0.143	0.590	0.881	0.014	12.0	0.35	0.10	4.50	0.60	0.0017	1	0.24	0.11	10.81
1386	1386	GREELEY	0.058	0.181	0.708	0.006	12.1	0.35	0.10	3.40	0.50	0.0018	1	0.24	0.11	11.14
1388	1388	GREELEY	0.185	0.300	0.506	0.019	12.8	0.35	0.10	3.30	0.50	0.0018	1	0.26	0.11	11.82
1392	1392	GREELEY	0.129	0.204	0.668	0.014	27.1	0.35	0.10	4.00	0.60	0.0017	1	0.54	0.16	25.63
1394	1394	GREELEY	0.160	0.234	1.013	0.009	25.6	0.35	0.10	3.40	0.50	0.0018	1	0.51	0.15	24.38
1396	1396	GREELEY	0.121	0.336	0.678	0.012	76.6	0.35	0.10	3.00	0.50	0.0018	1	0.93	0.32	76.03
1398	1398	GREELEY	0.082	0.188	0.534	0.008	75.6	0.35	0.10	3.00	0.50	0.0018	1	0.93	0.32	75.04

		Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
Catchment Name/ID	User Comment for Catchment	CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
110		0.147	0.164	71.2	10.49	37.0	7.42	17.5	47	257,766	1.84	473,338	65.0	73	473,245	1.02
114		0.151	0.206	45.3	8.67	23.5	6.13	14.4	116	406,013	1.78	721,528	50.0	157	721,151	1.41
118		0.156	0.131	43.8	5.91	22.8	4.18	9.9	40	136,996	1.76	240,856	50.0	53	240,835	1.41
122		0.094	0.218	37.1	7.71	19.3	5.45	12.8	155	445,075	2.23	994,334	45.0	232	993,705	1.89
126		0.112	0.078	40.0	3.88	20.8	2.74	6.5	24	74,154	1.83	135,547	45.0	31	135,166	1.51
130		0.121	0.116	48.7	5.84	25.3	4.13	9.7	45	169,548	1.94	329,048	50.0	65	328,917	1.40
134		0.087	0.182	19.8	4.27	10.3	3.01	7.1	127	194,175	2.41	467,672	35.0	158	464,232	2.95
138		0.081	0.245	12.6	3.88	6.6	2.74	6.5	309	301,853	2.59	783,054	35.0	337	768,468	4.05
142		0.125	0.080	58.4	5.10	30.4	3.60	8.5	16	71,765	1.87	134,112	50.0	23	133,907	1.17
146		0.102	0.109	63.3	6.79	32.9	4.80	11.3	29	143,818	2.11	303,229	55.0	48	303,224	1.21
150		0.112	0.126	39.3	5.30	20.4	3.75	8.8	71	216,576	2.01	434,934	45.0	100	434,158	1.67
154		0.088	0.227	15.6	4.22	8.1	2.98	7.0	268	323,632	2.40	775,838	35.0	314	773,687	3.52
210		0.148	0.140	31.3	4.85	16.3	3.43	8.1	73	177,186	1.83	324,965	45.0	90	324,052	1.85
220		0.156	0.202	47.5	8.89	24.7	6.28	14.8	99	363,101	1.76	639,124	50.0	134	638,747	1.34
224		0.154	0.163	38.6	6.35	20.1	4.49	10.6	77	231,887	1.82	420,951	45.0	102	421,133	1.60
226		0.092	0.175	24.4	4.78	12.7	3.38	8.0	117	221,759	2.30	509,470	40.0	155	508,247	2.55
228		0.094	0.172	30.7	5.55	16.0	3.92	9.3	101	240,005	2.25	540,783	45.0	141	540,071	2.13
232		0.151	0.202	51.6	9.50	26.8	6.71	15.8	96	384,902	1.82	702,016	55.0	139	701,742	1.31
236		0.100	0.139	39.6	5.73	20.6	4.05	9.5	71	217,622	2.14	466,071	45.0	104	465,681	1.74
240		0.156	0.102	38.8	4.54	20.2	3.21	7.6	26	79,324	1.76	139,630	45.0	33	139,293	1.53
244		0.087	0.230	25.1	5.93	13.1	4.19	9.9	169	328,035	2.41	789,839	40.0	235	788,745	2.60
248		0.079	0.269	15.0	4.59	7.8	3.25	7.7	303	350,880	2.67	936,288	35.0	372	934,635	3.85
250		0.082	0.180	11.4	3.08	5.9	2.18	5.1	179	158,220	2.55	404,169	35.0	181	394,372	4.16
252		0.081	0.216	24.7	5.59	12.8	3.95	9.3	120	228,783	2.59	591,507	40.0	172	590,560	2.73
256		0.093	0.208	35.2	7.12	18.3	5.03	11.9	125	339,970	2.17	738,960	45.0	180	737,894	1.92
260		0.131	0.142	42.3	6.11	22.0	4.32	10.2	72	234,503	1.89	442,967	50.0	99	443,000	1.53
264		0.082	0.222	23.2	5.44	12.0	3.84	9.1	139	249,635	2.56	638,512	40.0	195	638,136	2.83
268		0.086	0.194	24.0	5.07	12.5	3.59	8.5	115	212,597	2.45	519,866	40.0	157	518,851	2.68
310		0.155	0.190	46.6	8.32	24.2	5.88	13.9	89	319,565	1.59	507,766	50.0	111	507,556	1.26
314		0.097	0.157	23.9	4.38	12.4	3.10	7.3	136	251,527	2.05	516,373	40.0	166	514,876	2.39
410		0.147	0.078	42.8	4.05	22.3	2.86	6.8	15	48,596	1.79	86,935	45.0	19	86,728	1.43
414		0.153	0.077	34.7	3.55	18.0	2.51	5.9	16	43,852	1.77	77,546	45.0	20	77,272	1.64
418		0.151	0.129	48.3	6.30	25.1	4.45	10.5	38	143,829	1.82	262,413	50.0	54	262,486	1.36

		Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
Catchment Name/ID	User Comment for Catchment	CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
422		0.152	0.047	40.3	2.96	21.0	2.09	4.9	5	15,040	0.70	10,486	40.0	3	10,403	0.70
426		0.148	0.133	51.1	6.71	26.6	4.74	11.2	40	157,878	1.66	262,320	50.0	53	262,391	1.21
510		0.120	0.176	49.0	8.13	25.5	5.75	13.6	118	448,125	1.95	872,868	50.0	175	872,345	1.41
514		0.084	0.240	26.2	6.35	13.6	4.48	10.6	158	321,518	2.49	801,281	40.0	228	799,650	2.57
518		0.088	0.213	21.4	5.01	11.1	3.54	8.3	174	289,290	2.38	689,564	40.0	225	686,541	2.83
610		0.117	0.165	51.1	7.99	26.6	5.65	13.3	97	384,646	1.97	757,751	50.0	146	757,266	1.37
614		0.088	0.238	17.8	4.76	9.3	3.36	7.9	263	364,132	2.39	870,328	35.0	319	866,011	3.18
618		0.078	0.208	12.9	3.55	6.7	2.51	5.9	196	195,193	2.69	524,214	35.0	217	512,807	4.03
620		0.108	0.097	70.4	6.72	36.6	4.75	11.2	22	122,352	2.06	251,828	60.0	37	251,875	1.10
622		0.079	0.276	17.1	5.12	8.9	3.62	8.5	282	373,312	2.66	991,623	35.0	359	984,692	3.49
712		0.101	0.162	35.0	5.86	18.2	4.14	9.8	120	325,181	2.14	694,753	45.0	171	694,138	1.91
714		0.124	0.085	23.8	3.05	12.4	2.16	5.1	45	82,342	1.93	158,953	40.0	52	156,881	2.27
804		0.135	0.096	33.2	3.95	17.2	2.79	6.6	36	92,961	0.86	79,978	40.0	25	79,718	0.99
810		0.090	0.198	25.1	5.32	13.0	3.76	8.9	138	267,236	2.35	627,887	40.0	188	626,375	2.55
820		0.081	0.243	12.4	3.82	6.5	2.70	6.4	307	295,500	2.61	771,295	35.0	332	753,111	4.07
824		0.078	0.189	15.2	3.72	7.9	2.63	6.2	133	157,588	2.71	426,988	35.0	165	424,631	3.80
830		0.081	0.226	11.8	3.55	6.1	2.51	5.9	281	256,828	2.59	664,304	35.0	293	647,959	4.15
840		0.078	0.224	20.0	4.93	10.4	3.48	8.2	150	231,423	2.69	623,051	40.0	200	618,472	3.13
842		0.081	0.278	19.3	5.62	10.0	3.97	9.4	269	402,357	2.60	1,044,424	40.0	353	1,040,010	3.18
844		0.079	0.299	13.4	4.57	7.0	3.23	7.6	444	460,600	2.69	1,238,160	35.0	523	1,234,651	4.12
850		0.085	0.252	18.2	5.01	9.4	3.54	8.4	258	362,833	2.41	874,190	35.0	313	869,553	3.13
910		0.104	0.160	48.0	7.38	25.0	5.21	12.3	99	369,353	1.82	670,712	50.0	137	670,696	1.35
930		0.079	0.280	19.7	5.74	10.3	4.05	9.6	250	381,368	2.64	1,006,085	40.0	334	1,003,153	3.18
940		0.110	0.151	45.9	6.84	23.9	4.83	11.4	93	330,766	2.02	667,358	50.0	137	667,186	1.50
950		0.109	0.165	55.6	8.56	28.9	6.05	14.3	94	402,531	2.02	813,041	55.0	145	812,654	1.31
960		0.105	0.101	26.0	3.52	13.5	2.49	5.9	68	136,125	2.08	283,006	40.0	85	281,727	2.26
1032		0.092	0.076	18.8	2.60	9.8	1.84	4.3	24	34,775	1.66	57,828	35.0	22	56,325	2.29
1108		0.099	0.042	21.8	2.21	11.4	1.56	3.7	9	14,665	1.39	20,336	35.0	7	19,676	1.80
1110		0.095	0.090	29.9	3.57	15.5	2.52	5.9	27	62,872	1.52	95,355	40.0	27	94,919	1.58
1116		0.093	0.168	22.3	4.39	11.6	3.10	7.3	127	218,962	1.93	422,663	40.0	143	420,099	2.36
1124		0.092	0.125	23.3	3.74	12.1	2.64	6.2	59	105,996	1.88	199,738	40.0	65	198,654	2.22
1132		0.095	0.107	20.6	3.19	10.7	2.25	5.3	58	92,384	1.51	139,506	35.0	52	138,054	2.05
1126		0.087	0.193	8.7	2.79	4.5	1.97	4.6	326	218,889	1.89	414,044	30.0	229	401,022	3.80
1140		0.093	0.228	20.0	5.00	10.4	3.53	8.3	282	437,451	1.67	732,664	40.0	271	727,879	2.25

		Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
Catchment Name/ID	User Comment for Catchment	CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
1142		0.082	0.123	21.2	3.50	11.0	2.47	5.8	41	68,026	2.14	145,667	35.0	48	144,515	2.54
1144		0.095	0.182	18.0	4.02	9.4	2.84	6.7	211	294,502	1.65	487,382	35.0	197	484,936	2.42
1148		0.093	0.220	30.1	6.59	15.7	4.66	11.0	169	394,944	1.68	661,547	45.0	187	661,693	1.72
1150		0.127	0.130	67.6	8.27	35.2	5.85	13.8	39	205,095	1.30	267,563	55.0	44	267,458	0.78
1152		0.081	0.132	15.0	3.02	7.8	2.13	5.0	66	76,883	2.59	199,223	35.0	77	195,131	3.65
1154		0.079	0.208	21.1	4.88	11.0	3.45	8.1	121	198,597	2.63	523,060	40.0	164	520,358	3.00
1156		0.091	0.197	29.8	6.01	15.5	4.24	10.0	122	281,761	1.84	517,769	40.0	144	517,501	1.85
1164		0.092	0.236	21.9	5.47	11.4	3.86	9.1	252	427,396	2.30	981,409	40.0	325	979,250	2.76
1172		0.127	0.123	68.0	7.92	35.4	5.59	13.2	34	179,358	0.92	165,346	50.0	28	165,289	0.57
1180		0.093	0.085	30.1	3.46	15.6	2.45	5.8	21	47,916	1.92	92,157	40.0	25	91,668	1.90
1208		0.098	0.149	28.2	4.72	14.7	3.33	7.9	105	228,982	1.49	342,050	40.0	105	340,930	1.66
1210		0.125	0.165	55.2	8.49	28.7	6.00	14.2	83	353,344	1.02	358,901	50.0	73	358,679	0.75
1216		0.124	0.182	85.6	13.48	44.5	9.53	22.5	70	467,181	1.58	738,818	70.0	100	738,758	0.78
1224		0.119	0.147	56.1	7.86	29.2	5.55	13.1	67	292,614	1.81	530,905	55.0	97	530,753	1.20
1226		0.102	0.118	55.3	6.50	28.8	4.59	10.8	39	165,710	2.00	331,083	50.0	59	330,973	1.29
1228		0.121	0.104	62.8	6.52	32.7	4.61	10.9	27	132,967	1.67	221,737	55.0	38	221,788	1.02
1230		0.125	0.099	39.5	4.50	20.6	3.18	7.5	37	113,474	1.74	197,125	45.0	47	196,585	1.49
1232		0.091	0.241	17.0	4.65	8.8	3.28	7.7	345	454,149	2.23	1,011,693	35.0	396	1,004,549	3.17
1234		0.092	0.159	21.1	4.07	11.0	2.87	6.8	109	177,507	2.22	393,817	40.0	131	390,987	2.68
1236		0.091	0.196	34.7	6.73	18.0	4.76	11.2	103	276,025	2.24	616,950	45.0	150	616,395	1.98
1238		0.092	0.197	32.4	6.42	16.9	4.54	10.7	115	288,367	2.31	665,196	45.0	168	665,471	2.12
1240		0.122	0.088	35.2	3.87	18.3	2.73	6.4	33	90,060	1.79	161,500	45.0	41	161,057	1.66
1248		0.090	0.133	33.0	4.86	17.2	3.44	8.1	43	109,735	2.34	257,164	45.0	63	256,574	2.07
1256		0.087	0.191	27.2	5.50	14.2	3.89	9.2	101	213,045	2.35	500,670	40.0	140	499,055	2.39
1258		0.118	0.125	41.5	5.48	21.6	3.87	9.1	64	204,514	1.96	400,984	45.0	89	400,560	1.58
1260		0.119	0.132	58.3	7.41	30.3	5.24	12.3	51	229,598	1.95	448,553	55.0	78	448,525	1.23
1264		0.126	0.110	44.2	5.24	23.0	3.70	8.7	42	143,494	1.46	210,119	45.0	47	209,864	1.20
1272		0.130	0.089	58.6	5.49	30.5	3.88	9.2	18	83,926	0.99	82,729	50.0	16	82,662	0.69
1274		0.113	0.076	55.2	4.74	28.7	3.35	7.9	17	71,438	1.89	135,003	50.0	24	134,809	1.24
1308		0.127	0.137	59.0	7.70	30.7	5.44	12.8	50	227,565	1.62	369,469	55.0	67	369,377	1.06
1310		0.123	0.105	52.5	5.73	27.3	4.05	9.6	33	132,205	1.78	235,526	50.0	45	235,433	1.24
1316		0.123	0.167	46.8	7.49	24.3	5.29	12.5	102	369,607	1.78	656,996	50.0	140	656,898	1.37
1318		0.124	0.101	53.2	5.61	27.7	3.97	9.4	29	119,028	1.76	209,981	50.0	40	209,858	1.22
1320		0.125	0.128	22.4	3.71	11.6	2.62	6.2	117	202,881	1.76	356,227	40.0	125	353,085	2.24

		Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
Catchment Name/ID	User Comment for Catchment	CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
1322		0.125	0.143	42.5	6.16	22.1	4.35	10.3	79	258,202	1.90	490,730	50.0	109	490,790	1.53
1324		0.125	0.125	39.3	5.27	20.4	3.72	8.8	63	190,648	1.78	339,747	45.0	81	339,107	1.55
1328		0.112	0.050	83.2	4.71	43.3	3.33	7.9	4	28,350	2.03	57,461	65.0	7	57,408	0.95
1340		0.088	0.254	25.9	6.54	13.4	4.62	10.9	206	412,985	2.33	960,976	40.0	284	959,055	2.49
1348		0.122	0.140	41.7	5.98	21.7	4.22	10.0	78	252,793	1.92	486,605	45.0	108	486,613	1.56
1349		0.122	0.102	42.7	4.84	22.2	3.42	8.1	38	124,654	1.92	239,468	45.0	52	239,017	1.52
1352		0.125	0.179	52.8	8.77	27.5	6.20	14.6	105	427,614	1.90	812,710	55.0	155	812,135	1.31
1354		0.125	0.138	46.0	6.37	23.9	4.50	10.6	67	238,092	1.90	452,509	50.0	95	452,315	1.44
1356		0.121	0.160	44.1	6.91	22.9	4.89	11.5	101	344,233	1.92	662,217	50.0	143	662,082	1.50
1358		0.123	0.173	54.0	8.66	28.1	6.12	14.4	96	401,696	1.91	767,903	55.0	143	767,390	1.29
1368		0.081	0.153	19.9	3.84	10.3	2.71	6.4	69	106,686	2.61	277,940	35.0	91	275,951	3.10
1364		0.078	0.191	15.0	3.70	7.8	2.61	6.2	140	162,551	2.69	438,018	35.0	171	434,991	3.82
1372		0.124	0.179	46.7	7.91	24.3	5.59	13.2	122	441,626	1.91	843,812	50.0	176	843,536	1.45
1362		0.118	0.077	75.2	5.93	39.1	4.19	9.9	12	69,006	1.95	134,510	60.0	19	134,481	1.00
1382		0.125	0.161	74.1	10.64	38.5	7.52	17.7	58	332,581	1.74	577,633	65.0	87	577,506	0.95
1386		0.125	0.107	69.3	7.17	36.0	5.07	11.9	25	134,746	1.91	256,843	60.0	39	256,866	1.06
1388		0.123	0.178	34.1	6.17	17.7	4.36	10.3	163	428,848	1.92	822,979	45.0	215	823,086	1.82
1392		0.105	0.144	36.0	5.49	18.7	3.88	9.2	107	299,039	1.96	585,188	45.0	144	584,270	1.75
1394		0.106	0.159	48.9	7.47	25.4	5.28	12.5	98	372,438	2.07	769,830	50.0	150	769,723	1.46
1396		0.078	0.244	21.3	5.49	11.1	3.88	9.1	170	280,490	2.69	755,377	40.0	238	753,350	3.08
1398		0.079	0.204	19.0	4.48	9.9	3.17	7.5	129	190,139	2.68	509,806	35.0	170	507,068	3.25

APPENDIX E – 6
Alternative Results Summary

Vol. - Volume, acre-ft	Side S - Channel side slopes, H:V
Q_{in} - Inflow, cfs	V_{100} - Average channel velocity, ft/sec
Q_{out} - Outflow, cfs	Q_{100} - Maximum flow in channel, ft/sec
W - Bottom width, ft	Depth - 100-yr flow depth, ft

Reach	Option 1 Do Nothing						Option 2 Detention						Option 3 Channel Improvement						Option 4 LID					
	Width Bottom	Side Slope	Q_{100}	V_{100}	Depth	Width Top	Width Bottom	Side Slope	Q_{100}	V_{100}	Depth	Width Top	Width Bottom	Side Slope	Q_{100}	V_{100}	Depth	Width Top	Width Bottom	Side Slope	Q_{100}	V_{100}	Depth	Width Top
100	100	5	1233	6	1.3	128	114	5	780	5.0	1.3	142	185	5	1196	5.0	1.3	213	118	5	811	5.0	1.3	146
118	10	2	768	10	1.0	20	89	5	470	5.0	1.0	114	150	5	755	5.0	1.0	175	89	2	465	5.0	1.0	99
134	50	8	316	6	0.7	85	86	5	312	5.0	0.7	108	86	5	312	5.0	0.7	108	86	5	310	4.8	0.8	109
142	30	2	400	9	0.6	38	69	5	213	5.0	0.6	90	133	5	396	5.0	0.6	154	80	5	249	5.0	0.6	101
150	50	2	307	6	0.7	59	79	5	304	5.0	0.7	101	81	5	304	5.0	0.7	103	79	5	302	5.0	0.7	101
200	40	4	2139	8	4.5	88	140	5	1253	5.0	1.7	172	250	5	1961	4.9	1.6	281	140	5	1113	4.8	1.7	172
224	40	2	295	7	1.0	50	90	5	293	5.0	0.6	111	90	5	293	5.0	0.6	111	59	5	264	4.8	0.6	80
232	100	3	1634	8	1.9	120	190	5	865	5.0	0.9	214	350	5	1510	5.0	0.9	374	190	5	770	4.8	0.9	214
239	75	2	1524	8	2.3	90	140	5	763	5.0	1.0	165	290	5	1439	4.9	1.0	315	142	5	680	4.8	1.0	167
241	30	2	1342	9	3.8	51	100	5	632	4.9	1.2	127	210	5	1263	4.9	1.2	237	99	5	561	4.7	1.3	127
244	10	2	669	12	3.3	29	110	5	304	4.9	0.6	131	230	5	614	5.0	0.5	250	98	5	261	4.6	0.6	119
260	20	2	347	9	1.7	33	40	5	151	5.0	0.7	62	100	5	338	5.0	0.7	122	45	5	136	4.8	0.7	67
300	50	2	161	5	0.7	59	50	2	161	4.9	0.7	59	50	2	161	4.9	0.7	59	50	2	159	4.8	0.7	59
500	50	2	438	6	1.3	61	50	2	228	4.9	0.9	60	92	5	428	5.0	0.9	116	50	2	208	4.7	0.9	60
600	100	3	801	7	1.2	116	100	3	344	4.8	0.8	114	178	5	752	5.0	0.9	202	100	3	364	4.9	0.8	114
614	80	2	542	7	1.0	90	80	2	213	4.6	0.6	88	163	5	528	5.0	0.6	184	80	2	233	4.7	0.6	88
618	20	10	352	7	1.5	80	101	5	351	5.0	0.7	123	101	5	351	5.0	0.7	123	101	5	350	5.0	0.7	123
700	106	15	173	4	0.4	163	106	15	173	3.7	0.4	163	106	15	173	3.7	0.4	163	106	15	170	3.7	0.4	163
800	115	3	2049	6	4.2	149	65	3	412	3.6	1.6	84	145	6	2033	4.9	2.6	194	65	3	298	3.2	1.3	82
829	235	5	1504	4	1.5	265	235	5	434	2.6	0.7	257	235	5	1499	4.1	1.5	265	235	5	311	1.7	0.8	258
843	100	10	844	4	1.1	152	100	27	203	2.5	0.5	208	100	27	844	4.0	1.1	240	100	10	528	3.4	0.8	146
900	85	4	594	5	1.4	108	85	4	594	4.6	1.4	108	85	4	594	4.6	1.4	108	85	4	592	4.6	2.4	116
1000	64	1.5	11757	9	7.8	92	64	5	3267	5.0	3.4	113	400	5	11242	5.0	2.7	442	64	5	3315	5.0	3.4	113
1010	25	3	9916	9	7.5	79	80	5	2005	4.9	2.0	115	550	5	9598	4.9	1.7	582	85	5	2154	5.0	2.1	121
1024	65	2.5	8294	5	5.6	101	65	2.5	1761	2.9	2.4	85	65	2.5	8196	4.6	5.6	101	65	2.5	1934	3.0	2.6	86
1088	25	3	5504	9	5.3	66	25	5	1213	4.0	2.8	68	375	5	5422	5.0	1.4	404	35	5	901	3.7	1.8	68
1100	90	2.5	1288	5	2.6	111	90	2.5	311	3.0	1.1	103	90	5	1248	4.8	2.5	130	90	2.5	311	3.0	1.1	103
1140	25	5	1070	8	3.4	74	25	5	271	4.2	1.9	59	90	5	1044	5.0	2.1	126	25	5	275	4.2	1.9	59
1148	300	10	845	2	1.1	352	10	3	184	5.0	2.2	32	300	10	826	2.5	1.1	352	10	5	183	4.6	2.0	45
1200	20	3	1380	5	7.0	71	20	3	718	4.1	5.0	59	20	3	1369	4.9	7.0	71	20	3	703	4.1	5.0	59
1216	0.001	15	1001	4	4.0	165	0.001	15	329	3.6	2.6	123	0.001	15	993	4.4	4.0	165	0.001	15	315	3.5	2.6	123
1232	4	4	152	6	2.1	33	25	5	152	4.9	1.0	50	25	5	152	4.9	1.0	50	25	5	150	4.9	1.0	50
1240	0.001	4	292	3	5.1	53	0.001	4	292	2.9	5.1	53	0.001	4	292	2.9	5.1	53	0.001	4	291	2.9	5.0	52
1256	4	2	158	3	4.0	26	4	2	158	3.3	4.0	26	4	2	158	3.3	4.0	26	4	2	158	3.3	4.0	26
1300	90	3	2633	7	3.8	122	90	3	1053	5.0	2.2	112	230	5	2612	5.0	2.2	267	90	3	951	4.8	2.1	112
1316	0.001	15	1758	5	4.9	192	0.001	15	366	3.3	2.7	126	0.001	15	1753	4.8	4.9	192	0.001	15	362	3.3	2.7	126
1340	0.001	15	1422	7	3.7	156	0.001	15	131	3.3	1.6	93	250	5	1419	4.9	1.1	276	0.001	15	119	3.3	1.6	93

APPENDIX E – 7
MHFD Cost Estimate Workbooks

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Alteratives Analysis**			
DRAINAGEWAY :	**Reach 100**			
REACH :	**1**			
JURISDICTION :	**Greeley**			
REACH ID:	**Option 2A-Reach1**	**Elena Lundeen**	**DATE :**	**9/29/2022**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	**Box Height (ft)**	**No. of Barrels**	**Length (ft)**				
6	3	1	127	L.F.	$923.32	$117,261.00	
6	4	1	295	L.F.	$1,009.44	$297,785.00	
12	4	2	52	L.F.	$3,058.36	$159,035.00	
Channel Improvements							
Excavation, Mid Range			18924	C.Y.	$40.00	$756,960.00	
Detention/Water Quality Facilities							
Detention (Complete-in-Place)							
Detention Facility 1 (Complete-in-Place)			16	AC-FT	$76,152.00	$1,233,662.00	
Detention Facility 2 (Complete-in-Place)			13	AC-FT	$76,152.00	$982,361.00	
Removals							
Removal of culvert pipe (48"<D<84")			526	L.F.	$84.00	$44,184.00	
Landscaping and Maintenance Improvements							
Reclamation & seeding (native grasses)			42	ACRE	$1,670.00	$70,808.00	
Land Acquisition							
Easement/ROW Acquisition			42.40	ACRE	$11,228.00	$476,067.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains				$0.00
Concrete Box Culverts				$574,081.00
Hydraulic Structures				$0.00
Channel Improvements				$756,960.00
Detention/Water Quality Facilities				$2,216,023.00
Removals				$44,184.00
Landscaping and Maintenance Improvements				$70,808.00
Special Items (User Defined)				$0.00
Subtotal Capital Improvement Costs				**$3,662,056.00**
Additional Capital Improvement Costs				
Dewatering			L.S.	$0.00
Mobilization	5%			$183,103.00
Traffic Control			L.S.	$0.00
Utility Coordination/Relocation			L.S.	$0.00

Stormwater Management/Erosion Control	5%		$183,103.00	
Subtotal Additional Capital Improvement Costs			**$366,206.00**	
Land Acquisition Costs				
ROW/Easements			$476,067.00	
Subtotal Land Acquisition Costs			**$476,067.00**	
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%		$604,239.00	
Legal/Administrative	5%		$201,413.00	
Contract Admin/Construction Management	10%		$402,826.00	
Contingency	25%		$1,007,066.00	
Subtotal Other Costs			**$2,215,544.00**	
Total Capital Improvement Costs			**$6,719,873.00**	

Master Plan Operation and Maintenance Cost Summary					
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, e	474	L.F.	$2.00	$948.00	
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	8935	L.F.	$3.00	$26,805.00	
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal, st	9.1	ACRE	$2,505.00	$22,796.00	
Total Annual Operation and Maintenance Cost				**$50,549.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$2,527,450.00**	

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$4,028,262.00
ROW/Easements	$476,067.00
Engineering	$604,239.00
Legal/Administrative	$201,413.00
Contract Admin/Construction Management	$402,826.00
Contingency	$1,007,066.00
Total Capital Improvement Costs	$6,719,873.00
Total Annual Operation and Maintenance Cost	$50,549.00
Total Operation and Maintenance Costs Over 50 Years	$2,527,450.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Alteratives Analysis**			
DRAINAGEWAY :	**Reach 100**			
REACH :	**1**			
JURISDICTION :	**Greeley**			
REACH ID:	**Option 2B-Reach1**	**Elena Lundeen**	**DATE :**	**9/29/2022**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	**Box Height (ft)**	**No. of Barrels**	**Length (ft)**				
6	3	1	127	L.F.	$923.32	$117,261.00	
12	4	2	52	L.F.	$3,058.36	$159,035.00	
8	5	1	295	L.F.	$1,252.80	$369,575.00	
Channel Improvements							
Excavation, Mid Range			24572	C.Y.	$40.00	$982,880.00	
Detention/Water Quality Facilities							
Detention (Complete-in-Place)							
Detention Facility 1 (Complete-in-Place)			16	AC-FT	$76,152.00	$1,233,662.00	
Removals							
Removal of culvert pipe (48"<D<84")			526	L.F.	$84.00	$44,184.00	
Landscaping and Maintenance Improvements							
Reclamation & seeding (native grasses)			43	ACRE	$1,670.00	$72,478.00	
Land Acquisition							
Easement/ROW Acquisition			43.40	ACRE	$11,228.00	$487,295.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains			$0.00	
Concrete Box Culverts			$645,871.00	
Hydraulic Structures			$0.00	
Channel Improvements			$982,880.00	
Detention/Water Quality Facilities			$1,233,662.00	
Removals			$44,184.00	
Landscaping and Maintenance Improvements			$72,478.00	
Special Items (User Defined)			$0.00	
Subtotal Capital Improvement Costs			**$2,979,075.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$148,954.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$148,954.00	

Subtotal Additional Capital Improvement Costs				**$297,908.00**
Land Acquisition Costs				
ROW/Easements				$487,295.00
Subtotal Land Acquisition Costs				**$487,295.00**
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%			$491,547.00
Legal/Administrative	5%			$163,849.00
Contract Admin/Construction Management	10%			$327,698.00
Contingency	25%			$819,246.00
Subtotal Other Costs				**$1,802,340.00**
Total Capital Improvement Costs				**$5,566,618.00**

Master Plan Operation and Maintenance Cost Summary				
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, e	474	L.F.	$2.00	$948.00
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	8935	L.F.	$3.00	$26,805.00
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal, st	5.2	ACRE	$2,505.00	$13,026.00
Total Annual Operation and Maintenance Cost				**$40,779.00**
Effective Interest Rate				0.00%
Total Operation and Maintenance Costs Over 50 Years				**$2,038,950.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Alteratives Analysis**			
DRAINAGEWAY :	**Reach 100**			
REACH :	**1**			
JURISDICTION :	**Greeley**			
REACH ID:	**Option 2C-Reach1**	**Elena Lundeen**	**DATE :**	**9/29/2022**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	**Box Height (ft)**	**No. of Barrels**	**Length (ft)**				
6	4	1	295	L.F.	$1,009.44	$297,785.00	
10	5	1	127	L.F.	$1,512.15	$192,043.00	
12	4	3	52	L.F.	$4,587.55	$238,552.00	
Channel Improvements							
Excavation, Mid Range			31786	C.Y.	$40.00	$1,271,440.00	
Detention/Water Quality Facilities							
Detention (Complete-in-Place)							
Detention Facility 1 (Complete-in-Place)			13	AC-FT	$76,152.00	$982,361.00	
Removals							
Removal of culvert pipe (48"<D<84")			526	L.F.	$84.00	$44,184.00	
Landscaping and Maintenance Improvements							
Reclamation & seeding (native grasses)			45	ACRE	$1,670.00	$74,482.00	
Land Acquisition							
Easement/ROW Acquisition			44.60	ACRE	$11,228.00	$500,769.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains			$0.00	
Concrete Box Culverts			$728,380.00	
Hydraulic Structures			$0.00	
Channel Improvements			$1,271,440.00	
Detention/Water Quality Facilities			$982,361.00	
Removals			$44,184.00	
Landscaping and Maintenance Improvements			$74,482.00	
Special Items (User Defined)			$0.00	
Subtotal Capital Improvement Costs			**$3,100,847.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$155,042.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$155,042.00	

Subtotal Additional Capital Improvement Costs				**$310,084.00**
Land Acquisition Costs				
ROW/Easements				$500,769.00
Subtotal Land Acquisition Costs				**$500,769.00**
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%			$511,640.00
Legal/Administrative	5%			$170,547.00
Contract Admin/Construction Management	10%			$341,093.00
Contingency	25%			$852,733.00
Subtotal Other Costs				**$1,876,013.00**
Total Capital Improvement Costs				**$5,787,713.00**

Master Plan Operation and Maintenance Cost Summary				
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, e	474	L.F.	$2.00	$948.00
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	8935	L.F.	$3.00	$26,805.00
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal, st	3.9	ACRE	$2,505.00	$9,770.00
Total Annual Operation and Maintenance Cost				**$37,523.00**
Effective Interest Rate				0.00%
Total Operation and Maintenance Costs Over 50 Years				**$1,876,150.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Alteratives Analysis**			
DRAINAGEWAY :	**Reach 100**			
REACH :	**1**			
JURISDICTION :	**Greeley**			
REACH ID:	**Option 3-Reach1**	**Elena Lundeen**	**DATE :**	**9/29/2022**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	**Box Height (ft)**	**No. of Barrels**	**Length (ft)**				
10	5	1	127	L.F.	$1,512.15	$192,043.00	
8	5	1	295	L.F.	$1,252.80	$369,575.00	
12	5	3	52	L.F.	$5,227.30	$271,819.00	
Channel Improvements							
Excavation, Mid Range			37600	C.Y.	$40.00	$1,504,000.00	
Removals							
Removal of culvert pipe (48"<D<84")			526	L.F.	$84.00	$44,184.00	
Landscaping and Maintenance Improvements							
Reclamation & seeding (native grasses)			43	ACRE	$1,670.00	$71,309.00	
Land Acquisition							
Easement/ROW Acquisition			42.70	ACRE	$11,228.00	$479,436.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains			$0.00	
Concrete Box Culverts			$833,437.00	
Hydraulic Structures			$0.00	
Channel Improvements			$1,504,000.00	
Detention/Water Quality Facilities			$0.00	
Removals			$44,184.00	
Landscaping and Maintenance Improvements			$71,309.00	
Special Items (User Defined)			$0.00	
Subtotal Capital Improvement Costs			**$2,452,930.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$122,647.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$122,647.00	
Subtotal Additional Capital Improvement Costs			**$245,294.00**	
Land Acquisition Costs				
ROW/Easements			$479,436.00	
Subtotal Land Acquisition Costs			**$479,436.00**	

Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%		$404,734.00	
Legal/Administrative	5%		$134,911.00	
Contract Admin/Construction Management	10%		$269,822.00	
Contingency	25%		$674,556.00	
Subtotal Other Costs			**$1,484,023.00**	
Total Capital Improvement Costs			**$4,661,683.00**	

Master Plan Operation and Maintenance Cost Summary					
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, e	474	L.F.	$2.00	$948.00	
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	8935	L.F.	$3.00	$26,805.00	
Total Annual Operation and Maintenance Cost				**$27,753.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$1,387,650.00**	

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Alteratives Analysis**			
DRAINAGEWAY :	**Reach 100**			
REACH :	**1**			
JURISDICTION :	**Greeley**			
REACH ID:	**Option 4-Reach1**	**Elena Lundeen**	**DATE :**	**9/29/2022**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	**Box Height (ft)**	**No. of Barrels**	**Length (ft)**				
6	3	1	127	L.F.	$923.32	$117,261.00	
6	4	1	295	L.F.	$1,009.44	$297,785.00	
12	4	2	52	L.F.	$3,058.36	$159,035.00	
Channel Improvements							
Excavation, Mid Range			13449	C.Y.	$40.00	$537,960.00	
Removals							
Removal of culvert pipe (48"<D<84")			526	L.F.	$84.00	$44,184.00	
Landscaping and Maintenance Improvements							
Reclamation & seeding (native grasses)			27	ACRE	$1,670.00	$45,758.00	
Special Items (User Defined)							
LID	**<----User Defined Items**		367	ACRE	$3,000.00	$1,101,000.00	
Land Acquisition							
Easement/ROW Acquisition			27.40	ACRE	$11,228.00	$307,647.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains				$0.00
Concrete Box Culverts				$574,081.00
Hydraulic Structures				$0.00
Channel Improvements				$537,960.00
Detention/Water Quality Facilities				$0.00
Removals				$44,184.00
Landscaping and Maintenance Improvements				$45,758.00
Special Items (User Defined)				$1,101,000.00
Subtotal Capital Improvement Costs				**$2,302,983.00**
Additional Capital Improvement Costs				
Dewatering		L.S.		$0.00
Mobilization	5%			$115,149.00
Traffic Control		L.S.		$0.00
Utility Coordination/Relocation		L.S.		$0.00
Stormwater Management/Erosion Control	5%			$115,149.00
Subtotal Additional Capital Improvement Costs				**$230,298.00**

Land Acquisition Costs				
ROW/Easements			$307,647.00	
Subtotal Land Acquisition Costs			**$307,647.00**	
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%		$379,992.00	
Legal/Administrative	5%		$126,664.00	
Contract Admin/Construction Management	10%		$253,328.00	
Contingency	25%		$633,320.00	
Subtotal Other Costs			**$1,393,304.00**	
Total Capital Improvement Costs			**$4,234,232.00**	

Master Plan Operation and Maintenance Cost Summary					
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, e	474	L.F.	$2.00	$948.00	
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	7450	L.F.	$3.00	$22,350.00	
LID Maintenance (6% of LID Cost) **<----User Defined Items**	1	LS	$66,060.00	$66,060.00	
Total Annual Operation and Maintenance Cost				**$89,358.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$4,467,900.00**	

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Alteratives Analysis**			
DRAINAGEWAY :	**Reach 100**			
REACH :	**100**			
JURISDICTION :	**Greeley**			
REACH ID:	**Option 1-Reach100**	**Elena Lundeen**	**DATE :**	**9/29/2022**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	**Box Height (ft)**	**No. of Barrels**	**Length (ft)**				
12	5	3	52	L.F.	$5,227.30	$271,819.00	
8	5	1	295	L.F.	$1,252.80	$369,575.00	
10	5	1	127	L.F.	$1,512.15	$192,043.00	
Headwall and Toewalls							
Individual Box Span (ft)	**No. of Barrels**	**Total Span (ft)**					
12	3	39.00	2	EA	$5,474.43	$10,949.00	
8	1	10.00	2	EA	$1,301.70	$2,603.00	
10	1	12.00	2	EA	$1,698.84	$3,398.00	
Wingwalls (includes wingwalls on either side of channel and concrete apron)							
Individual Box Span (ft)	**Box Rise (ft)**	**No. of Barrels**					
12	5	3	2	EA	$24,969.64	$49,939.30	
8	5	1	2	EA	$14,839.37	$29,678.70	
10	5	1	2	EA	$15,514.72	$31,029.40	
Removals							
Removal of culvert pipe (48"<D<84")			526	L.F.	$84.00	$44,184.00	

Master Plan Capital Improvement Cost Summary			
Capital Improvement Costs			
Pipe Culverts and Storm Drains			$0.00
Concrete Box Culverts			$961,034.00
Hydraulic Structures			$0.00
Channel Improvements			$0.00
Detention/Water Quality Facilities			$0.00
Removals			$44,184.00
Landscaping and Maintenance Improvements			$0.00
Special Items (User Defined)			$0.00
Subtotal Capital Improvement Costs			**$1,005,218.00**
Additional Capital Improvement Costs			
Dewatering		L.S.	$0.00
Mobilization	5%		$50,261.00
Traffic Control		L.S.	$0.00
Utility Coordination/Relocation		L.S.	$0.00
Stormwater Management/Erosion Control	5%		$50,261.00
Subtotal Additional Capital Improvement Costs			**$100,522.00**

Land Acquisition Costs				
ROW/Easements			$0.00	
Subtotal Land Acquisition Costs			**$0.00**	
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%		$165,861.00	
Legal/Administrative	5%		$55,287.00	
Contract Admin/Construction Management	10%		$110,574.00	
Contingency	25%		$276,435.00	
Subtotal Other Costs			**$608,157.00**	
Total Capital Improvement Costs			**$1,713,897.00**	

Master Plan Operation and Maintenance Cost Summary					
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, e	474	L.F.	$2.00	$948.00	
Total Annual Operation and Maintenance Cost				**$948.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$47,400.00**	

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Greeley - Oklahoma Drainage Basin			
DRAINAGEWAY :	Reach 200			
REACH :	1			
JURISDICTION :	Greeley			
REACH ID:	Option 2A-Reach1	Andrew Greer	DATE :	10/3/2022

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Pipe Culverts and Storm Drains							
Circular Pipes							
Diameter (in)	Length (ft)	No. of Barrels					
48-inch	327	1	327	L.F.	$240.00	$78,480.00	Structure #1 (48" CMP) at US Highway 34 (158 CFS)
Flare End Sections							
Diameter (in)	Applicable	No. of Barrels					
48-inch	Yes	1	2	EA	$3,440.00	$6,880.00	Structure #1 (48" CMP) at US Highway 34 (158 CFS)
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	Box Height (ft)	No. of Barrels	Length (ft)				
6	3	1	60	L.F.	$923.32	$55,399.00	Strucutre #2 (Box culvert) at Farm Road south of US 34 (158 CFS)
11	4	2	35	L.F.	$2,886.12	$101,014.00	Strucutre #25 (Box culvert at farm road) at Outfall 220 (1364 CFS)
Headwall and Toewalls							
Individual Box Span (ft)	No. of Barrels	Total Span (ft)					
6	1	8.00	2	EA	$1,034.96	$2,070.00	
11	2	25.00	2	EA	$3,539.25	$7,079.00	
Wingwalls (includes wingwalls on either side of channel and concrete apron)							
Individual Box Span (ft)	Box Rise (ft)	No. of Barrels					
6	3	1	2	EA	$8,534.24	$17,068.50	
11	4	2	2	EA	$15,877.45	$31,754.90	
Channel Improvements							
Excavation, Mid Range			5496	C.Y.	$40.00	$219,840.00	
Detention/Water Quality Facilities							
Detention (Complete-in-Place)							
Detention Facility 1 (Complete-in-Place)			19	AC-FT	$76,152.00	$1,446,888.00	
Detention Facility 2 (Complete-in-Place)			16	AC-FT	$76,152.00	$1,218,432.00	
Removals							
Removal of culvert pipe (48"<D<84")			422	L.F.	$84.00	$35,448.00	
Landscaping and Maintenance Improvements							
Reclamation & seeding (native grasses)			56	ACRE	$1,670.00	$93,520.00	
Land Acquisition							
Easement/ROW Acquisition			30.00	ACRE	$11,228.00	$336,840.00	

Master Plan Capital Improvement Cost Summary		
Capital Improvement Costs		
Pipe Culverts and Storm Drains	$85,360.00	

Concrete Box Culverts			$214,385.00	
Hydraulic Structures			$0.00	
Channel Improvements			$219,840.00	
Detention/Water Quality Facilities			$2,665,320.00	
Removals			$35,448.00	
Landscaping and Maintenance Improvements			$93,520.00	
Special Items (User Defined)			$0.00	
Subtotal Capital Improvement Costs			**$3,313,873.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$165,694.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$165,694.00	
Subtotal Additional Capital Improvement Costs			**$331,388.00**	
Land Acquisition Costs				
ROW/Easements			$336,840.00	
Subtotal Land Acquisition Costs			**$336,840.00**	
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%		$546,789.00	
Legal/Administrative	5%		$182,263.00	
Contract Admin/Construction Management	10%		$364,526.00	
Contingency	25%		$911,315.00	
Subtotal Other Costs			**$2,004,893.00**	
Total Capital Improvement Costs			**$5,986,994.00**	

Master Plan Operation and Maintenance Cost Summary					
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, etc.)	95	L.F.	$2.00	$190.00	
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	11313	L.F.	$3.00	$33,939.00	
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal, struct	12.5	ACRE	$2,505.00	$31,313.00	
Total Annual Operation and Maintenance Cost				**$65,442.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$3,272,100.00**	

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$3,645,261.00
ROW/Easements	$336,840.00
Engineering	$546,789.00
Legal/Administrative	$182,263.00
Contract Admin/Construction Management	$364,526.00
Contingency	$911,315.00
Total Capital Improvement Costs	$5,986,994.00
Total Annual Operation and Maintenance Cost	$65,442.00
Total Operation and Maintenance Costs Over 50 Years	$3,272,100.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Oklahoma Drainage Basin**			
DRAINAGEWAY :	**Reach 200**			
REACH :	**1**			
JURISDICTION :	**Greeley**			
REACH ID:	**Option 2B-Reach1**	**Andrew Greer**	**DATE :**	**10/3/2022**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Pipe Culverts and Storm Drains							
Circular Pipes							
Diameter (in)	**Length (ft)**	**No. of Barrels**					
48-inch	327	1	327	L.F.	$240.00	$78,480.00	Structure #1 (48" CMP) at US Highway 34 (158 CFS)
Flare End Sections							
Diameter (in)	**Applicable**	**No. of Barrels**					
48-inch	Yes	1	2	EA	$3,440.00	$6,880.00	Structure #1 (48" CMP) at US Highway 34 (158 CFS)
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	**Box Height (ft)**	**No. of Barrels**	**Length (ft)**				
6	3	1	60	L.F.	$923.32	$55,399.00	Strucutre #2 (Box culvert) at Farm Road south of US 34 (152 CFS)
12	5	2	35	L.F.	$3,484.86	$121,970.00	Strucutre #25 (Box culvert at farm road) at Outfall 220 (1783 CFS)
Channel Improvements							
Excavation, Mid Range			23719	C.Y.	$40.00	$948,760.00	
Detention/Water Quality Facilities							
Detention (Complete-in-Place)							
Detention Facility 1 (Complete-in-Place)			16	AC-FT	$76,152.00	$1,233,662.00	
Removals							
Removal of culvert pipe (48"<D<84")			422	L.F.	$84.00	$35,448.00	
Landscaping and Maintenance Improvements							
Reclamation & seeding (native grasses)			77	ACRE	$1,670.00	$128,590.00	
Land Acquisition							
Easement/ROW Acquisition			51.00	ACRE	$11,228.00	$572,628.00	

Master Plan Capital Improvement Cost Summary		
Capital Improvement Costs		
Pipe Culverts and Storm Drains	$85,360.00	
Concrete Box Culverts	$177,369.00	
Hydraulic Structures	$0.00	
Channel Improvements	$948,760.00	
Detention/Water Quality Facilities	$1,233,662.00	
Removals	$35,448.00	
Landscaping and Maintenance Improvements	$128,590.00	
Special Items (User Defined)	$0.00	
Subtotal Capital Improvement Costs	**$2,609,189.00**	

Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$130,459.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$130,459.00	
Subtotal Additional Capital Improvement Costs			**$260,918.00**	
Land Acquisition Costs				
ROW/Easements			$572,628.00	
Subtotal Land Acquisition Costs			**$572,628.00**	
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%		$430,516.00	
Legal/Administrative	5%		$143,505.00	
Contract Admin/Construction Management	10%		$287,011.00	
Contingency	25%		$717,527.00	
Subtotal Other Costs			**$1,578,559.00**	
Total Capital Improvement Costs			**$5,021,294.00**	

Master Plan Operation and Maintenance Cost Summary					
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, et	95	L.F.	$2.00	$190.00	
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	11313	L.F.	$3.00	$33,939.00	
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal, st	5.4	ACRE	$2,505.00	$13,527.00	
Total Annual Operation and Maintenance Cost				**$47,656.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$2,382,800.00**	

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$2,870,107.00
ROW/Easements	$572,628.00
Engineering	$430,516.00
Legal/Administrative	$143,505.00
Contract Admin/Construction Management	$287,011.00
Contingency	$717,527.00
Total Capital Improvement Costs	$5,021,294.00
Total Annual Operation and Maintenance Cost	$47,656.00
Total Operation and Maintenance Costs Over 50 Years	$2,382,800.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Oklahoma Drainage Basin**			
DRAINAGEWAY :	**Reach 200**			
REACH :	**1**			
JURISDICTION :	**Greeley**			
REACH ID:	**Option 2C-Reach1**	**Andrew Greer**	**DATE :**	**10/3/2022**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Pipe Culverts and Storm Drains							
Circular Pipes							
Diameter (in)	**Length (ft)**	**No. of Barrels**					
48-inch	327	1	327	L.F.	$240.00	$78,480.00	Structure #1 (48" CMP) at US Highway 34 (158 CFS)
Flare End Sections							
Diameter (in)	**Applicable**	**No. of Barrels**					
48-inch	Yes	1	2	EA	$3,440.00	$6,880.00	Structure #1 (48" CMP) at US Highway 34 (158 CFS)
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	**Box Height (ft)**	**No. of Barrels**	**Length (ft)**				
7	3	2	60	L.F.	$2,018.88	$121,133.00	Strucutre #2 (Box culvert) at Farm Road south of US 34 (348 CFS)
12	5	2	35	L.F.	$3,484.86	$121,970.00	Strucutre #25 (Box culvert at farm road at Outfall 220 (1686 CFS)
Channel Improvements							
Excavation, Mid Range			14605	C.Y.	$40.00	$584,200.00	
Detention/Water Quality Facilities							
Detention (Complete-in-Place)							
Detention Facility 1 (Complete-in-Place)			19	AC-FT	$76,152.00	$1,446,888.00	
Removals							
Removal of culvert pipe (48"<D<84")			422	L.F.	$84.00	$35,448.00	
Landscaping and Maintenance Improvements							
Reclamation & seeding (native grasses)			69	ACRE	$1,670.00	$115,230.00	
Land Acquisition							
Easement/ROW Acquisition			43.00	ACRE	$11,228.00	$482,804.00	

Master Plan Capital Improvement Cost Summary		
Capital Improvement Costs		
Pipe Culverts and Storm Drains	$85,360.00	
Concrete Box Culverts	$243,103.00	
Hydraulic Structures	$0.00	
Channel Improvements	$584,200.00	
Detention/Water Quality Facilities	$1,446,888.00	
Removals	$35,448.00	
Landscaping and Maintenance Improvements	$115,230.00	
Special Items (User Defined)	$0.00	
Subtotal Capital Improvement Costs	**$2,510,229.00**	

Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$125,511.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$125,511.00	
Subtotal Additional Capital Improvement Costs			**$251,022.00**	
Land Acquisition Costs				
ROW/Easements			$482,804.00	
Subtotal Land Acquisition Costs			**$482,804.00**	
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%		$414,188.00	
Legal/Administrative	5%		$138,063.00	
Contract Admin/Construction Management	10%		$276,125.00	
Contingency	25%		$690,313.00	
Subtotal Other Costs			**$1,518,689.00**	
Total Capital Improvement Costs			**$4,762,744.00**	

Master Plan Operation and Maintenance Cost Summary					
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, et	95	L.F.	$2.00	$190.00	
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	11313	L.F.	$3.00	$33,939.00	
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal, st	7.1	ACRE	$2,505.00	$17,786.00	
Total Annual Operation and Maintenance Cost				**$51,915.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$2,595,750.00**	

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$2,761,251.00
ROW/Easements	$482,804.00
Engineering	$414,188.00
Legal/Administrative	$138,063.00
Contract Admin/Construction Management	$276,125.00
Contingency	$690,313.00
Total Capital Improvement Costs	$4,762,744.00
Total Annual Operation and Maintenance Cost	$51,915.00
Total Operation and Maintenance Costs Over 50 Years	$2,595,750.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Oklahoma Drainage Basin**			
DRAINAGEWAY :	**Reach 200**			
REACH :	**1**			
JURISDICTION :	**Greeley**			
REACH ID:	**Option 3-Reach1**	**Andrew Greer**	**DATE :**	**10/3/2022**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Pipe Culverts and Storm Drains							
Circular Pipes							
Diameter (in)	**Length (ft)**	**No. of Barrels**					
48-inch	327	1	327	L.F.	$240.00	$78,480.00	Structure #1 (48" CMP) at US Highway 34 (158 CFS)
Flare End Sections							
Diameter (in)	**Applicable**	**No. of Barrels**					
48-inch	Yes	1	2	EA	$3,440.00	$6,880.00	Structure #1 (48" CMP) at US Highway 34 (158 CFS)
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	**Box Height (ft)**	**No. of Barrels**	**Length (ft)**				
6	3	1	60	L.F.	$923.32	$55,399.00	Strucutre #2 (Box culvert) at Farm Road south of US 34 (158 CFS)
12	5	3	35	L.F.	$5,227.30	$182,955.00	Strucutre #25 (Box culvert at farm road) at Outfall 220 (2273 CFS)
Channel Improvements							
Excavation, Mid Range			47775	C.Y.	$40.00	$1,911,000.00	
Removals							
Removal of culvert pipe (48"<D<84")			422	L.F.	$84.00	$35,448.00	
Landscaping and Maintenance Improvements							
Reclamation & seeding (native grasses)			94	ACRE	$1,670.00	$156,980.00	
Land Acquisition							
Easement/ROW Acquisition			68.00	ACRE	$11,228.00	$763,504.00	

Master Plan Capital Improvement Cost Summary							
Capital Improvement Costs							
Pipe Culverts and Storm Drains						$85,360.00	
Concrete Box Culverts						$238,354.00	
Hydraulic Structures						$0.00	
Channel Improvements						$1,911,000.00	
Detention/Water Quality Facilities						$0.00	
Removals						$35,448.00	
Landscaping and Maintenance Improvements						$156,980.00	
Special Items (User Defined)						$0.00	
Subtotal Capital Improvement Costs						**$2,427,142.00**	
Additional Capital Improvement Costs							
Dewatering				L.S.		$0.00	
Mobilization			5%			$121,357.00	

Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$121,357.00	
Subtotal Additional Capital Improvement Costs			**$242,714.00**	
Land Acquisition Costs				
ROW/Easements			$763,504.00	
Subtotal Land Acquisition Costs			**$763,504.00**	
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%		$400,478.00	
Legal/Administrative	5%		$133,493.00	
Contract Admin/Construction Management	10%		$266,986.00	
Contingency	25%		$667,464.00	
Subtotal Other Costs			**$1,468,421.00**	
Total Capital Improvement Costs			**$4,901,781.00**	

Master Plan Operation and Maintenance Cost Summary					
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, e	95	L.F.	$2.00	$190.00	
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	11313	L.F.	$3.00	$33,939.00	
Total Annual Operation and Maintenance Cost				**$34,129.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$1,706,450.00**	

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$2,669,856.00
ROW/Easements	$763,504.00
Engineering	$400,478.00
Legal/Administrative	$133,493.00
Contract Admin/Construction Management	$266,986.00
Contingency	$667,464.00
Total Capital Improvement Costs	$4,901,781.00
Total Annual Operation and Maintenance Cost	$34,129.00
Total Operation and Maintenance Costs Over 50 Years	$1,706,450.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Oklahoma Drainage Basin**			
DRAINAGEWAY :	**Reach 200**			
REACH :	**1**			
JURISDICTION :	**Greeley**			
REACH ID:	**Option 4-Reach1**	**Andrew Greer**	**DATE :**	**10/3/2022**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Pipe Culverts and Storm Drains							
Circular Pipes							
Diameter (in)	**Length (ft)**	**No. of Barrels**					
48-inch	327	1	327	L.F.	$240.00	$78,480.00	
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	**Box Height (ft)**	**No. of Barrels**	**Length (ft)**				
6	3	1	60	L.F.	$923.32	$55,399.00	
11	4	2	35	L.F.	$2,886.12	$101,014.00	
Channel Improvements							
Excavation, Mid Range			7703	C.Y.	$40.00	$308,120.00	
Removals							
Removal of culvert pipe (48"<D<84")			422	L.F.	$84.00	$35,448.00	
Special Items (User Defined)							
LID	**<----User Defined Items**		588	ACRE	$3,000.00	$1,764,000.00	
Land Acquisition							
Easement/ROW Acquisition			27.00	ACRE	$11,228.00	$303,156.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains			$78,480.00	
Concrete Box Culverts			$156,413.00	
Hydraulic Structures			$0.00	
Channel Improvements			$308,120.00	
Detention/Water Quality Facilities			$0.00	
Removals			$35,448.00	
Landscaping and Maintenance Improvements			$0.00	
Special Items (User Defined)			$1,764,000.00	
Subtotal Capital Improvement Costs			**$2,342,461.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$117,123.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$117,123.00	

Subtotal Additional Capital Improvement Costs				**$234,246.00**
Land Acquisition Costs				
ROW/Easements				$303,156.00
Subtotal Land Acquisition Costs				**$303,156.00**
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%			$386,506.00
Legal/Administrative	5%			$128,835.00
Contract Admin/Construction Management	10%			$257,671.00
Contingency	25%			$644,177.00
Subtotal Other Costs				**$1,417,189.00**
Total Capital Improvement Costs				**$4,297,052.00**

Master Plan Operation and Maintenance Cost Summary					
Description		**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, e		95	L.F.	$2.00	$190.00
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)		11313	L.F.	$3.00	$33,939.00
LID Maintenance (6% of LID cost)	**<----User Defined Items**	1	LS	$105,840.00	$105,840.00
Total Annual Operation and Maintenance Cost					**$139,969.00**
Effective Interest Rate					0.00%
Total Operation and Maintenance Costs Over 50 Years					**$6,998,450.00**

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$2,576,707.00
ROW/Easements	$303,156.00
Engineering	$386,506.00
Legal/Administrative	$128,835.00
Contract Admin/Construction Management	$257,671.00
Contingency	$644,177.00
Total Capital Improvement Costs	$4,297,052.00
Total Annual Operation and Maintenance Cost	$139,969.00
Total Operation and Maintenance Costs Over 50 Years	$6,998,450.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Oklahoma Drainage Basin**			
DRAINAGEWAY :	**Reach 200**			
REACH :	**1**			
JURISDICTION :	**Greeley**			
REACH ID:	**Option 1-Reach1**	**Andrew Greer**	**DATE :**	**10/3/2022**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Pipe Culverts and Storm Drains							
Circular Pipes							
Diameter (in)	**Length (ft)**	**No. of Barrels**					
48-inch	327	1	327	L.F.	$240.00	$78,480.00	
Flare End Sections							
Diameter (in)	**Applicable**	**No. of Barrels**					
48-inch	Yes	1	2	EA	$3,440.00	$6,880.00	
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	**Box Height (ft)**	**No. of Barrels**	**Length (ft)**				
12	5	3	35	L.F.	$5,227.30	$182,955.00	
6	3	1	60	L.F.	$923.32	$55,399.00	
Headwall and Toewalls							
Individual Box Span (ft)	**No. of Barrels**	**Total Span (ft)**					
12	3	39.00	2	EA	$5,474.43	$10,949.00	
6	1	8.00	2	EA	$1,034.96	$2,070.00	
Wingwalls (includes wingwalls on either side of channel and concrete apron)							
Individual Box Span (ft)	**Box Rise (ft)**	**No. of Barrels**					
12	5	3	2	EA	$24,969.64	$49,939.30	
6	3	1	2	EA	$8,534.24	$17,068.50	
Removals							
Removal of culvert pipe (48"<D<84")			422	L.F.	$84.00	$35,448.00	

Master Plan Capital Improvement Cost Summary							
Capital Improvement Costs							
Pipe Culverts and Storm Drains						$85,360.00	
Concrete Box Culverts						$318,381.00	
Hydraulic Structures						$0.00	
Channel Improvements						$0.00	
Detention/Water Quality Facilities						$0.00	
Removals						$35,448.00	
Landscaping and Maintenance Improvements						$0.00	
Special Items (User Defined)						$0.00	
Subtotal Capital Improvement Costs						**$439,189.00**	
Additional Capital Improvement Costs							
Dewatering				L.S.		$0.00	

Mobilization	5%		$21,959.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$21,959.00	
Subtotal Additional Capital Improvement Costs			**$43,918.00**	
Land Acquisition Costs				
ROW/Easements			$0.00	
Subtotal Land Acquisition Costs			**$0.00**	
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%		$72,466.00	
Legal/Administrative	5%		$24,155.00	
Contract Admin/Construction Management	10%		$48,311.00	
Contingency	25%		$120,777.00	
Subtotal Other Costs			**$265,709.00**	
Total Capital Improvement Costs			**$748,816.00**	

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, e	95	L.F.	$2.00	$190.00
Total Annual Operation and Maintenance Cost				**$190.00**
Effective Interest Rate				0.00%
Total Operation and Maintenance Costs Over 50 Years				**$9,500.00**

Summary for Tabulation (Does Not Print)

Capital Improvement Costs	$483,107.00
ROW/Easements	$0.00
Engineering	$72,466.00
Legal/Administrative	$24,155.00
Contract Admin/Construction Management	$48,311.00
Contingency	$120,777.00
Total Capital Improvement Costs	$748,816.00
Total Annual Operation and Maintenance Cost	$190.00
Total Operation and Maintenance Costs Over 50 Years	$9,500.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Alternative Analysis**			
DRAINAGEWAY :	**Reach 500**			
REACH :	**500**			
JURISDICTION :	**Greeley**			
REACH ID:	**Option 2-Reach500**	**Elena Lundeen**	**DATE :**	**9/30/2022**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	**Box Height (ft)**	**No. of Barrels**	**Length (ft)**				
8	3	1	88	L.F.	$1,095.56	$96,410.00	
Detention/Water Quality Facilities							
Detention (Complete-in-Place)							
Detention Facility 1 (Complete-in-Place)			18	AC-FT	$76,152.00	$1,401,197.00	
Removals							
Concrete Box Culvert			88	L.F./CELL	$167.00	$14,696.00	
Landscaping and Maintenance Improvements							
Reclamation & seeding (native grasses)			6	ACRE	$1,670.00	$10,521.00	
Land Acquisition							
Easement/ROW Acquisition			6.30	ACRE	$11,228.00	$70,736.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains			$0.00	
Concrete Box Culverts			$96,410.00	
Hydraulic Structures			$0.00	
Channel Improvements			$0.00	
Detention/Water Quality Facilities			$1,401,197.00	
Removals			$14,696.00	
Landscaping and Maintenance Improvements			$10,521.00	
Special Items (User Defined)			$0.00	
Subtotal Capital Improvement Costs			**$1,522,824.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$76,141.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$76,141.00	
Subtotal Additional Capital Improvement Costs			**$152,282.00**	
Land Acquisition Costs				
ROW/Easements			$70,736.00	
Subtotal Land Acquisition Costs			**$70,736.00**	
Other Costs (percentage of Capital Improvement Costs)				

Engineering	15%			$251,266.00	
Legal/Administrative	5%			$83,755.00	
Contract Admin/Construction Management	10%			$167,511.00	
Contingency	25%			$418,777.00	
Subtotal Other Costs				**$921,309.00**	
Total Capital Improvement Costs				**$2,667,151.00**	

Master Plan Operation and Maintenance Cost Summary					
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, e	88	L.F.	$2.00	$176.00	
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal, st	6.3	ACRE	$2,505.00	$15,782.00	
Total Annual Operation and Maintenance Cost				**$15,958.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$797,900.00**	

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$1,675,106.00
ROW/Easements	$70,736.00
Engineering	$251,266.00
Legal/Administrative	$83,755.00
Contract Admin/Construction Management	$167,511.00
Contingency	$418,777.00
Total Capital Improvement Costs	$2,667,151.00
Total Annual Operation and Maintenance Cost	$15,958.00
Total Operation and Maintenance Costs Over 50 Years	$797,900.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Alternative Analysis**			
DRAINAGEWAY :	**Reach 500**			
REACH :	**500**			
JURISDICTION :	**Greeley**			
REACH ID:	**Option 3-Reach500**	**Elena Lundeen**	**DATE :**	**9/30/2022**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	**Box Height (ft)**	**No. of Barrels**	**Length (ft)**				
8	5	1	88	L.F.	$1,252.80	$110,246.00	
Channel Improvements							
Excavation, Mid Range			5168	C.Y.	$40.00	$206,720.00	
Removals							
Concrete Box Culvert			88	L.F./CELL	$167.00	$14,696.00	
Landscaping and Maintenance Improvements							
Reclamation & seeding (native grasses)			9	ACRE	$1,670.00	$15,364.00	
Land Acquisition							
Easement/ROW Acquisition			9.20	ACRE	$11,228.00	$103,298.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains			$0.00	
Concrete Box Culverts			$110,246.00	
Hydraulic Structures			$0.00	
Channel Improvements			$206,720.00	
Detention/Water Quality Facilities			$0.00	
Removals			$14,696.00	
Landscaping and Maintenance Improvements			$15,364.00	
Special Items (User Defined)			$0.00	
Subtotal Capital Improvement Costs			**$347,026.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$17,351.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$17,351.00	
Subtotal Additional Capital Improvement Costs			**$34,702.00**	
Land Acquisition Costs				
ROW/Easements			$103,298.00	
Subtotal Land Acquisition Costs			**$103,298.00**	
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%		$57,259.00	

Legal/Administrative	5%		$19,086.00	
Contract Admin/Construction Management	10%		$38,173.00	
Contingency	25%		$95,432.00	
Subtotal Other Costs			**$209,950.00**	
Total Capital Improvement Costs			**$694,976.00**	

Master Plan Operation and Maintenance Cost Summary					
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, e	88	L.F.	$2.00	$176.00	
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	3468	L.F.	$3.00	$10,404.00	
Total Annual Operation and Maintenance Cost				**$10,580.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$529,000.00**	

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$381,728.00
ROW/Easements	$103,298.00
Engineering	$57,259.00
Legal/Administrative	$19,086.00
Contract Admin/Construction Management	$38,173.00
Contingency	$95,432.00
Total Capital Improvement Costs	$694,976.00
Total Annual Operation and Maintenance Cost	$10,580.00
Total Operation and Maintenance Costs Over 50 Years	$529,000.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Alternative Analysis**			
DRAINAGEWAY :	**Reach 500**			
REACH :	**500**			
JURISDICTION :	**Greeley**			
REACH ID:	**Option 4-Reach500**	**Elena Lundeen**	**DATE :**	**9/30/2022**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	**Box Height (ft)**	**No. of Barrels**	**Length (ft)**				
8	3	1	88	L.F.	$1,095.56	$96,410.00	
Removals							
Concrete Box Culvert			88	L.F./CELL	$167.00	$14,696.00	
Special Items (User Defined)							
LID	**<----User Defined Items**		180	ACRE	$3,000.00	$540,000.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains			$0.00	
Concrete Box Culverts			$96,410.00	
Hydraulic Structures			$0.00	
Channel Improvements			$0.00	
Detention/Water Quality Facilities			$0.00	
Removals			$14,696.00	
Landscaping and Maintenance Improvements			$0.00	
Special Items (User Defined)			$540,000.00	
Subtotal Capital Improvement Costs			**$651,106.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$32,555.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$32,555.00	
Subtotal Additional Capital Improvement Costs			**$65,110.00**	
Land Acquisition Costs				
ROW/Easements			$0.00	
Subtotal Land Acquisition Costs			**$0.00**	
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%		$107,432.00	
Legal/Administrative	5%		$35,811.00	
Contract Admin/Construction Management	10%		$71,622.00	
Contingency	25%		$179,054.00	
Subtotal Other Costs			**$393,919.00**	

Total Capital Improvement Costs	**$1,110,135.00**

Master Plan Operation and Maintenance Cost Summary					
Description		**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, e		88	L.F.	$2.00	$176.00
LID Maintenance (6% of LID Cost)	**<----User Defined Items**	1	LS	$32,400.00	$32,400.00
Total Annual Operation and Maintenance Cost					**$32,576.00**
Effective Interest Rate					0.00%
Total Operation and Maintenance Costs Over 50 Years					**$1,628,800.00**

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$716,216.00
ROW/Easements	$0.00
Engineering	$107,432.00
Legal/Administrative	$35,811.00
Contract Admin/Construction Management	$71,622.00
Contingency	$179,054.00
Total Capital Improvement Costs	$1,110,135.00
Total Annual Operation and Maintenance Cost	$32,576.00
Total Operation and Maintenance Costs Over 50 Years	$1,628,800.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Alternative Analysis**			
DRAINAGEWAY :	**Reach 500**			
REACH :	**500**			
JURISDICTION :	**Greeley**			
REACH ID:	**Option 1-Reach500**	**Elena Lundeen**	**DATE :**	**9/30/2022**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	**Box Height (ft)**	**No. of Barrels**	**Length (ft)**				
8	5	1	86	L.F.	$1,252.80	$107,740.00	
Headwall and Toewalls							
Individual Box Span (ft)	**No. of Barrels**	**Total Span (ft)**					
8	1	10.00	2	EA	$1,301.70	$2,603.00	
Wingwalls (includes wingwalls on either side of channel and concrete apron)							
Individual Box Span (ft)	**Box Rise (ft)**	**No. of Barrels**					
8	5	1	2	EA	$14,839.37	$29,678.70	
Removals							
Concrete Box Culvert			88	L.F./CELL	$167.00	$14,696.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains			$0.00	
Concrete Box Culverts			$140,022.00	
Hydraulic Structures			$0.00	
Channel Improvements			$0.00	
Detention/Water Quality Facilities			$0.00	
Removals			$14,696.00	
Landscaping and Maintenance Improvements			$0.00	
Special Items (User Defined)			$0.00	
Subtotal Capital Improvement Costs			**$154,718.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$7,736.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$7,736.00	
Subtotal Additional Capital Improvement Costs			**$15,472.00**	
Land Acquisition Costs				
ROW/Easements			$0.00	
Subtotal Land Acquisition Costs			**$0.00**	
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%		$25,529.00	
Legal/Administrative	5%		$8,510.00	

Contract Admin/Construction Management	10%		$17,019.00	
Contingency	25%		$42,548.00	
Subtotal Other Costs			**$93,606.00**	
Total Capital Improvement Costs			**$263,796.00**	

Master Plan Operation and Maintenance Cost Summary					
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, e	88	L.F.	$2.00	$176.00	
Total Annual Operation and Maintenance Cost				**$176.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$8,800.00**	

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$170,190.00
ROW/Easements	$0.00
Engineering	$25,529.00
Legal/Administrative	$8,510.00
Contract Admin/Construction Management	$17,019.00
Contingency	$42,548.00
Total Capital Improvement Costs	$263,796.00
Total Annual Operation and Maintenance Cost	$176.00
Total Operation and Maintenance Costs Over 50 Years	$8,800.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Alternatives Analysis**			
DRAINAGEWAY :	**Reach 600**			
REACH :	**600**			
JURISDICTION :	**Greeley**			
REACH ID:	**Option 2-Reach600**	**Elena Lundeen**	**DATE :**	**9/30/2022**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	**Box Height (ft)**	**No. of Barrels**	**Length (ft)**				
7	3	1	80	L.F.	$1,009.44	$80,755.00	
10	4	1	41	L.F.	$1,354.93	$55,552.00	
8	5	1	120	L.F.	$1,252.80	$150,336.00	
Channel Improvements							
Excavation, Mid Range			4001	C.Y.	$40.00	$160,040.00	
Detention/Water Quality Facilities							
Detention (Complete-in-Place)							
Detention Facility 1 (Complete-in-Place)			21	AC-FT	$76,152.00	$1,614,422.00	
Removals							
Removal of culvert pipe (48"<D<84")			396	L.F.	$84.00	$33,264.00	
Landscaping and Maintenance Improvements							
Reclamation & seeding (native grasses)			13	ACRE	$1,670.00	$22,378.00	
Land Acquisition							
Easement/ROW Acquisition			13.40	ACRE	$11,228.00	$150,455.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains			$0.00	
Concrete Box Culverts			$286,643.00	
Hydraulic Structures			$0.00	
Channel Improvements			$160,040.00	
Detention/Water Quality Facilities			$1,614,422.00	
Removals			$33,264.00	
Landscaping and Maintenance Improvements			$22,378.00	
Special Items (User Defined)			$0.00	
Subtotal Capital Improvement Costs			**$2,116,747.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$105,837.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$105,837.00	

Subtotal Additional Capital Improvement Costs				**$211,674.00**
Land Acquisition Costs				
ROW/Easements				$150,455.00
Subtotal Land Acquisition Costs				**$150,455.00**
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%			$349,263.00
Legal/Administrative	5%			$116,421.00
Contract Admin/Construction Management	10%			$232,842.00
Contingency	25%			$582,105.00
Subtotal Other Costs				**$1,280,631.00**
Total Capital Improvement Costs				**$3,759,507.00**

Master Plan Operation and Maintenance Cost Summary				
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, e	241	L.F.	$2.00	$482.00
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	1991	L.F.	$3.00	$5,973.00
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal, st	7.8	ACRE	$2,505.00	$19,539.00
Total Annual Operation and Maintenance Cost				**$25,994.00**
Effective Interest Rate				0.00%
Total Operation and Maintenance Costs Over 50 Years				**$1,299,700.00**

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$2,328,421.00
ROW/Easements	$150,455.00
Engineering	$349,263.00
Legal/Administrative	$116,421.00
Contract Admin/Construction Management	$232,842.00
Contingency	$582,105.00
Total Capital Improvement Costs	$3,759,507.00
Total Annual Operation and Maintenance Cost	$25,994.00
Total Operation and Maintenance Costs Over 50 Years	$1,299,700.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Alternatives Analysis**			
DRAINAGEWAY :	**Reach 600**			
REACH :	**600**			
JURISDICTION :	**Greeley**			
REACH ID:	**Option 3-Reach600**	**Elena Lundeen**	**DATE :**	**9/30/2022**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	**Box Height (ft)**	**No. of Barrels**	**Length (ft)**				
12	5	1	80	L.F.	$1,742.43	$139,395.00	
7	5	2	41	L.F.	$2,367.38	$97,062.00	
10	6	1	120	L.F.	$1,669.36	$200,323.00	
Channel Improvements							
Excavation, Mid Range			16957	C.Y.	$40.00	$678,280.00	
Removals							
Removal of culvert pipe (48"<D<84")			396	L.F.	$84.00	$33,264.00	
Landscaping and Maintenance Improvements							
Reclamation & seeding (native grasses)			30	ACRE	$1,670.00	$49,933.00	
Land Acquisition							
Easement/ROW Acquisition			29.90	ACRE	$11,228.00	$335,717.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains			$0.00	
Concrete Box Culverts			$436,780.00	
Hydraulic Structures			$0.00	
Channel Improvements			$678,280.00	
Detention/Water Quality Facilities			$0.00	
Removals			$33,264.00	
Landscaping and Maintenance Improvements			$49,933.00	
Special Items (User Defined)			$0.00	
Subtotal Capital Improvement Costs			**$1,198,257.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$59,913.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$59,913.00	
Subtotal Additional Capital Improvement Costs			**$119,826.00**	
Land Acquisition Costs				
ROW/Easements			$335,717.00	
Subtotal Land Acquisition Costs			**$335,717.00**	

Other Costs (percentage of Capital Improvement Costs)			
Engineering	15%		$197,712.00
Legal/Administrative	5%		$65,904.00
Contract Admin/Construction Management	10%		$131,808.00
Contingency	25%		$329,521.00
Subtotal Other Costs			**$724,945.00**
Total Capital Improvement Costs			**$2,378,745.00**

Master Plan Operation and Maintenance Cost Summary				
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, e	241	L.F.	$2.00	$482.00
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	7378	L.F.	$3.00	$22,134.00
Total Annual Operation and Maintenance Cost				**$22,616.00**
Effective Interest Rate				0.00%
Total Operation and Maintenance Costs Over 50 Years				**$1,130,800.00**

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$1,318,083.00
ROW/Easements	$335,717.00
Engineering	$197,712.00
Legal/Administrative	$65,904.00
Contract Admin/Construction Management	$131,808.00
Contingency	$329,521.00
Total Capital Improvement Costs	$2,378,745.00
Total Annual Operation and Maintenance Cost	$22,616.00
Total Operation and Maintenance Costs Over 50 Years	$1,130,800.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Alternatives Analysis**			
DRAINAGEWAY :	**Reach 600**			
REACH :	**600**			
JURISDICTION :	**Greeley**			
REACH ID:	**Option 4-Reach600**	**Elena Lundeen**	**DATE :**	**9/30/2022**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	**Box Height (ft)**	**No. of Barrels**	**Length (ft)**				
7	3	1	80	L.F.	$1,009.44	$80,755.00	
10	4	1	41	L.F.	$1,354.93	$55,552.00	
8	5	1	120	L.F.	$1,252.80	$150,336.00	
Channel Improvements							
Excavation, Mid Range			749	C.Y.	$40.00	$29,960.00	
Removals							
Removal of culvert pipe (48"<D<84")			396	L.F.	$84.00	$33,264.00	
Landscaping and Maintenance Improvements							
Reclamation & seeding (native grasses)			3	ACRE	$1,670.00	$4,509.00	
Special Items (User Defined)							
LID	**<----User Defined Items**		259	ACRE	$3,000.00	$777,000.00	
Land Acquisition							
Easement/ROW Acquisition			2.70	ACRE	$11,228.00	$30,316.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains				$0.00
Concrete Box Culverts				$286,643.00
Hydraulic Structures				$0.00
Channel Improvements				$29,960.00
Detention/Water Quality Facilities				$0.00
Removals				$33,264.00
Landscaping and Maintenance Improvements				$4,509.00
Special Items (User Defined)				$777,000.00
Subtotal Capital Improvement Costs				**$1,131,376.00**
Additional Capital Improvement Costs				
Dewatering		L.S.		$0.00
Mobilization	5%			$56,569.00
Traffic Control		L.S.		$0.00
Utility Coordination/Relocation		L.S.		$0.00
Stormwater Management/Erosion Control	5%			$56,569.00
Subtotal Additional Capital Improvement Costs				**$113,138.00**

Land Acquisition Costs			
ROW/Easements			$30,316.00
Subtotal Land Acquisition Costs			**$30,316.00**
Other Costs (percentage of Capital Improvement Costs)			
Engineering	15%		$186,677.00
Legal/Administrative	5%		$62,226.00
Contract Admin/Construction Management	10%		$124,451.00
Contingency	25%		$311,129.00
Subtotal Other Costs			**$684,483.00**
Total Capital Improvement Costs			**$1,959,313.00**

Master Plan Operation and Maintenance Cost Summary					
Description		**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, e		241	L.F.	$2.00	$482.00
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)		1991	L.F.	$3.00	$5,973.00
LID Maintenance (6% of LID Cost)	**<----User Defined Items**	1	LS	$46,620.00	$46,620.00
Total Annual Operation and Maintenance Cost					**$53,075.00**
Effective Interest Rate					0.00%
Total Operation and Maintenance Costs Over 50 Years					**$2,653,750.00**

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$1,244,514.00
ROW/Easements	$30,316.00
Engineering	$186,677.00
Legal/Administrative	$62,226.00
Contract Admin/Construction Management	$124,451.00
Contingency	$311,129.00
Total Capital Improvement Costs	$1,959,313.00
Total Annual Operation and Maintenance Cost	$53,075.00
Total Operation and Maintenance Costs Over 50 Years	$2,653,750.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Alternatives Analysis**			
DRAINAGEWAY :	**Reach 600**			
REACH :	**600**			
JURISDICTION :	**Greeley**			
REACH ID:	**Option 1-Reach600**	**Elena Lundeen**	**DATE :**	**9/30/2022**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	**Box Height (ft)**	**No. of Barrels**	**Length (ft)**				
10	6	1	120	L.F.	$1,669.36	$200,323.00	
8	5	2	41	L.F.	$2,505.59	$102,729.00	
12	5	1	80	L.F.	$1,742.43	$139,395.00	
Headwall and Toewalls							
Individual Box Span (ft)	**No. of Barrels**	**Total Span (ft)**					
10	1	12.00	2	EA	$1,698.84	$3,398.00	
Wingwalls (includes wingwalls on either side of channel and concrete apron)							
Individual Box Span (ft)	**Box Rise (ft)**	**No. of Barrels**					
10	6	1	2	EA	$19,569.52	$39,139.00	
Removals							
Removal of culvert pipe (48"<D<84")			396	L.F.	$84.00	$33,264.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains			$0.00	
Concrete Box Culverts			$484,984.00	
Hydraulic Structures			$0.00	
Channel Improvements			$0.00	
Detention/Water Quality Facilities			$0.00	
Removals			$33,264.00	
Landscaping and Maintenance Improvements			$0.00	
Special Items (User Defined)			$0.00	
Subtotal Capital Improvement Costs			**$518,248.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$25,912.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$25,912.00	
Subtotal Additional Capital Improvement Costs			**$51,824.00**	
Land Acquisition Costs				
ROW/Easements			$0.00	
Subtotal Land Acquisition Costs			**$0.00**	
Other Costs (percentage of Capital Improvement Costs)				

Engineering	15%		$85,511.00	
Legal/Administrative	5%		$28,504.00	
Contract Admin/Construction Management	10%		$57,007.00	
Contingency	25%		$142,518.00	
Subtotal Other Costs			**$313,540.00**	
Total Capital Improvement Costs			**$883,612.00**	

Master Plan Operation and Maintenance Cost Summary					
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, e	241	L.F.	$2.00	$482.00	
Total Annual Operation and Maintenance Cost				**$482.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$24,100.00**	

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$570,072.00
ROW/Easements	$0.00
Engineering	$85,511.00
Legal/Administrative	$28,504.00
Contract Admin/Construction Management	$57,007.00
Contingency	$142,518.00
Total Capital Improvement Costs	$883,612.00
Total Annual Operation and Maintenance Cost	$482.00
Total Operation and Maintenance Costs Over 50 Years	$24,100.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greely - Oklahoma Basin**			
DRAINAGEWAY :	**Reach 800**			
REACH :	**800**			
JURISDICTION :	**Greely**			
REACH ID:	**Option 2-Reach800**	**Elena Lundeen**	**DATE :**	**9/30/2022**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	**Box Height (ft)**	**No. of Barrels**	**Length (ft)**				
8	4	1	71	L.F.	$1,183.69	$84,042.00	
Detention/Water Quality Facilities							
Detention (Complete-in-Place)							
Detention Facility 1 (Complete-in-Place)			25	AC-FT	$76,152.00	$1,934,261.00	
Removals							
Removal of culvert pipe (48"<D<84")			71	L.F.	$84.00	$5,964.00	
Landscaping and Maintenance Improvements							
Reclamation & seeding (native grasses)			12	ACRE	$1,670.00	$20,040.00	
Land Acquisition							
Easement/ROW Acquisition			12.20	ACRE	$11,228.00	$136,982.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains			$0.00	
Concrete Box Culverts			$84,042.00	
Hydraulic Structures			$0.00	
Channel Improvements			$0.00	
Detention/Water Quality Facilities			$1,934,261.00	
Removals			$5,964.00	
Landscaping and Maintenance Improvements			$20,040.00	
Special Items (User Defined)			$0.00	
Subtotal Capital Improvement Costs			**$2,044,307.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$102,215.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$102,215.00	
Subtotal Additional Capital Improvement Costs			**$204,430.00**	
Land Acquisition Costs				
ROW/Easements			$136,982.00	
Subtotal Land Acquisition Costs			**$136,982.00**	
Other Costs (percentage of Capital Improvement Costs)				

Engineering	15%		$337,311.00
Legal/Administrative	5%		$112,437.00
Contract Admin/Construction Management	10%		$224,874.00
Contingency	25%		$562,184.00
Subtotal Other Costs			**$1,236,806.00**
Total Capital Improvement Costs			**$3,622,525.00**

Master Plan Operation and Maintenance Cost Summary				
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, e	71	L.F.	$2.00	$142.00
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal, st	12.2	ACRE	$2,505.00	$30,561.00
Total Annual Operation and Maintenance Cost				**$30,703.00**
Effective Interest Rate				0.00%
Total Operation and Maintenance Costs Over 50 Years				**$1,535,150.00**

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$2,248,737.00
ROW/Easements	$136,982.00
Engineering	$337,311.00
Legal/Administrative	$112,437.00
Contract Admin/Construction Management	$224,874.00
Contingency	$562,184.00
Total Capital Improvement Costs	$3,622,525.00
Total Annual Operation and Maintenance Cost	$30,703.00
Total Operation and Maintenance Costs Over 50 Years	$1,535,150.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greely - Oklahoma Basin**			
DRAINAGEWAY :	**Reach 800**			
REACH :	**800**			
JURISDICTION :	**Greely**			
REACH ID:	**Option 3-Reach800**	**Elena Lundeen**	**DATE :**	**9/30/2022**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	**Box Height (ft)**	**No. of Barrels**	**Length (ft)**				
7	5	2	71	L.F.	$2,367.38	$168,084.00	
Channel Improvements							
Excavation, Mid Range			4508	C.Y.	$40.00	$180,320.00	
Removals							
Removal of culvert pipe (48"<D<84")			71	L.F.	$84.00	$5,964.00	
Landscaping and Maintenance Improvements							
Reclamation & seeding (native grasses)			6	ACRE	$1,670.00	$9,352.00	
Land Acquisition							
Easement/ROW Acquisition			5.60	ACRE	$11,228.00	$62,877.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains			$0.00	
Concrete Box Culverts			$168,084.00	
Hydraulic Structures			$0.00	
Channel Improvements			$180,320.00	
Detention/Water Quality Facilities			$0.00	
Removals			$5,964.00	
Landscaping and Maintenance Improvements			$9,352.00	
Special Items (User Defined)			$0.00	
Subtotal Capital Improvement Costs			**$363,720.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$18,186.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$18,186.00	
Subtotal Additional Capital Improvement Costs			**$36,372.00**	
Land Acquisition Costs				
ROW/Easements			$62,877.00	
Subtotal Land Acquisition Costs			**$62,877.00**	
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%		$60,014.00	

Legal/Administrative	5%		$20,005.00	
Contract Admin/Construction Management	10%		$40,009.00	
Contingency	25%		$100,023.00	
Subtotal Other Costs			**$220,051.00**	
Total Capital Improvement Costs			**$683,020.00**	

Master Plan Operation and Maintenance Cost Summary					
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, e	71	L.F.	$2.00	$142.00	
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	2005	L.F.	$3.00	$6,015.00	
Total Annual Operation and Maintenance Cost				**$6,157.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$307,850.00**	

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$400,092.00
ROW/Easements	$62,877.00
Engineering	$60,014.00
Legal/Administrative	$20,005.00
Contract Admin/Construction Management	$40,009.00
Contingency	$100,023.00
Total Capital Improvement Costs	$683,020.00
Total Annual Operation and Maintenance Cost	$6,157.00
Total Operation and Maintenance Costs Over 50 Years	$307,850.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greely - Oklahoma Basin**			
DRAINAGEWAY :	**Reach 800**			
REACH :	**800**			
JURISDICTION :	**Greeley**			
REACH ID:	**Option 4-Reach800**	**Elena Lundeen**	**DATE :**	**9/30/2022**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	**Box Height (ft)**	**No. of Barrels**	**Length (ft)**				
8	4	1	71	L.F.	$1,183.69	$84,042.00	
Removals							
Removal of culvert pipe (48"<D<84")			71	L.F.	$84.00	$5,964.00	
Special Items (User Defined)							
LID	**<----User Defined Items**		275	ACRE	$3,000.00	$825,000.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains			$0.00	
Concrete Box Culverts			$84,042.00	
Hydraulic Structures			$0.00	
Channel Improvements			$0.00	
Detention/Water Quality Facilities			$0.00	
Removals			$5,964.00	
Landscaping and Maintenance Improvements			$0.00	
Special Items (User Defined)			$825,000.00	
Subtotal Capital Improvement Costs			**$915,006.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$45,750.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$45,750.00	
Subtotal Additional Capital Improvement Costs			**$91,500.00**	
Land Acquisition Costs				
ROW/Easements			$0.00	
Subtotal Land Acquisition Costs			**$0.00**	
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%		$150,976.00	
Legal/Administrative	5%		$50,325.00	
Contract Admin/Construction Management	10%		$100,651.00	
Contingency	25%		$251,627.00	
Subtotal Other Costs			**$553,579.00**	

Total Capital Improvement Costs	**$1,560,085.00**

Master Plan Operation and Maintenance Cost Summary

Description		Quantity	Unit	Unit Cost	Total Annual Cost
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, e		71	L.F.	$2.00	$142.00
LID Maintenance (6% of LID Cost)	**<----User Defined Items**	1	LS	$49,500.00	$49,500.00
Total Annual Operation and Maintenance Cost					**$49,642.00**
Effective Interest Rate					0.00%
Total Operation and Maintenance Costs Over 50 Years					**$2,482,100.00**

Summary for Tabulation (Does Not Print)

Capital Improvement Costs	$1,006,506.00
ROW/Easements	$0.00
Engineering	$150,976.00
Legal/Administrative	$50,325.00
Contract Admin/Construction Management	$100,651.00
Contingency	$251,627.00
Total Capital Improvement Costs	$1,560,085.00
Total Annual Operation and Maintenance Cost	$49,642.00
Total Operation and Maintenance Costs Over 50 Years	$2,482,100.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greely - Oklahoma Basin**			
DRAINAGEWAY :	**Reach 800**			
REACH :	**800**			
JURISDICTION :	**Greeley**			
REACH ID:	**Option 1-Reach800**	**Elena Lundeen**	**DATE :**	**9/30/2022**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	**Box Height (ft)**	**No. of Barrels**	**Length (ft)**				
9	5	2	50	L.F.	$2,764.44	$138,222.00	
Headwall and Toewalls							
Individual Box Span (ft)	**No. of Barrels**	**Total Span (ft)**					
9	2	21.00	2	EA	$2,733.57	$5,467.00	
Wingwalls (includes wingwalls on either side of channel and concrete apron)							
Individual Box Span (ft)	**Box Rise (ft)**	**No. of Barrels**					
9	5	2	2	EA	$18,553.80	$37,107.60	
Removals							
Removal of culvert pipe (48"<D<84")			71	L.F.	$84.00	$5,964.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains			$0.00	
Concrete Box Culverts			$180,797.00	
Hydraulic Structures			$0.00	
Channel Improvements			$0.00	
Detention/Water Quality Facilities			$0.00	
Removals			$5,964.00	
Landscaping and Maintenance Improvements			$0.00	
Special Items (User Defined)			$0.00	
Subtotal Capital Improvement Costs			**$186,761.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$9,338.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$9,338.00	
Subtotal Additional Capital Improvement Costs			**$18,676.00**	
Land Acquisition Costs				
ROW/Easements			$0.00	
Subtotal Land Acquisition Costs			**$0.00**	
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%		$30,816.00	
Legal/Administrative	5%		$10,272.00	

Contract Admin/Construction Management	10%		$20,544.00	
Contingency	25%		$51,359.00	
Subtotal Other Costs			**$112,991.00**	
Total Capital Improvement Costs			**$318,428.00**	

Master Plan Operation and Maintenance Cost Summary					
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, e	71	L.F.	$2.00	$142.00	
Total Annual Operation and Maintenance Cost				**$142.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$7,100.00**	

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$205,437.00
ROW/Easements	$0.00
Engineering	$30,816.00
Legal/Administrative	$10,272.00
Contract Admin/Construction Management	$20,544.00
Contingency	$51,359.00
Total Capital Improvement Costs	$318,428.00
Total Annual Operation and Maintenance Cost	$142.00
Total Operation and Maintenance Costs Over 50 Years	$7,100.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	23.1447.001 Greeley - Comprehensive Drainage Plan Oklahoma Alterative Analysis			
DRAINAGEWAY :	Reach 700			
REACH :	700			
JURISDICTION :	Greeley			
REACH ID:	Option 1 -Reach700	Sabastian Ortega	DATE :	6/11/2024

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST
Pipe Culverts and Storm Drains						
Circular Pipes						
Diameter (in)	**Length (ft)**	**No. of Barrels**				
42-inch	97	2	194	L.F.	$210.00	$40,740.00
48-inch	89	2	178	L.F.	$240.00	$42,720.00
Removals						
Removal of culvert pipe (D<48")			186	L.F.	$33.00	$6,138.00

Master Plan Capital Improvement Cost Summary			
Capital Improvement Costs			
Pipe Culverts and Storm Drains			$83,460.00
Concrete Box Culverts			$0.00
Hydraulic Structures			$0.00
Channel Improvements			$0.00
Detention/Water Quality Facilities			$0.00
Removals			$6,138.00
Landscaping and Maintenance Improvements			$0.00
Special Items (User Defined)			$0.00
Subtotal Capital Improvement Costs			**$89,598.00**
Additional Capital Improvement Costs			
Dewatering		L.S.	$0.00
Mobilization	5%		$4,480.00
Traffic Control		L.S.	$0.00
Utility Coordination/Relocation		L.S.	$0.00
Stormwater Management/Erosion Control	5%		$4,480.00
Subtotal Additional Capital Improvement Costs			**$8,960.00**

Land Acquisition Costs			
ROW/Easements			$0.00
Subtotal Land Acquisition Costs			**$0.00**
Other Costs (percentage of Capital Improvement Costs)			
Engineering	15%		$14,784.00
Legal/Administrative	5%		$4,928.00
Contract Admin/Construction Management	10%		$9,856.00
Contingency	25%		$24,640.00
Subtotal Other Costs			**$54,208.00**
Total Capital Improvement Costs			**$152,766.00**

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, etc.)	372	L.F.	$2.00	$744.00	
Total Annual Operation and Maintenance Cost				**$744.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$37,200.00**	

Summary for Tabulation (Does Not Print)

Capital Improvement Costs	$98,558.00
ROW/Easements	$0.00
Engineering	$14,784.00
Legal/Administrative	$4,928.00
Contract Admin/Construction Management	$9,856.00
Contingency	$24,640.00
Total Capital Improvement Costs	$152,766.00
Total Annual Operation and Maintenance Cost	$744.00
Total Operation and Maintenance Costs Over 50 Years	$37,200.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	23.1447.001 Greeley - Comprehensive Drainage Plan Oklahoma Alteratives Analysis			
DRAINAGEWAY :	Reach 700			
REACH :	700			
JURISDICTION :	Greeley			
REACH ID:	Option 2-Reach700	Sabastian Ortega	DATE :	6/11/2024

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST
Pipe Culverts and Storm Drains						
Circular Pipes						
Diameter (in)	Length (ft)	No. of Barrels				
36-inch	97	2	194	L.F.	$180.00	$34,920.00
48-inch	89	2	178	L.F.	$240.00	$42,720.00
Channel Improvements						
Soil Riprap, Type M			295	C.Y.	$117.00	$34,515.00
Detention/Water Quality Facilities						
Detention (Complete-in-Place)						
Detention Facility 1 (Complete-in-Place)			7	AC-FT	$76,152.00	$494,988.00
Removals						
Removal of culvert pipe (D<48")			186	L.F.	$33.00	$6,138.00
Landscaping and Maintenance Improvements						
Reclamation & seeding (native grasses)			2	ACRE	$1,670.00	$2,672.00
Land Acquisition						
Easement/ROW Acquisition			1.60	ACRE	$11,228.00	$17,965.00

Master Plan Capital Improvement Cost Summary	
Capital Improvement Costs	
Pipe Culverts and Storm Drains	$77,640.00
Concrete Box Culverts	$0.00
Hydraulic Structures	$0.00
Channel Improvements	$34,515.00
Detention/Water Quality Facilities	$494,988.00
Removals	$6,138.00
Landscaping and Maintenance Improvements	$2,672.00
Special Items (User Defined)	$0.00

Subtotal Capital Improvement Costs			**$615,953.00**
Additional Capital Improvement Costs			
Dewatering		L.S.	$0.00
Mobilization	5%		$30,798.00
Traffic Control		L.S.	$0.00
Utility Coordination/Relocation		L.S.	$0.00
Stormwater Management/Erosion Control	5%		$30,798.00
Subtotal Additional Capital Improvement Costs			**$61,596.00**
Land Acquisition Costs			
ROW/Easements			$17,965.00
Subtotal Land Acquisition Costs			**$17,965.00**
Other Costs (percentage of Capital Improvement Costs)			
Engineering	15%		$101,632.00
Legal/Administrative	5%		$33,877.00
Contract Admin/Construction Management	10%		$67,755.00
Contingency	25%		$169,387.00
Subtotal Other Costs			**$372,651.00**
Total Capital Improvement Costs			**$1,068,165.00**

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, etc.)	372	L.F.	$2.00	$744.00	
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal, structural repairs, etc.)	1.6	ACRE	$2,505.00	$4,008.00	
Total Annual Operation and Maintenance Cost				**$4,752.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$237,600.00**	

Summary for Tabulation (Does Not Print)

Capital Improvement Costs	$677,549.00
ROW/Easements	$17,965.00
Engineering	$101,632.00
Legal/Administrative	$33,877.00
Contract Admin/Construction Management	$67,755.00
Contingency	$169,387.00
Total Capital Improvement Costs	$1,068,165.00
Total Annual Operation and Maintenance Cost	$4,752.00
Total Operation and Maintenance Costs Over 50 Years	$237,600.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	23.1447.001 Greeley - Comprehensive Drainage Plan Oklahoma Alteratives Analysis			
DRAINAGEWAY :	Reach 700			
REACH :	700			
JURISDICTION :	Greeley			
REACH ID:	Option 3-Reach700	Sabastian Ortega	DATE :	6/11/2024

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST
Pipe Culverts and Storm Drains						
Circular Pipes						
Diameter (in)	Length (ft)	No. of Barrels				
42-inch	97	2	194	L.F.	$210.00	$40,740.00
48-inch	89	2	178	L.F.	$240.00	$42,720.00
Channel Improvements						
Excavation, Mid Range			12378	C.Y.	$40.00	$495,109.00
Removals						
Removal of culvert pipe (D<48")			186	L.F.	$33.00	$6,138.00
Landscaping and Maintenance Improvements						
Reclamation & seeding (native grasses)			6	ACRE	$1,670.00	$9,770.00
Land Acquisition						
Easement/ROW Acquisition			5.85	ACRE	$11,228.00	$65,684.00

Master Plan Capital Improvement Cost Summary	
Capital Improvement Costs	
Pipe Culverts and Storm Drains	$83,460.00
Concrete Box Culverts	$0.00
Hydraulic Structures	$0.00
Channel Improvements	$495,109.00
Detention/Water Quality Facilities	$0.00
Removals	$6,138.00
Landscaping and Maintenance Improvements	$9,770.00
Special Items (User Defined)	$0.00
Subtotal Capital Improvement Costs	**$594,477.00**
Additional Capital Improvement Costs	
Dewatering	$0.00

Mobilization	5%		$29,724.00
Traffic Control		L.S.	$0.00
Utility Coordination/Relocation		L.S.	$0.00
Stormwater Management/Erosion Control	5%		$29,724.00
Subtotal Additional Capital Improvement Costs			**$59,448.00**
Land Acquisition Costs			
ROW/Easements			$65,684.00
Subtotal Land Acquisition Costs			**$65,684.00**
Other Costs (percentage of Capital Improvement Costs)			
Engineering	15%		$98,089.00
Legal/Administrative	5%		$32,696.00
Contract Admin/Construction Management	10%		$65,393.00
Contingency	25%		$163,481.00
Subtotal Other Costs			**$359,659.00**
Total Capital Improvement Costs			**$1,079,268.00**

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, etc.)	372	L.F.	$2.00	$744.00	
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	2400	L.F.	$3.00	$7,200.00	
Total Annual Operation and Maintenance Cost				**$7,944.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$397,200.00**	

Summary for Tabulation (Does Not Print)

Capital Improvement Costs	$653,925.00
ROW/Easements	$65,684.00
Engineering	$98,089.00
Legal/Administrative	$32,696.00
Contract Admin/Construction Management	$65,393.00
Contingency	$163,481.00
Total Capital Improvement Costs	$1,079,268.00
Total Annual Operation and Maintenance Cost	$7,944.00
Total Operation and Maintenance Costs Over 50 Years	$397,200.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	23.1447.001 Greeley - Comprehensive Drainage Plan Oklahoma Alteratives Analysis			
DRAINAGEWAY :	Reach 700			
REACH :	700			
JURISDICTION :	Greeley			
REACH ID:	Option 4-Reach700	Sabastian Ortega	DATE :	6/11/2024

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST
Pipe Culverts and Storm Drains						
Circular Pipes						
Diameter (in)	Length (ft)	No. of Barrels				
48-inch	97	1	97	L.F.	$240.00	$23,280.00
48-inch	89	2	178	L.F.	$240.00	$42,720.00
Channel Improvements						
Soil Riprap, Type M			291	C.Y.	$117.00	$34,047.00
Detention/Water Quality Facilities						
Detention (Complete-in-Place)						
Detention Facility 1 (Complete-in-Place)			6.5	AC-FT	$76,152.00	$494,988.00
Removals						
Removal of culvert pipe (D<48")			186	L.F.	$33.00	$6,138.00
Landscaping and Maintenance Improvements						
Reclamation & seeding (native grasses)			1.3	ACRE	$1,670.00	$2,171.00
Land Acquisition						
Easement/ROW Acquisition			1.30	ACRE	$11,228.00	$14,596.00

Master Plan Capital Improvement Cost Summary	
Capital Improvement Costs	
Pipe Culverts and Storm Drains	$66,000.00
Concrete Box Culverts	$0.00
Hydraulic Structures	$0.00
Channel Improvements	$34,047.00
Detention/Water Quality Facilities	$494,988.00
Removals	$6,138.00
Landscaping and Maintenance Improvements	$2,171.00
Special Items (User Defined)	$0.00
Subtotal Capital Improvement Costs	**$603,344.00**

Additional Capital Improvement Costs			
Dewatering		L.S.	$0.00
Mobilization	5%		$30,167.00
Traffic Control		L.S.	$0.00
Utility Coordination/Relocation		L.S.	$0.00
Stormwater Management/Erosion Control	5%		$30,167.00
Subtotal Additional Capital Improvement Costs			**$60,334.00**
Land Acquisition Costs			
ROW/Easements			$14,596.00
Subtotal Land Acquisition Costs			**$14,596.00**
Other Costs (percentage of Capital Improvement Costs)			
Engineering	15%		$99,552.00
Legal/Administrative	5%		$33,184.00
Contract Admin/Construction Management	10%		$66,368.00
Contingency	25%		$165,920.00
Subtotal Other Costs			**$365,024.00**
Total Capital Improvement Costs			**$1,043,298.00**

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, etc.)	359	L.F.	$2.00	$718.00	
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal, structural repairs, etc.)	1.3	ACRE	$2,505.00	$3,257.00	
Total Annual Operation and Maintenance Cost				**$3,975.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$198,750.00**	

Summary for Tabulation (Does Not Print)

Capital Improvement Costs	$663,678.00
ROW/Easements	$14,596.00
Engineering	$99,552.00
Legal/Administrative	$33,184.00
Contract Admin/Construction Management	$66,368.00
Contingency	$165,920.00
Total Capital Improvement Costs	$1,043,298.00
Total Annual Operation and Maintenance Cost	$3,975.00
Total Operation and Maintenance Costs Over 50 Years	$198,750.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	23.1447.001 Greeley - Comprehensive Drainage Plan Oklahoma Alteratives Analysis			
DRAINAGEWAY :	Reach 800			
REACH :	800			
JURISDICTION :	Greeley			
REACH ID:	Option 1 -Reach800	Sabastian Ortega	DATE :	6/11/2024

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST
Concrete Box Culverts						
Box Culvert Pipe						
Individual Box Span (ft)	Box Height (ft)	No. of Barrels	Length (ft)			
10	8	2	90	L.F.	$3,677.22	$330,949.00
10	3	10	62	L.F.	$12,688.10	$786,662.00
Removals						
Removal of culvert pipe (D<48")			62	L.F.	$33.00	$2,046.00
Concrete Box Culvert			90	L.F./CELL	$167.00	$15,030.00

Master Plan Capital Improvement Cost Summary			
Capital Improvement Costs			
Pipe Culverts and Storm Drains			$0.00
Concrete Box Culverts			$1,117,611.00
Hydraulic Structures			$0.00
Channel Improvements			$0.00
Detention/Water Quality Facilities			$0.00
Removals			$17,076.00
Landscaping and Maintenance Improvements			$0.00
Special Items (User Defined)			$0.00
Subtotal Capital Improvement Costs			**$1,134,687.00**
Additional Capital Improvement Costs			
Dewatering		L.S.	$0.00
Mobilization	5%		$56,734.00
Traffic Control		L.S.	$0.00
Utility Coordination/Relocation		L.S.	$0.00
Stormwater Management/Erosion Control	5%		$56,734.00

Subtotal Additional Capital Improvement Costs			**$113,468.00**
Land Acquisition Costs			
ROW/Easements			$0.00
Subtotal Land Acquisition Costs			**$0.00**
Other Costs (percentage of Capital Improvement Costs)			
Engineering	15%		$187,223.00
Legal/Administrative	5%		$62,408.00
Contract Admin/Construction Management	10%		$124,816.00
Contingency	25%		$312,039.00
Subtotal Other Costs			**$686,486.00**
Total Capital Improvement Costs			**$1,934,641.00**

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, etc.)	800	L.F.	$2.00	$1,600.00	
Total Annual Operation and Maintenance Cost				**$1,600.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$80,000.00**	

Summary for Tabulation (Does Not Print)

Capital Improvement Costs	$1,248,155.00
ROW/Easements	$0.00
Engineering	$187,223.00
Legal/Administrative	$62,408.00
Contract Admin/Construction Management	$124,816.00
Contingency	$312,039.00
Total Capital Improvement Costs	$1,934,641.00
Total Annual Operation and Maintenance Cost	$1,600.00
Total Operation and Maintenance Costs Over 50 Years	$80,000.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	23.1447.001 Greeley - Comprehensive Drainage Plan Oklahoma Alteratives Analysis			
DRAINAGEWAY :	Reach 800			
REACH :	800			
JURISDICTION :	Greeley			
REACH ID:	Option 2-Reach800	Sabastian Ortega	DATE :	6/11/2024

DESCRIPTION		QUANTITY		UNIT	UNIT COST	TOTAL COST
Concrete Box Culverts						
Box Culvert Pipe						
Individual Box Span (ft)	Box Height (ft)	No. of Barrels	Length (ft)			
6	7	1	90	L.F.	$1,141.67	$102,750.00
8	3	3	62	L.F.	$3,286.69	$203,775.00
				L.F.	$0.00	$0.00
Removals						
Removal of culvert pipe (48"<D<84")			62	L.F.	$84.00	$5,208.00
Concrete Box Culvert			90	L.F./CELL	$167.00	$15,030.00

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains				$0.00
Concrete Box Culverts				$306,525.00
Hydraulic Structures				$0.00
Channel Improvements				$0.00
Detention/Water Quality Facilities				$0.00
Removals				$20,238.00
Landscaping and Maintenance Improvements				$0.00
Special Items (User Defined)				$0.00
Subtotal Capital Improvement Costs				**$326,763.00**
Additional Capital Improvement Costs				
Dewatering			L.S.	$0.00
Mobilization	5%			$16,338.00
Traffic Control			L.S.	$0.00

Utility Coordination/Relocation		L.S.	$0.00
Stormwater Management/Erosion Control	5%		$16,338.00
Subtotal Additional Capital Improvement Costs			**$32,676.00**
Land Acquisition Costs			
ROW/Easements			$0.00
Subtotal Land Acquisition Costs			**$0.00**
Other Costs (percentage of Capital Improvement Costs)			
Engineering	15%		$53,916.00
Legal/Administrative	5%		$17,972.00
Contract Admin/Construction Management	10%		$35,944.00
Contingency	25%		$89,860.00
Subtotal Other Costs			**$197,692.00**
Total Capital Improvement Costs			**$557,131.00**

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, etc.)	276	L.F.	$2.00	$552.00	
Total Annual Operation and Maintenance Cost				**$552.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$27,600.00**	

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MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	23.1447.001 Greeley - Comprehensive Drainage Plan Oklahoma Alteratives Analysis			
DRAINAGEWAY :	Reach 800			
REACH :	800			
JURISDICTION :	Greeley			
REACH ID:	Option 3-Reach800	Sabastian Ortega	DATE :	6/11/2024

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST
Concrete Box Culverts					
Box Culvert Pipe					
Individual Box Span (ft)	Box Height (ft)	No. of Barrels	Length (ft)		
10	8	2	90	L.F.	$3,677.22	$330,949.00
10	3	10	62	L.F.	$12,688.10	$786,662.00
Channel Improvements					
Excavation, Mid Range		36879	C.Y.	$40.00	$1,475,141.00
Removals					
Removal of culvert pipe (48"<D<84")		62	L.F.	$84.00	$5,208.00
Concrete Box Culvert		90	L.F./CELL	$167.00	$15,030.00
Landscaping and Maintenance Improvements					
Reclamation & seeding (native grasses)		8	ACRE	$1,670.00	$13,811.00
Land Acquisition					
Easement/ROW Acquisition		8.27	ACRE	$11,228.00	$92,856.00

Master Plan Capital Improvement Cost Summary	
Capital Improvement Costs	
Pipe Culverts and Storm Drains	$0.00
Concrete Box Culverts	$1,117,611.00
Hydraulic Structures	$0.00
Channel Improvements	$1,475,141.00
Detention/Water Quality Facilities	$0.00
Removals	$20,238.00
Landscaping and Maintenance Improvements	$13,811.00
Special Items (User Defined)	$0.00

Subtotal Capital Improvement Costs			**$2,626,801.00**
Additional Capital Improvement Costs			
Dewatering		L.S.	$0.00
Mobilization	5%		$131,340.00
Traffic Control		L.S.	$0.00
Utility Coordination/Relocation		L.S.	$0.00
Stormwater Management/Erosion Control	5%		$131,340.00
Subtotal Additional Capital Improvement Costs			**$262,680.00**
Land Acquisition Costs			
ROW/Easements			$92,856.00
Subtotal Land Acquisition Costs			**$92,856.00**
Other Costs (percentage of Capital Improvement Costs)			
Engineering	15%		$433,422.00
Legal/Administrative	5%		$144,474.00
Contract Admin/Construction Management	10%		$288,948.00
Contingency	25%		$722,370.00
Subtotal Other Costs			**$1,589,214.00**
Total Capital Improvement Costs			**$4,571,551.00**

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, etc.)		800	L.F.	$2.00	$1,600.00
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	2141	L.F.	$3.00	$6,423.00	
Total Annual Operation and Maintenance Cost				**$8,023.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$401,150.00**	

Summary for Tabulation (Does Not Print)

Capital Improvement Costs	$2,889,481.00
ROW/Easements	$92,856.00
Engineering	$433,422.00
Legal/Administrative	$144,474.00
Contract Admin/Construction Management	$288,948.00
Contingency	$722,370.00
Total Capital Improvement Costs	$4,571,551.00
Total Annual Operation and Maintenance Cost	$8,023.00
Total Operation and Maintenance Costs Over 50 Years	$401,150.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	23.1447.001 Greeley - Comprehensive Drainage Plan Oklahoma Alteratives Analysis			
DRAINAGEWAY :	Reach 800			
REACH :	800			
JURISDICTION :	Greeley			
REACH ID:	Option 4-Reach800	Sabastian Ortega	DATE :	6/11/2024

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST
Concrete Box Culverts						
Box Culvert Pipe						
Individual Box Span (ft)	Box Height (ft)	No. of Barrels	Length (ft)			
6	5	1	90	L.F.	$1,095.56	$98,601.00
8	3	2	62	L.F.	$2,191.13	$135,850.00
				L.F.	$0.00	$0.00
Removals						
Removal of culvert pipe (D<48")			62	L.F.	$33.00	$2,046.00
Concrete Box Culvert			90	L.F./CELL	$167.00	$15,030.00

Master Plan Capital Improvement Cost Summary			
Capital Improvement Costs			
Pipe Culverts and Storm Drains			$0.00
Concrete Box Culverts			$234,451.00
Hydraulic Structures			$0.00
Channel Improvements			$0.00
Detention/Water Quality Facilities			$0.00
Removals			$17,076.00
Landscaping and Maintenance Improvements			$0.00
Special Items (User Defined)			$0.00
Subtotal Capital Improvement Costs			**$251,527.00**
Additional Capital Improvement Costs			
Dewatering		L.S.	$0.00
Mobilization	5%		$12,576.00
Traffic Control		L.S.	$0.00
Utility Coordination/Relocation		L.S.	$0.00

Stormwater Management/Erosion Control	5%		$12,576.00
Subtotal Additional Capital Improvement Costs			**$25,152.00**
Land Acquisition Costs			
ROW/Easements			$0.00
Subtotal Land Acquisition Costs			**$0.00**
Other Costs (percentage of Capital Improvement Costs)			
Engineering	15%		$41,502.00
Legal/Administrative	5%		$13,834.00
Contract Admin/Construction Management	10%		$27,668.00
Contingency	25%		$69,170.00
Subtotal Other Costs			**$152,174.00**
Total Capital Improvement Costs			**$428,853.00**

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, etc.)	214	L.F.	$2.00	$428.00	
Total Annual Operation and Maintenance Cost				**$428.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$21,400.00**	

Summary for Tabulation (Does Not Print)

Capital Improvement Costs	$276,679.00
ROW/Easements	$0.00
Engineering	$41,502.00
Legal/Administrative	$13,834.00
Contract Admin/Construction Management	$27,668.00
Contingency	$69,170.00
Total Capital Improvement Costs	$428,853.00
Total Annual Operation and Maintenance Cost	$428.00
Total Operation and Maintenance Costs Over 50 Years	$21,400.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	23.1447.001 Greeley - Comprehensive Drainage Plan Oklahoma Alteratives Analysis			
DRAINAGEWAY :	Reach 829			
REACH :	829			
JURISDICTION :	Greeley			
REACH ID:	Option 1 -Reach829	Sabastian Ortega	DATE :	6/11/2024

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST
Concrete Box Culverts						
Box Culvert Pipe						
Individual Box Span (ft)	Box Height (ft)	No. of Barrels	Length (ft)			
12	5	3	80	L.F.	$5,227.30	$418,184.00
12	5	3	527	L.F.	$5,227.30	$2,754,785.00
Removals						
Removal of culvert pipe (48"<D<84")			527	L.F.	$84.00	$44,268.00
Concrete Box Culvert			80	L.F./CELL	$167.00	$13,360.00

Master Plan Capital Improvement Cost Summary			
Capital Improvement Costs			
Pipe Culverts and Storm Drains			$0.00
Concrete Box Culverts			$3,172,969.00
Hydraulic Structures			$0.00
Channel Improvements			$0.00
Detention/Water Quality Facilities			$0.00
Removals			$57,628.00
Landscaping and Maintenance Improvements			$0.00
Special Items (User Defined)			$0.00
Subtotal Capital Improvement Costs			**$3,230,597.00**
Additional Capital Improvement Costs			
Dewatering		L.S.	$0.00
Mobilization	5%		$161,530.00
Traffic Control		L.S.	$0.00
Utility Coordination/Relocation		L.S.	$0.00
Stormwater Management/Erosion Control	5%		$161,530.00
Subtotal Additional Capital Improvement Costs			**$323,060.00**

Land Acquisition Costs			
ROW/Easements			$0.00
Subtotal Land Acquisition Costs			**$0.00**
Other Costs (percentage of Capital Improvement Costs)			
Engineering	15%		$533,049.00
Legal/Administrative	5%		$177,683.00
Contract Admin/Construction Management	10%		$355,366.00
Contingency	25%		$888,414.00
Subtotal Other Costs			**$1,954,512.00**
Total Capital Improvement Costs			**$5,508,169.00**

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, etc.)	1821	L.F.	$2.00	$3,642.00	
Total Annual Operation and Maintenance Cost				**$3,642.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$182,100.00**	

Summary for Tabulation (Does Not Print)

Capital Improvement Costs	$3,553,657.00
ROW/Easements	$0.00
Engineering	$533,049.00
Legal/Administrative	$177,683.00
Contract Admin/Construction Management	$355,366.00
Contingency	$888,414.00
Total Capital Improvement Costs	$5,508,169.00
Total Annual Operation and Maintenance Cost	$3,642.00
Total Operation and Maintenance Costs Over 50 Years	$182,100.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	23.1447.001 Greeley - Comprehensive Drainage Plan Oklahoma Alteratives Analysis			
DRAINAGEWAY :	Reach 829			
REACH :	829			
JURISDICTION :	Greeley			
REACH ID:	Option 2-Reach829	Sabastian Ortega	DATE :	6/11/2024

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST
Concrete Box Culverts						
Box Culvert Pipe						
Individual Box Span (ft)	Box Height (ft)	No. of Barrels	Length (ft)			
12	4	1	80	L.F.	$1,529.18	$122,335.00
12	4	1	527	L.F.	$1,529.18	$805,879.00
Channel Improvements						
Soil Riprap, Type M			561	C.Y.	$117.00	$65,637.00
Detention/Water Quality Facilities						
Detention (Complete-in-Place)						
Detention Facility 1 (Complete-in-Place)			43	AC-FT	$76,152.00	$3,274,536.00
Removals						
Removal of culvert pipe (48"<D<84")			527	L.F.	$84.00	$44,268.00
Concrete Box Culvert			80	L.F./CELL	$167.00	$13,360.00
Landscaping and Maintenance Improvements						
Reclamation & seeding (native grasses)			6	ACRE	$1,670.00	$10,521.00
Land Acquisition						
Easement/ROW Acquisition			6.30	ACRE	$11,228.00	$70,736.00

Master Plan Capital Improvement Cost Summary	
Capital Improvement Costs	
Pipe Culverts and Storm Drains	$0.00
Concrete Box Culverts	$928,214.00
Hydraulic Structures	$0.00
Channel Improvements	$65,637.00
Detention/Water Quality Facilities	$3,274,536.00
Removals	$57,628.00
Landscaping and Maintenance Improvements	$10,521.00
Special Items (User Defined)	$0.00

Subtotal Capital Improvement Costs			**$4,336,536.00**
Additional Capital Improvement Costs			
Dewatering		L.S.	$0.00
Mobilization	5%		$216,827.00
Traffic Control		L.S.	$0.00
Utility Coordination/Relocation		L.S.	$0.00
Stormwater Management/Erosion Control	5%		$216,827.00
Subtotal Additional Capital Improvement Costs			**$433,654.00**
Land Acquisition Costs			
ROW/Easements			$70,736.00
Subtotal Land Acquisition Costs			**$70,736.00**
Other Costs (percentage of Capital Improvement Costs)			
Engineering	15%		$715,529.00
Legal/Administrative	5%		$238,510.00
Contract Admin/Construction Management	10%		$477,019.00
Contingency	25%		$1,192,548.00
Subtotal Other Costs			**$2,623,606.00**
Total Capital Improvement Costs			**$7,464,532.00**

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, etc.)	607	L.F.	$2.00	$1,214.00	
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal, structural repairs, etc.)	6.3	ACRE	$2,505.00	$15,782.00	
Total Annual Operation and Maintenance Cost				**$16,996.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$849,800.00**	

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MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	23.1447.001 Greeley - Comprehensive Drainage Plan Oklahoma Alteratives Analysis			
DRAINAGEWAY :	Reach 829			
REACH :	829			
JURISDICTION :	Greeley			
REACH ID:	Option 3-Reach829	Sabastian Ortega	DATE :	6/11/2024

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST
Concrete Box Culverts						
Box Culvert Pipe						
Individual Box Span (ft)	Box Height (ft)	No. of Barrels	Length (ft)			
12	5	3	80	L.F.	$5,227.30	$418,184.00
12	5	3	527	L.F.	$5,227.30	$2,754,785.00
Channel Improvements						
Soil Riprap, Type M			561	C.Y.	$117.00	$65,637.00
Excavation, Mid Range			38190	C.Y.	$40.00	$1,527,600.00
Removals						
Removal of culvert pipe (48"<D<84")			527	L.F.	$84.00	$44,268.00
Concrete Box Culvert			80	L.F./CELL	$167.00	$13,360.00
Landscaping and Maintenance Improvements						
Reclamation & seeding (native grasses)			11	ACRE	$1,670.00	$19,138.00
Land Acquisition						
Easement/ROW Acquisition			11.46	ACRE	$11,228.00	$128,673.00

Master Plan Capital Improvement Cost Summary	
Capital Improvement Costs	
Pipe Culverts and Storm Drains	$0.00
Concrete Box Culverts	$3,172,969.00
Hydraulic Structures	$0.00
Channel Improvements	$1,593,237.00
Detention/Water Quality Facilities	$0.00
Removals	$57,628.00
Landscaping and Maintenance Improvements	$19,138.00
Special Items (User Defined)	$0.00
Subtotal Capital Improvement Costs	**$4,842,972.00**
Additional Capital Improvement Costs	

Dewatering		L.S.	$0.00
Mobilization	5%		$242,149.00
Traffic Control		L.S.	$0.00
Utility Coordination/Relocation		L.S.	$0.00
Stormwater Management/Erosion Control	5%		$242,149.00
Subtotal Additional Capital Improvement Costs			**$484,298.00**
Land Acquisition Costs			
ROW/Easements			$128,673.00
Subtotal Land Acquisition Costs			**$128,673.00**
Other Costs (percentage of Capital Improvement Costs)			
Engineering	15%		$799,091.00
Legal/Administrative	5%		$266,364.00
Contract Admin/Construction Management	10%		$532,727.00
Contingency	25%		$1,331,818.00
Subtotal Other Costs			**$2,930,000.00**
Total Capital Improvement Costs			**$8,385,943.00**

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, etc.)	1821	L.F.	$2.00	$3,642.00	
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	3030	L.F.	$3.00	$9,090.00	
Total Annual Operation and Maintenance Cost				**$12,732.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$636,600.00**	

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MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	23.1447.001 Greeley - Comprehensive Drainage Plan Oklahoma Alteratives Analysis			
DRAINAGEWAY :	Reach 829			
REACH :	829			
JURISDICTION :	Greeley			
REACH ID:	Option 4-Reach829	Sabastian Ortega	DATE :	6/11/2024

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST
Concrete Box Culverts					
Box Culvert Pipe					
Individual Box Span (ft)	Box Height (ft) / No. of Barrels / Length (ft)				
12	4 / 1 / 80		L.F.	$1,529.18	$122,335.00
12	4 / 1 / 527		L.F.	$1,529.18	$805,879.00
Channel Improvements					
Soil Riprap, Type M		561	C.Y.	$117.00	$65,637.00
Detention/Water Quality Facilities					
Detention (Complete-in-Place)					
Detention Facility 1 (Complete-in-Place)		20	AC-FT	$76,152.00	$1,523,040.00
Detention Facility 2 (Complete-in-Place)		17	AC-FT	$76,152.00	$1,317,430.00
Removals					
Removal of culvert pipe (48"<D<84")		527	L.F.	$84.00	$44,268.00
Concrete Box Culvert		80	L.F./CELL	$167.00	$13,360.00
Landscaping and Maintenance Improvements					
Reclamation & seeding (native grasses)		8	ACRE	$1,670.00	$13,861.00
Land Acquisition					
Easement/ROW Acquisition		8.30	ACRE	$11,228.00	$93,192.00

Master Plan Capital Improvement Cost Summary

Capital Improvement Costs	
Pipe Culverts and Storm Drains	$0.00
Concrete Box Culverts	$928,214.00
Hydraulic Structures	$0.00
Channel Improvements	$65,637.00
Detention/Water Quality Facilities	$2,840,470.00
Removals	$57,628.00

Landscaping and Maintenance Improvements			$13,861.00
Special Items (User Defined)			$0.00
Subtotal Capital Improvement Costs			**$3,905,810.00**
Additional Capital Improvement Costs			
Dewatering		L.S.	$0.00
Mobilization	5%		$195,291.00
Traffic Control		L.S.	$0.00
Utility Coordination/Relocation		L.S.	$0.00
Stormwater Management/Erosion Control	5%		$195,291.00
Subtotal Additional Capital Improvement Costs			**$390,582.00**
Land Acquisition Costs			
ROW/Easements			$93,192.00
Subtotal Land Acquisition Costs			**$93,192.00**
Other Costs (percentage of Capital Improvement Costs)			
Engineering	15%		$644,459.00
Legal/Administrative	5%		$214,820.00
Contract Admin/Construction Management	10%		$429,639.00
Contingency	25%		$1,074,098.00
Subtotal Other Costs			**$2,363,016.00**
Total Capital Improvement Costs			**$6,752,600.00**

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, etc.)	607	L.F.	$2.00	$1,214.00	
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal, structural repairs, etc.)	8.3	ACRE	$2,505.00	$20,792.00	
Total Annual Operation and Maintenance Cost				**$22,006.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$1,100,300.00**	

Summary for Tabulation (Does Not Print)

Capital Improvement Costs	$4,296,392.00
ROW/Easements	$93,192.00
Engineering	$644,459.00
Legal/Administrative	$214,820.00
Contract Admin/Construction Management	$429,639.00
Contingency	$1,074,098.00
Total Capital Improvement Costs	$6,752,600.00
Total Annual Operation and Maintenance Cost	$22,006.00
Total Operation and Maintenance Costs Over 50 Years	$1,100,300.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	23.1447.001 Greeley - Comprehensive Drainage Plan Oklahoma Alteratives Analysis			
DRAINAGEWAY :	Reach 843			
REACH :	843			
JURISDICTION :	Greeley			
REACH ID:	Option 1 -Reach843	Sabastian Ortega	DATE :	6/11/2024

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST
Concrete Box Culverts						
Box Culvert Pipe						
Individual Box Span (ft)	Box Height (ft)	No. of Barrels	Length (ft)			
9	5	2	74	L.F.	$2,764.44	$204,569.00
12	7	2	304	L.F.	$4,124.61	$1,253,881.00
Removals						
Removal of culvert pipe (48"<D<84")			378	L.F.	$84.00	$31,752.00

Master Plan Capital Improvement Cost Summary			
Capital Improvement Costs			
Pipe Culverts and Storm Drains			$0.00
Concrete Box Culverts			$1,458,450.00
Hydraulic Structures			$0.00
Channel Improvements			$0.00
Detention/Water Quality Facilities			$0.00
Removals			$31,752.00
Landscaping and Maintenance Improvements			$0.00
Special Items (User Defined)			$0.00
Subtotal Capital Improvement Costs			**$1,490,202.00**
Additional Capital Improvement Costs			
Dewatering		L.S.	$0.00
Mobilization	5%		$74,510.00
Traffic Control		L.S.	$0.00
Utility Coordination/Relocation		L.S.	$0.00
Stormwater Management/Erosion Control	5%		$74,510.00
Subtotal Additional Capital Improvement Costs			**$149,020.00**

Land Acquisition Costs			
ROW/Easements			$0.00
Subtotal Land Acquisition Costs			**$0.00**
Other Costs (percentage of Capital Improvement Costs)			
Engineering	15%		$245,883.00
Legal/Administrative	5%		$81,961.00
Contract Admin/Construction Management	10%		$163,922.00
Contingency	25%		$409,806.00
Subtotal Other Costs			**$901,572.00**
Total Capital Improvement Costs			**$2,540,794.00**

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, etc.)	756	L.F.	$2.00	$1,512.00	
Total Annual Operation and Maintenance Cost				**$1,512.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$75,600.00**	

Summary for Tabulation (Does Not Print)

Capital Improvement Costs	$1,639,222.00
ROW/Easements	$0.00
Engineering	$245,883.00
Legal/Administrative	$81,961.00
Contract Admin/Construction Management	$163,922.00
Contingency	$409,806.00
Total Capital Improvement Costs	$2,540,794.00
Total Annual Operation and Maintenance Cost	$1,512.00
Total Operation and Maintenance Costs Over 50 Years	$75,600.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	23.1447.001 Greeley - Comprehensive Drainage Plan Oklahoma Alteratives Analysis			
DRAINAGEWAY :	Reach 843			
REACH :	843			
JURISDICTION :	Greeley			
REACH ID:	Option 2-Reach843	Sabastian Ortega	DATE :	6/11/2024

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST
Concrete Box Culverts						
Box Culvert Pipe						
Individual Box Span (ft)	Box Height (ft)	No. of Barrels	Length (ft)			
6	4	1	74	L.F.	$1,009.44	$74,699.00
10	4	1	304	L.F.	$1,354.93	$411,900.00
Detention/Water Quality Facilities						
Detention (Complete-in-Place)						
Detention Facility 1 (Complete-in-Place)			25	AC-FT	$76,152.00	$1,903,800.00
Detention Facility 2 (Complete-in-Place)			17	AC-FT	$76,152.00	$1,294,584.00
Removals						
Removal of culvert pipe (48"<D<84")			378	L.F.	$84.00	$31,752.00
Landscaping and Maintenance Improvements						
Reclamation & seeding (native grasses)			16.60	ACRE	$1,670.00	$27,722.00
Land Acquisition						
Easement/ROW Acquisition			16.60	ACRE	$11,228.00	$186,385.00

Master Plan Capital Improvement Cost Summary	
Capital Improvement Costs	
Pipe Culverts and Storm Drains	$0.00
Concrete Box Culverts	$486,599.00
Hydraulic Structures	$0.00
Channel Improvements	$0.00
Detention/Water Quality Facilities	$3,198,384.00
Removals	$31,752.00
Landscaping and Maintenance Improvements	$27,722.00
Special Items (User Defined)	$0.00
Subtotal Capital Improvement Costs	**$3,744,457.00**
Additional Capital Improvement Costs	

Dewatering		L.S.	$0.00
Mobilization	5%		$187,223.00
Traffic Control		L.S.	$0.00
Utility Coordination/Relocation		L.S.	$0.00
Stormwater Management/Erosion Control	5%		$187,223.00
Subtotal Additional Capital Improvement Costs			**$374,446.00**
Land Acquisition Costs			
ROW/Easements			$186,385.00
Subtotal Land Acquisition Costs			**$186,385.00**
Other Costs (percentage of Capital Improvement Costs)			
Engineering	15%		$617,835.00
Legal/Administrative	5%		$205,945.00
Contract Admin/Construction Management	10%		$411,890.00
Contingency	25%		$1,029,726.00
Subtotal Other Costs			**$2,265,396.00**
Total Capital Improvement Costs			**$6,570,684.00**

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, etc.)	378	L.F.	$2.00	$756.00	
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal, structural repairs, etc.)	16.6	ACRE	$2,505.00	$41,583.00	
Total Annual Operation and Maintenance Cost				**$42,339.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$2,116,950.00**	

Summary for Tabulation (Does Not Print)

Capital Improvement Costs	$4,118,903.00
ROW/Easements	$186,385.00
Engineering	$617,835.00
Legal/Administrative	$205,945.00
Contract Admin/Construction Management	$411,890.00
Contingency	$1,029,726.00
Total Capital Improvement Costs	$6,570,684.00
Total Annual Operation and Maintenance Cost	$42,339.00
Total Operation and Maintenance Costs Over 50 Years	$2,116,950.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	23.1447.001 Greeley - Comprehensive Drainage Plan Oklahoma Alteratives Analysis			
DRAINAGEWAY :	Reach 843			
REACH :	843			
JURISDICTION :	Greeley			
REACH ID:	Option 3-Reach843	Sabastian Ortega	DATE :	6/11/2024

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
Concrete Box Culverts				
Box Culvert Pipe				
Individual Box Span (ft) / **Box Height (ft)** / **No. of Barrels** / **Length (ft)**				
9 / 5 / 2 / 74		L.F.	$2,764.44	$204,569.00
12 / 7 / 2 / 304		L.F.	$4,124.61	$1,253,881.00
Channel Improvements				
Excavation, Mid Range	8828	C.Y.	$40.00	$353,120.00
Removals				
Removal of culvert pipe (48"<D<84")	378	L.F.	$84.00	$31,752.00
Landscaping and Maintenance Improvements				
Reclamation & seeding (native grasses)	5	ACRE	$1,670.00	$7,899.00
Land Acquisition				
Easement/ROW Acquisition	4.73	ACRE	$11,228.00	$53,108.00

Master Plan Capital Improvement Cost Summary

Capital Improvement Costs	
Pipe Culverts and Storm Drains	$0.00
Concrete Box Culverts	$1,458,450.00
Hydraulic Structures	$0.00
Channel Improvements	$353,120.00
Detention/Water Quality Facilities	$0.00
Removals	$31,752.00
Landscaping and Maintenance Improvements	$7,899.00
Special Items (User Defined)	$0.00
Subtotal Capital Improvement Costs	**$1,851,221.00**
Additional Capital Improvement Costs	

Dewatering		L.S.	$0.00
Mobilization	5%		$92,561.00
Traffic Control		L.S.	$0.00
Utility Coordination/Relocation		L.S.	$0.00
Stormwater Management/Erosion Control	5%		$92,561.00
Subtotal Additional Capital Improvement Costs			**$185,122.00**
Land Acquisition Costs			
ROW/Easements			$53,108.00
Subtotal Land Acquisition Costs			**$53,108.00**
Other Costs (percentage of Capital Improvement Costs)			
Engineering	15%		$305,451.00
Legal/Administrative	5%		$101,817.00
Contract Admin/Construction Management	10%		$203,634.00
Contingency	25%		$509,086.00
Subtotal Other Costs			**$1,119,988.00**
Total Capital Improvement Costs			**$3,209,439.00**

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, etc.)	756	L.F.	$2.00	$1,512.00	
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	2471	L.F.	$3.00	$7,413.00	
Total Annual Operation and Maintenance Cost				**$8,925.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$446,250.00**	

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MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	23.1447.001 Greeley - Comprehensive Drainage Plan Oklahoma Alteratives Analysis			
DRAINAGEWAY :	Reach 843			
REACH :	843			
JURISDICTION :	Greeley			
REACH ID:	Option 4-Reach843	Sabastian Ortega	DATE :	6/11/2024

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST
Concrete Box Culverts						
Box Culvert Pipe						
Individual Box Span (ft)	Box Height (ft)	No. of Barrels	Length (ft)			
9	4	2	74	L.F.	$2,537.62	$187,784.00
10	4	1	304	L.F.	$1,354.93	$411,900.00
Detention/Water Quality Facilities						
Detention (Complete-in-Place)						
Detention Facility 1 (Complete-in-Place)			2	AC-FT	$76,152.00	$182,765.00
Removals						
Removal of culvert pipe (48"<D<84")			378	L.F.	$84.00	$31,752.00
Landscaping and Maintenance Improvements						
Reclamation & seeding (native grasses)			1	ACRE	$1,670.00	$1,002.00
Land Acquisition						
Easement/ROW Acquisition			0.60	ACRE	$11,228.00	$6,737.00

Master Plan Capital Improvement Cost Summary	
Capital Improvement Costs	
Pipe Culverts and Storm Drains	$0.00
Concrete Box Culverts	$599,684.00
Hydraulic Structures	$0.00
Channel Improvements	$0.00
Detention/Water Quality Facilities	$182,765.00
Removals	$31,752.00
Landscaping and Maintenance Improvements	$1,002.00
Special Items (User Defined)	$0.00
Subtotal Capital Improvement Costs	**$815,203.00**
Additional Capital Improvement Costs	

Dewatering		L.S.	$0.00
Mobilization	5%		$40,760.00
Traffic Control		L.S.	$0.00
Utility Coordination/Relocation		L.S.	$0.00
Stormwater Management/Erosion Control	5%		$40,760.00
Subtotal Additional Capital Improvement Costs			**$81,520.00**
Land Acquisition Costs			
ROW/Easements			$6,737.00
Subtotal Land Acquisition Costs			**$6,737.00**
Other Costs (percentage of Capital Improvement Costs)			
Engineering	15%		$134,508.00
Legal/Administrative	5%		$44,836.00
Contract Admin/Construction Management	10%		$89,672.00
Contingency	25%		$224,181.00
Subtotal Other Costs			**$493,197.00**
Total Capital Improvement Costs			**$1,396,657.00**

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, etc.)	452	L.F.	$2.00	$904.00	
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal, structural repairs, etc.)	0.6	ACRE	$2,505.00	$1,503.00	
Total Annual Operation and Maintenance Cost				**$2,407.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$120,350.00**	

Summary for Tabulation (Does Not Print)

Capital Improvement Costs	$896,723.00
ROW/Easements	$6,737.00
Engineering	$134,508.00
Legal/Administrative	$44,836.00
Contract Admin/Construction Management	$89,672.00
Contingency	$224,181.00
Total Capital Improvement Costs	$1,396,657.00
Total Annual Operation and Maintenance Cost	$2,407.00
Total Operation and Maintenance Costs Over 50 Years	$120,350.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Alteratives Analysis**			
DRAINAGEWAY :	**1000**			
REACH :	**1000**			
JURISDICTION :	**Greeley**			
REACH ID:	**Option 1 -Reach1000**	**Sabastian Ortega**	**DATE :**	**5/8/2025**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	**Box Height (ft)**	**No. of Barrels**	**Length (ft)**				
12	10	3	113	L.F.	$8,008.44	$904,954.00	Structure 1031, Reach 1024 [Note, shouldm be 12 by 12]
10	10	4	43	L.F.	$9,072.88	$390,134.00	Structure 1004, Reach 1088
12	8	5	49	L.F.	$12,264.72	$600,971.00	Structure 1005, Reach 1088
Headwall and Toewalls							
Individual Box Span (ft)	**No. of Barrels**	**Total Span (ft)**					
12	3	39.00	2	EA	$6,117.54	$12,235.00	
Wingwalls (includes wingwalls on either side of channel and concrete apron)							
Individual Box Span (ft)	**Box Rise (ft)**	**No. of Barrels**					
12	10	3	2	EA	$62,477.48	$124,955.00	
Removals							
Removal of culvert pipe (48"<D<84")			172	L.F.	$100.00	$17,200.00	
Concrete Box Culvert			52	L.F./CELL	$199.00	$10,348.00	
Special Items (User Defined)							
92' Span Bridge	**<----User Defined Items**		2760	SQ	$312.00	$861,120.00	Structure 1001, 30' width
79' Span Bridge	**<----User Defined Items**		1975	SQ	$312.00	$616,200.00	Structure 1002, 25' width
Bridge maintenance	**<----User Defined Items**		2	EA	$10,000.00	$20,000.00	
Land Acquisition							
Easement/ROW Acquisition			0.10	ACRE	$19,551.00	$1,955.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains			$0.00	
Concrete Box Culverts			$2,033,249.00	
Hydraulic Structures			$0.00	
Channel Improvements			$0.00	
Detention/Water Quality Facilities			$0.00	
Removals			$27,548.00	
Landscaping and Maintenance Improvements			$0.00	
Special Items (User Defined)			$1,497,320.00	
Subtotal Capital Improvement Costs			**$3,558,117.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$177,906.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	

Stormwater Management/Erosion Control	5%		$177,906.00	
Subtotal Additional Capital Improvement Costs			**$355,812.00**	
Land Acquisition Costs				
ROW/Easements			$1,955.00	
Subtotal Land Acquisition Costs			**$1,955.00**	
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%		$587,089.00	
Legal/Administrative	5%		$195,696.00	
Contract Admin/Construction Management	10%		$391,393.00	
Contingency	25%		$978,482.00	
Subtotal Other Costs			**$2,152,660.00**	
Total Capital Improvement Costs			**$6,068,544.00**	

Master Plan Operation and Maintenance Cost Summary					
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, et	756	L.F.	$2.00	$1,512.00	
Total Annual Operation and Maintenance Cost				**$1,512.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$75,600.00**	

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Alteratives Analysis			
DRAINAGEWAY :	1000			
REACH :	1000			
JURISDICTION :	Greeley			
REACH ID:	Option 2-Reach1000	Sabastian Ortega	DATE :	5/8/2025

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	Box Height (ft)	No. of Barrels	Length (ft)				
10	10	2	123	L.F.	$4,536.44	$557,982.00	Structure 1002, Reach 1010
12	10	1	113	L.F.	$2,669.48	$301,651.00	Structure 1031, Reach 1024
8	5	2	43	L.F.	$2,854.02	$122,723.00	Structure 1004, Reach 1088
14	8	1	49	L.F.	$2,914.20	$142,796.00	Structure 1005, Reach 1088
Hydraulic Structures							
Sloping Drop Structures							
Height (ft)	Bottom Width (ft)	Yn (ft)					
2	57	3.4	1	EA	$198,505.73	$198,506.00	L_1006 100yr Discharge=2004. Width=Discharge/35
4	46	2.3	1	EA	$174,876.78	$174,877.00	L_1028 100yr Discharge=1610. Width=Discharge/35
3	36	2.5	2	EA	$141,935.68	$283,871.00	L_1030 100yr Discharge=1263. Width=Discharge/35
3	35	2.8	2	EA	$145,409.96	$290,820.00	L_1046 100yr Discharge=1213. Width=Discharge/35
2	35	1.7	1	EA	$114,655.98	$114,656.00	L_1048 100yr Discharge=1213. Width=Discharge/35
Channel Improvements							
Excavation, Mid Range			56579	C.Y.	$48.00	$2,715,812.00	
Detention/Water Quality Facilities							
Detention (Complete-in-Place)							
Detention Facility 1 (Complete-in-Place)			11	AC-FT	$90,922.00	$1,000,142.00	D1034
Detention Facility 2 (Complete-in-Place)			159	AC-FT	$90,922.00	$14,456,598.00	D1050
Removals							
Removal of culvert pipe (48"<D<84")			172	L.F.	$100.00	$17,200.00	
Concrete Box Culvert			52	L.F./CELL	$199.00	$10,348.00	
Landscaping and Maintenance Improvements							
Reclamation & seeding (native grasses)			49	ACRE	$1,994.00	$97,507.00	
Special Items (User Defined)							
Bridge maintenance	<----User Defined Items		1	EA	$10,000.00	$10,000.00	Structure 1001, 30' width
Land Acquisition							
Easement/ROW Acquisition			48.90	ACRE	$19,551.00	$956,044.00	

Master Plan Capital Improvement Cost Summary		
Capital Improvement Costs		
Pipe Culverts and Storm Drains	$0.00	
Concrete Box Culverts	$1,125,152.00	
Hydraulic Structures	$1,062,730.00	
Channel Improvements	$2,715,812.00	

Detention/Water Quality Facilities			$15,456,740.00	
Removals			$27,548.00	
Landscaping and Maintenance Improvements			$97,507.00	
Special Items (User Defined)			$10,000.00	
Subtotal Capital Improvement Costs			**$20,495,489.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$1,024,774.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$1,024,774.00	
Subtotal Additional Capital Improvement Costs			**$2,049,548.00**	
Land Acquisition Costs				
ROW/Easements			$956,044.00	
Subtotal Land Acquisition Costs			**$956,044.00**	
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%		$3,381,756.00	
Legal/Administrative	5%		$1,127,252.00	
Contract Admin/Construction Management	10%		$2,254,504.00	
Contingency	25%		$5,636,259.00	
Subtotal Other Costs			**$12,399,771.00**	
Total Capital Improvement Costs			**$35,900,852.00**	

Master Plan Operation and Maintenance Cost Summary					
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, et	494	L.F.	$2.00	$988.00	
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)	7	EA	$997.00	$6,979.00	
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	7255	L.F.	$4.00	$29,020.00	
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal, st	30.6	ACRE	$2,991.00	$91,525.00	
Total Annual Operation and Maintenance Cost				**$128,512.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$6,425,600.00**	

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$22,545,037.00
ROW/Easements	$956,044.00
Engineering	$3,381,756.00
Legal/Administrative	$1,127,252.00
Contract Admin/Construction Management	$2,254,504.00
Contingency	$5,636,259.00
Total Capital Improvement Costs	$35,900,852.00
Total Annual Operation and Maintenance Cost	$128,512.00
Total Operation and Maintenance Costs Over 50 Years	$6,425,600.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Alteratives Analysis			
DRAINAGEWAY :	1000			
REACH :	1000			
JURISDICTION :	Greeley			
REACH ID:	Option 3-Reach1000	Sabastian Ortega	DATE :	5/8/2025

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	Box Height (ft)	No. of Barrels	Length (ft)				
12	10	3	113	L.F.	$8,008.44	$904,954.00	Structure 1031, Reach 1024 [Note, shouldm be 12 by 12]
10	10	4	43	L.F.	$9,072.88	$390,134.00	Structure 1004, Reach 1088
12	8	5	49	L.F.	$12,264.72	$600,971.00	Structure 1005, Reach 1088
Hydraulic Structures							
Sloping Drop Structures							
Height (ft)	Bottom Width (ft)	Yn (ft)					
2	274	2.7	1	EA	$700,327.28	$700,327.00	L_1006 100yr Discharge=9600. Width=Discharge/35
1.5	234	6.8	1	EA	$655,604.17	$655,604.00	L_1016 100yr Discharge=8189. Width=Discharge/35
4	229	1.8	1	EA	$663,531.76	$663,532.00	L_1028 100yr Discharge=8022. Width=Discharge/35
3	216	2	2	EA	$589,260.87	$1,178,522.00	L_1030 100yr Discharge=7543. Width=Discharge/35
3	151	1.5	2	EA	$413,761.24	$827,522.00	L_1042 100yr Discharge=5270. Width=Discharge/35
2	150	1.4	1	EA	$380,546.14	$380,546.00	L_1044 100yr Discharge=5235. Width=Discharge/35
3	147	2.9	2	EA	$433,140.08	$866,280.00	L_1046 100yr Discharge=5150. Width=Discharge/35
2	147	2.1	1	EA	$387,926.39	$387,926.00	L_1048 100yr Discharge=5151. Width=Discharge/35
Channel Improvements							
Excavation, Mid Range			313850	C.Y.	$48.00	$15,064,802.00	
Removals							
Removal of culvert pipe (48"<D<84")			172	L.F.	$100.00	$17,200.00	
Concrete Box Culvert			52	L.F./CELL	$199.00	$10,348.00	
Landscaping and Maintenance Improvements							
Reclamation & seeding (native grasses)			115	ACRE	$1,994.00	$229,606.00	
Special Items (User Defined)							
442' Span Bridge	**<----User Defined Items**		13260	SQ	$312.00	$4,137,120.00	Structure 1001, 30' width
582' Span Bridge	**<----User Defined Items**		14550	SQ	$312.00	$4,539,600.00	Structure 1002, 25' width
Bridge maintenance	**<----User Defined Items**		2	EA	$10,000.00	$20,000.00	
Land Acquisition							
Easement/ROW Acquisition			115.64	ACRE	$19,551.00	$2,260,847.00	

Master Plan Capital Improvement Cost Summary		
Capital Improvement Costs		
Pipe Culverts and Storm Drains	$0.00	
Concrete Box Culverts	$1,896,059.00	
Hydraulic Structures	$5,660,259.00	
Channel Improvements	$15,064,802.00	

Detention/Water Quality Facilities			$0.00	
Removals			$27,548.00	
Landscaping and Maintenance Improvements			$229,606.00	
Special Items (User Defined)			$8,696,720.00	
Subtotal Capital Improvement Costs			**$31,574,994.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$1,578,750.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$1,578,750.00	
Subtotal Additional Capital Improvement Costs			**$3,157,500.00**	
Land Acquisition Costs				
ROW/Easements			$2,260,847.00	
Subtotal Land Acquisition Costs			**$2,260,847.00**	
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%		$5,209,874.00	
Legal/Administrative	5%		$1,736,625.00	
Contract Admin/Construction Management	10%		$3,473,249.00	
Contingency	25%		$8,683,124.00	
Subtotal Other Costs			**$19,102,872.00**	
Total Capital Improvement Costs			**$56,096,213.00**	

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, et	756	L.F.	$2.00	$1,512.00	
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)	11	EA	$997.00	$10,967.00	
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	10085	L.F.	$4.00	$40,340.00	
Total Annual Operation and Maintenance Cost				**$52,819.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$2,640,950.00**	

Summary for Tabulation (Does Not Print)

Capital Improvement Costs	$34,732,494.00
ROW/Easements	$2,260,847.00
Engineering	$5,209,874.00
Legal/Administrative	$1,736,625.00
Contract Admin/Construction Management	$3,473,249.00
Contingency	$8,683,124.00
Total Capital Improvement Costs	$56,096,213.00
Total Annual Operation and Maintenance Cost	$52,819.00
Total Operation and Maintenance Costs Over 50 Years	$2,640,950.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Alteratives Analysis			
DRAINAGEWAY :	1000			
REACH :	1000			
JURISDICTION :	Greeley			
REACH ID:	Option 4-Reach1000	Sabastian Ortega	DATE :	5/8/2025

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	Box Height (ft)	No. of Barrels	Length (ft)				
10	10	2	123	L.F.	$4,536.44	$557,982.00	Structure 1002, Reach 1010
12	10	1	113	L.F.	$2,669.48	$301,651.00	Structure 1031, Reach 1024
14	8	1	49	L.F.	$2,914.20	$142,796.00	Structure 1005, Reach 1088
Hydraulic Structures							
Sloping Drop Structures							
Height (ft)	Bottom Width (ft)	Yn (ft)					
2	62	2.1	1	EA	$184,947.95	$184,948.00	L_1006 100yr Discharge=2153. Width=Discharge/35
1.5	5	3.5	1	EA	$75,322.59	$75,323.00	L_1016 100yr Discharge=1923. Width=Discharge/35
4	51	2.2	1	EA	$185,497.01	$185,497.00	L_1028 100yr Discharge=1774. Width=Discharge/35
3	42	2.4	2	EA	$154,264.26	$308,529.00	L_1030 100yr Discharge=1457. Width=Discharge/35
3	27	2.3	2	EA	$114,186.17	$228,372.00	L_1042 100yr Discharge=934. Width=Discharge/35
2	27	2.2	1	EA	$104,284.35	$104,284.00	L_1044 100yr Discharge=934. Width=Discharge/35
3	26	2.5	2	EA	$115,730.34	$231,461.00	L_1046 100yr Discharge=900. Width=Discharge/35
2	26	2	1	EA	$98,250.36	$98,250.00	L_1048 100yr Discharge=900. Width=Discharge/35
Channel Improvements							
Excavation, Mid Range			69152	C.Y.	$48.00	$3,319,304.00	
Detention/Water Quality Facilities							
Detention (Complete-in-Place)							
Detention Facility 1 (Complete-in-Place)			159	AC-FT	$90,922.00	$14,456,598.00	Flood Control 1050
Removals							
Removal of culvert pipe (48"<D<84")			172	L.F.	$100.00	$17,200.00	
Concrete Box Culvert			52	L.F./CELL	$199.00	$10,348.00	
Landscaping and Maintenance Improvements							
Reclamation & seeding (native grasses)			40	ACRE	$1,994.00	$79,760.00	
Special Items (User Defined)							
Bridge maintenance	<----User Defined Items		1	EA	$10,000.00	$10,000.00	Structure 1001, 30' width
Land Acquisition							
Easement/ROW Acquisition			40.00	ACRE	$19,551.00	$782,040.00	

Master Plan Capital Improvement Cost Summary		
Capital Improvement Costs		
Pipe Culverts and Storm Drains	$0.00	
Concrete Box Culverts	$1,002,429.00	
Hydraulic Structures	$1,416,664.00	

Channel Improvements			$3,319,304.00	
Detention/Water Quality Facilities			$14,456,598.00	
Removals			$27,548.00	
Landscaping and Maintenance Improvements			$79,760.00	
Special Items (User Defined)			$10,000.00	
Subtotal Capital Improvement Costs			**$20,312,303.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$1,015,615.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$1,015,615.00	
Subtotal Additional Capital Improvement Costs			**$2,031,230.00**	
Land Acquisition Costs				
ROW/Easements			$782,040.00	
Subtotal Land Acquisition Costs			**$782,040.00**	
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%		$3,351,530.00	
Legal/Administrative	5%		$1,117,177.00	
Contract Admin/Construction Management	10%		$2,234,353.00	
Contingency	25%		$5,585,883.00	
Subtotal Other Costs			**$12,288,943.00**	
Total Capital Improvement Costs			**$35,414,516.00**	

Master Plan Operation and Maintenance Cost Summary					
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, et	408	L.F.	$2.00	$816.00	
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)	11	EA	$997.00	$10,967.00	
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	10085	L.F.	$4.00	$40,340.00	
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal, st	16.5	ACRE	$2,991.00	$49,352.00	
Total Annual Operation and Maintenance Cost				**$101,475.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$5,073,750.00**	

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$22,343,533.00
ROW/Easements	$782,040.00
Engineering	$3,351,530.00
Legal/Administrative	$1,117,177.00
Contract Admin/Construction Management	$2,234,353.00
Contingency	$5,585,883.00
Total Capital Improvement Costs	$35,414,516.00
Total Annual Operation and Maintenance Cost	$101,475.00
Total Operation and Maintenance Costs Over 50 Years	$5,073,750.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Alteratives Analysis**			
DRAINAGEWAY :	**1100**			
REACH :	**1100**			
JURISDICTION :	**Greeley**			
REACH ID:	**Option 1 -Reach1100**	**Sabastian Ortega**	**DATE :**	**5/8/2025**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	**Box Height (ft)**	**No. of Barrels**	**Length (ft)**				
10	6	3	193	L.F.	$5,695.43	$1,099,218.00	Structure 1103, Reach 1140
Headwall and Toewalls							
Individual Box Span (ft)	**No. of Barrels**	**Total Span (ft)**					
10	3	33.00	2	EA	$5,215.98	$10,432.00	
Wingwalls (includes wingwalls on either side of channel and concrete apron)							
Individual Box Span (ft)	**Box Rise (ft)**	**No. of Barrels**					
10	6	3	2	EA	$32,695.77	$65,391.50	
Removals							
Removal of culvert pipe (48"<D<84")			386	L.F.	$100.00	$38,600.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains			$0.00	
Concrete Box Culverts			$1,175,042.00	
Hydraulic Structures			$0.00	
Channel Improvements			$0.00	
Detention/Water Quality Facilities			$0.00	
Removals			$38,600.00	
Landscaping and Maintenance Improvements			$0.00	
Special Items (User Defined)			$0.00	
Subtotal Capital Improvement Costs			**$1,213,642.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$60,682.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$60,682.00	
Subtotal Additional Capital Improvement Costs			**$121,364.00**	
Land Acquisition Costs				
ROW/Easements			$0.00	
Subtotal Land Acquisition Costs			**$0.00**	
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%		$200,251.00	
Legal/Administrative	5%		$66,750.00	
Contract Admin/Construction Management	10%		$133,501.00	
Contingency	25%		$333,752.00	

Subtotal Other Costs	**$734,254.00**
Total Capital Improvement Costs	**$2,069,260.00**

Master Plan Operation and Maintenance Cost Summary				
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, e	579	L.F.	$2.00	$1,158.00
Total Annual Operation and Maintenance Cost				**$1,158.00**
Effective Interest Rate				0.00%
Total Operation and Maintenance Costs Over 50 Years				**$57,900.00**

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$1,335,006.00
ROW/Easements	$0.00
Engineering	$200,251.00
Legal/Administrative	$66,750.00
Contract Admin/Construction Management	$133,501.00
Contingency	$333,752.00
Total Capital Improvement Costs	$2,069,260.00
Total Annual Operation and Maintenance Cost	$1,158.00
Total Operation and Maintenance Costs Over 50 Years	$57,900.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Alteratives Analysis**			
DRAINAGEWAY :	**1100**			
REACH :	**1100**			
JURISDICTION :	**Greeley**			
REACH ID:	**Option 2-Reach1100**	**Sabastian Ortega**	**DATE :**	**5/8/2025**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Hydraulic Structures							
Sloping Drop Structures							
Height (ft)	**Bottom Width (ft)**	**Yn (ft)**					
5	5.5	2.2	2	EA	$66,433.11	$132,866.00	L_1151 100yr Discharge=184. Width=Discharge/35
4	5.5	2.2	1	EA	$62,318.85	$62,319.00	L_1151 100yr Discharge=184. Width=Discharge/35
3	8	2	2	EA	$60,550.24	$121,100.00	L_1147 100yr Discharge=271. Width=Discharge/35
Detention/Water Quality Facilities							
Detention (Complete-in-Place)							
Detention Facility 1 (Complete-in-Place)			46	AC-FT	$90,922.00	$4,182,412.00	
Landscaping and Maintenance Improvements							
Reclamation & seeding (native grasses)			6	ACRE	$1,994.00	$10,967.00	
Land Acquisition							
Easement/ROW Acquisition			5.50	ACRE	$19,551.00	$107,531.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains			$0.00	
Concrete Box Culverts			$0.00	
Hydraulic Structures			$316,285.00	
Channel Improvements			$0.00	
Detention/Water Quality Facilities			$4,182,412.00	
Removals			$0.00	
Landscaping and Maintenance Improvements			$10,967.00	
Special Items (User Defined)			$0.00	
Subtotal Capital Improvement Costs			**$4,509,664.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$225,483.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$225,483.00	
Subtotal Additional Capital Improvement Costs			**$450,966.00**	
Land Acquisition Costs				
ROW/Easements			$107,531.00	
Subtotal Land Acquisition Costs			**$107,531.00**	
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%		$744,095.00	
Legal/Administrative	5%		$248,032.00	

Contract Admin/Construction Management	10%		$496,063.00	
Contingency	25%		$1,240,158.00	
Subtotal Other Costs			**$2,728,348.00**	
Total Capital Improvement Costs			**$7,796,509.00**	

Master Plan Operation and Maintenance Cost Summary					
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**	
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)	5	EA	$997.00	$4,985.00	
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal, st	30.2	ACRE	$2,991.00	$90,328.00	
Total Annual Operation and Maintenance Cost				**$95,313.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$4,765,650.00**	

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$4,960,630.00
ROW/Easements	$107,531.00
Engineering	$744,095.00
Legal/Administrative	$248,032.00
Contract Admin/Construction Management	$496,063.00
Contingency	$1,240,158.00
Total Capital Improvement Costs	$7,796,509.00
Total Annual Operation and Maintenance Cost	$95,313.00
Total Operation and Maintenance Costs Over 50 Years	$4,765,650.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Alteratives Analysis**			
DRAINAGEWAY :	**1100**			
REACH :	**1100**			
JURISDICTION :	**Greeley**			
REACH ID:	**Option 3-Reach1100**	**Sabastian Ortega**	**DATE :**	**5/8/2025**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	**Box Height (ft)**	**No. of Barrels**	**Length (ft)**				
10	5	3	193	L.F.	$5,161.51	$996,172.00	Structure 1103, Reach 1140
Hydraulic Structures							
Sloping Drop Structures							
Height (ft)	**Bottom Width (ft)**	**Yn (ft)**					
5	15	1.6	2	EA	$80,264.91	$160,530.00	L_1151 100yr Discharge=531. Width=Discharge/35
4	15	1.6	1	EA	$75,308.55	$75,309.00	L_1151 100yr Discharge=531. Width=Discharge/35
3	30	2	2	EA	$116,604.49	$233,209.00	L_1147 100yr Discharge=1044. Width=Discharge/35
Channel Improvements							
Excavation, Mid Range			8173	C.Y.	$48.00	$392,314.00	
Landscaping and Maintenance Improvements							
Reclamation & seeding (native grasses)			3	ACRE	$1,994.00	$5,612.00	
Land Acquisition							
Easement/ROW Acquisition			2.81	ACRE	$19,551.00	$55,025.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains			$0.00	
Concrete Box Culverts			$996,172.00	
Hydraulic Structures			$469,048.00	
Channel Improvements			$392,314.00	
Detention/Water Quality Facilities			$0.00	
Removals			$0.00	
Landscaping and Maintenance Improvements			$5,612.00	
Special Items (User Defined)			$0.00	
Subtotal Capital Improvement Costs			**$1,863,146.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$93,157.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$93,157.00	
Subtotal Additional Capital Improvement Costs			**$186,314.00**	
Land Acquisition Costs				
ROW/Easements			$55,025.00	
Subtotal Land Acquisition Costs			**$55,025.00**	

Other Costs (percentage of Capital Improvement Costs)			
Engineering	15%		$307,419.00
Legal/Administrative	5%		$102,473.00
Contract Admin/Construction Management	10%		$204,946.00
Contingency	25%		$512,365.00
Subtotal Other Costs			**$1,127,203.00**
Total Capital Improvement Costs			**$3,231,688.00**

Master Plan Operation and Maintenance Cost Summary				
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, et	579	L.F.	$2.00	$1,158.00
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)	5	EA	$997.00	$4,985.00
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	973	L.F.	$4.00	$3,892.00
Total Annual Operation and Maintenance Cost				**$10,035.00**
Effective Interest Rate				0.00%
Total Operation and Maintenance Costs Over 50 Years				**$501,750.00**

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$2,049,460.00
ROW/Easements	$55,025.00
Engineering	$307,419.00
Legal/Administrative	$102,473.00
Contract Admin/Construction Management	$204,946.00
Contingency	$512,365.00
Total Capital Improvement Costs	$3,231,688.00
Total Annual Operation and Maintenance Cost	$10,035.00
Total Operation and Maintenance Costs Over 50 Years	$501,750.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Alteratives Analysis**			
DRAINAGEWAY :	**1100**			
REACH :	**1100**			
JURISDICTION :	**Greeley**			
REACH ID:	**Option 4-Reach1100**	**Sabastian Ortega**	**DATE :**	**5/8/2025**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Hydraulic Structures							
Sloping Drop Structures							
Height (ft)	**Bottom Width (ft)**	**Yn (ft)**					
5	5	2	2	EA	$60,396.04	$120,792.00	L_1151 100yr Discharge=183. Width=Discharge/35
4	5	2	1	EA	$56,650.70	$56,651.00	L_1151 100yr Discharge=183. Width=Discharge/35
3	8	1.9	2	EA	$58,543.73	$117,087.00	L_1147 100yr Discharge=275. Width=Discharge/35
5	7.5	2.7	1	EA	$83,712.88	$83,713.00	L_1115 100yr Discharge=260. Width=Discharge/35
2	7.5	2.7	1	EA	$68,154.08	$68,154.00	L_1115 100yr Discharge=260. Width=Discharge/35

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains			$0.00	
Concrete Box Culverts			$0.00	
Hydraulic Structures			$446,397.00	
Channel Improvements			$0.00	
Detention/Water Quality Facilities			$0.00	
Removals			$0.00	
Landscaping and Maintenance Improvements			$0.00	
Special Items (User Defined)			$0.00	
Subtotal Capital Improvement Costs			**$446,397.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$22,320.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$22,320.00	
Subtotal Additional Capital Improvement Costs			**$44,640.00**	
Land Acquisition Costs				
ROW/Easements			$0.00	
Subtotal Land Acquisition Costs			**$0.00**	
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%		$73,656.00	
Legal/Administrative	5%		$24,552.00	
Contract Admin/Construction Management	10%		$49,104.00	
Contingency	25%		$122,759.00	
Subtotal Other Costs			**$270,071.00**	
Total Capital Improvement Costs			**$761,108.00**	

Master Plan Operation and Maintenance Cost Summary					
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**	
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)	7	EA	$997.00	$6,979.00	
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal, st	24.7	ACRE	$2,991.00	$73,878.00	
Total Annual Operation and Maintenance Cost				**$80,857.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$4,042,850.00**	

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$491,037.00
ROW/Easements	$0.00
Engineering	$73,656.00
Legal/Administrative	$24,552.00
Contract Admin/Construction Management	$49,104.00
Contingency	$122,759.00
Total Capital Improvement Costs	$761,108.00
Total Annual Operation and Maintenance Cost	$80,857.00
Total Operation and Maintenance Costs Over 50 Years	$4,042,850.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Alteratives Analysis**			
DRAINAGEWAY :	**1200**			
REACH :	**1200**			
JURISDICTION :	**Greeley**			
REACH ID:	**Option 1 -Reach1200**	**Sabastian Ortega**	**DATE :**	**5/8/2025**

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Master Plan Capital Improvement Cost Summary						
Capital Improvement Costs						
Pipe Culverts and Storm Drains					$0.00	
Concrete Box Culverts					$0.00	
Hydraulic Structures					$0.00	
Channel Improvements					$0.00	
Detention/Water Quality Facilities					$0.00	
Removals					$0.00	
Landscaping and Maintenance Improvements					$0.00	
Special Items (User Defined)					$0.00	
Subtotal Capital Improvement Costs					**$0.00**	
Additional Capital Improvement Costs						
Dewatering			L.S.		$0.00	
Mobilization		5%			$0.00	
Traffic Control			L.S.		$0.00	
Utility Coordination/Relocation			L.S.		$0.00	
Stormwater Management/Erosion Control		5%			$0.00	
Subtotal Additional Capital Improvement Costs					**$0.00**	
Land Acquisition Costs						
ROW/Easements					$0.00	
Subtotal Land Acquisition Costs					**$0.00**	
Other Costs (percentage of Capital Improvement Costs)						
Engineering		15%			$0.00	
Legal/Administrative		5%			$0.00	
Contract Admin/Construction Management		10%			$0.00	
Contingency		25%			$0.00	
Subtotal Other Costs					**$0.00**	
Total Capital Improvement Costs					**$0.00**	

Master Plan Operation and Maintenance Cost Summary					
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, et	642	L.F.	$2.00	$1,284.00	
Total Annual Operation and Maintenance Cost				**$1,284.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$64,200.00**	

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$0.00
ROW/Easements	$0.00
Engineering	$0.00
Legal/Administrative	$0.00
Contract Admin/Construction Management	$0.00
Contingency	$0.00
Total Capital Improvement Costs	$0.00
Total Annual Operation and Maintenance Cost	$1,284.00
Total Operation and Maintenance Costs Over 50 Years	$64,200.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Alteratives Analysis**			
DRAINAGEWAY :	**1200**			
REACH :	**1200**			
JURISDICTION :	**Greeley**			
REACH ID:	**Option 2-Reach1200**	**Sabastian Ortega**	**DATE :**	**5/8/2025**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Hydraulic Structures							
Sloping Drop Structures							
Height (ft)	**Bottom Width (ft)**	**Yn (ft)**					
5	9	4.1	2	EA	$120,178.15	$240,356.00	L_1239 100yr Discharge=326. Width=Discharge/35
Channel Improvements							
Excavation, Mid Range			1333	C.Y.	$48.00	$63,984.00	
Landscaping and Maintenance Improvements							
Reclamation & seeding (native grasses)			1	ACRE	$1,994.00	$2,193.00	
Land Acquisition							
Easement/ROW Acquisition			1.10	ACRE	$19,551.00	$21,506.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains			$0.00	
Concrete Box Culverts			$0.00	
Hydraulic Structures			$240,356.00	
Channel Improvements			$63,984.00	
Detention/Water Quality Facilities			$0.00	
Removals			$0.00	
Landscaping and Maintenance Improvements			$2,193.00	
Special Items (User Defined)			$0.00	
Subtotal Capital Improvement Costs			**$306,533.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$15,327.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$15,327.00	
Subtotal Additional Capital Improvement Costs			**$30,654.00**	
Land Acquisition Costs				
ROW/Easements			$21,506.00	
Subtotal Land Acquisition Costs			**$21,506.00**	
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%		$50,578.00	
Legal/Administrative	5%		$16,859.00	
Contract Admin/Construction Management	10%		$33,719.00	
Contingency	25%		$84,297.00	
Subtotal Other Costs			**$185,453.00**	

Total Capital Improvement Costs	$544,146.00

Master Plan Operation and Maintenance Cost Summary				
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)	2	EA	$997.00	$1,994.00
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	1333	L.F.	$4.00	$5,332.00
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal, st	13.1	ACRE	$2,991.00	$39,182.00
Total Annual Operation and Maintenance Cost				**$46,508.00**
Effective Interest Rate				0.00%
Total Operation and Maintenance Costs Over 50 Years				**$2,325,400.00**

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$337,187.00
ROW/Easements	$21,506.00
Engineering	$50,578.00
Legal/Administrative	$16,859.00
Contract Admin/Construction Management	$33,719.00
Contingency	$84,297.00
Total Capital Improvement Costs	$544,146.00
Total Annual Operation and Maintenance Cost	$46,508.00
Total Operation and Maintenance Costs Over 50 Years	$2,325,400.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Alteratives Analysis**			
DRAINAGEWAY :	**1200**			
REACH :	**1200**			
JURISDICTION :	**Greeley**			
REACH ID:	**Option 3-Reach1200**	**Sabastian Ortega**	**DATE :**	**5/8/2025**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Hydraulic Structures							
Sloping Drop Structures							
Height (ft)	**Bottom Width (ft)**	**Yn (ft)**					
5	9	1.1	2	EA	$51,372.84	$102,746.00	L_1239 100yr Discharge=326. Width=Discharge/35
Channel Improvements							
Excavation, Mid Range			1333	C.Y.	$48.00	$63,984.00	
Landscaping and Maintenance Improvements							
Reclamation & seeding (native grasses)			1	ACRE	$1,994.00	$1,994.00	
Land Acquisition							
Easement/ROW Acquisition			1.10	ACRE	$19,551.00	$21,506.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains			$0.00	
Concrete Box Culverts			$0.00	
Hydraulic Structures			$102,746.00	
Channel Improvements			$63,984.00	
Detention/Water Quality Facilities			$0.00	
Removals			$0.00	
Landscaping and Maintenance Improvements			$1,994.00	
Special Items (User Defined)			$0.00	
Subtotal Capital Improvement Costs			**$168,724.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$8,436.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$8,436.00	
Subtotal Additional Capital Improvement Costs			**$16,872.00**	
Land Acquisition Costs				
ROW/Easements			$21,506.00	
Subtotal Land Acquisition Costs			**$21,506.00**	
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%		$27,839.00	
Legal/Administrative	5%		$9,280.00	
Contract Admin/Construction Management	10%		$18,560.00	
Contingency	25%		$46,399.00	
Subtotal Other Costs			**$102,078.00**	

Total Capital Improvement Costs	**$309,180.00**

Master Plan Operation and Maintenance Cost Summary				
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)	2	EA	$997.00	$1,994.00
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	1333	L.F.	$4.00	$5,332.00
Total Annual Operation and Maintenance Cost				**$7,326.00**
Effective Interest Rate				0.00%
Total Operation and Maintenance Costs Over 50 Years				**$366,300.00**

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$185,596.00
ROW/Easements	$21,506.00
Engineering	$27,839.00
Legal/Administrative	$9,280.00
Contract Admin/Construction Management	$18,560.00
Contingency	$46,399.00
Total Capital Improvement Costs	$309,180.00
Total Annual Operation and Maintenance Cost	$7,326.00
Total Operation and Maintenance Costs Over 50 Years	$366,300.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Alteratives Analysis**			
DRAINAGEWAY :	**1200**			
REACH :	**1200**			
JURISDICTION :	**Greeley**			
REACH ID:	**Option 4-Reach1200**	**Sabastian Ortega**	**DATE :**	**5/8/2025**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Hydraulic Structures							
Sloping Drop Structures							
Height (ft)	**Bottom Width (ft)**	**Yn (ft)**					
5	9	4.1	2	EA	$120,178.15	$240,356.00	L_1239 100yr Discharge=326. Width=Discharge/35
Channel Improvements							
Excavation, Mid Range			1333	C.Y.	$48.00	$63,984.00	
Landscaping and Maintenance Improvements							
Reclamation & seeding (native grasses)			1	ACRE	$1,994.00	$2,193.00	
Land Acquisition							
Easement/ROW Acquisition			1.10	ACRE	$19,551.00	$21,506.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains			$0.00	
Concrete Box Culverts			$0.00	
Hydraulic Structures			$240,356.00	
Channel Improvements			$63,984.00	
Detention/Water Quality Facilities			$0.00	
Removals			$0.00	
Landscaping and Maintenance Improvements			$2,193.00	
Special Items (User Defined)			$0.00	
Subtotal Capital Improvement Costs			**$306,533.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$15,327.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$15,327.00	
Subtotal Additional Capital Improvement Costs			**$30,654.00**	
Land Acquisition Costs				
ROW/Easements			$21,506.00	
Subtotal Land Acquisition Costs			**$21,506.00**	
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%		$50,578.00	
Legal/Administrative	5%		$16,859.00	
Contract Admin/Construction Management	10%		$33,719.00	
Contingency	25%		$84,297.00	
Subtotal Other Costs			**$185,453.00**	

Total Capital Improvement Costs	$544,146.00

Master Plan Operation and Maintenance Cost Summary				
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)	2	EA	$997.00	$1,994.00
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	1333	L.F.	$4.00	$5,332.00
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal, st	13.1	ACRE	$2,991.00	$39,182.00
Total Annual Operation and Maintenance Cost				**$46,508.00**
Effective Interest Rate				0.00%
Total Operation and Maintenance Costs Over 50 Years				**$2,325,400.00**

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$337,187.00
ROW/Easements	$21,506.00
Engineering	$50,578.00
Legal/Administrative	$16,859.00
Contract Admin/Construction Management	$33,719.00
Contingency	$84,297.00
Total Capital Improvement Costs	$544,146.00
Total Annual Operation and Maintenance Cost	$46,508.00
Total Operation and Maintenance Costs Over 50 Years	$2,325,400.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Alteratives Analysis**			
DRAINAGEWAY :	**1300**			
REACH :	**1300**			
JURISDICTION :	**Greeley**			
REACH ID:	**Option 1 -Reach1300**	**Sabastian Ortega**	**DATE :**	**5/8/2025**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	**Box Height (ft)**	**No. of Barrels**	**Length (ft)**				
10	8	3	48	L.F.	$6,274.75	$301,188.00	Structure 1301, Reach 1316
Headwall and Toewalls							
Individual Box Span (ft)	**No. of Barrels**	**Total Span (ft)**					
10	3	33.00	2	EA	$5,215.98	$10,432.00	
Wingwalls (includes wingwalls on either side of channel and concrete apron)							
Individual Box Span (ft)	**Box Rise (ft)**	**No. of Barrels**					
10	8	3	2	EA	$43,232.98	$86,466.00	
Removals							
Removal of culvert pipe (D<48")			48	L.F.	$40.00	$1,920.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains			$0.00	
Concrete Box Culverts			$398,086.00	
Hydraulic Structures			$0.00	
Channel Improvements			$0.00	
Detention/Water Quality Facilities			$0.00	
Removals			$1,920.00	
Landscaping and Maintenance Improvements			$0.00	
Special Items (User Defined)			$0.00	
Subtotal Capital Improvement Costs			**$400,006.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$20,000.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$20,000.00	
Subtotal Additional Capital Improvement Costs			**$40,000.00**	
Land Acquisition Costs				
ROW/Easements			$0.00	
Subtotal Land Acquisition Costs			**$0.00**	
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%		$66,001.00	
Legal/Administrative	5%		$22,000.00	
Contract Admin/Construction Management	10%		$44,001.00	
Contingency	25%		$110,002.00	

Subtotal Other Costs	**$242,004.00**
Total Capital Improvement Costs	**$682,010.00**

Master Plan Operation and Maintenance Cost Summary				
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, e	48	L.F.	$2.00	$96.00
Total Annual Operation and Maintenance Cost				**$96.00**
Effective Interest Rate				0.00%
Total Operation and Maintenance Costs Over 50 Years				**$4,800.00**

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$440,006.00
ROW/Easements	$0.00
Engineering	$66,001.00
Legal/Administrative	$22,000.00
Contract Admin/Construction Management	$44,001.00
Contingency	$110,002.00
Total Capital Improvement Costs	$682,010.00
Total Annual Operation and Maintenance Cost	$96.00
Total Operation and Maintenance Costs Over 50 Years	$4,800.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Alteratives Analysis**			
DRAINAGEWAY :	**1300**			
REACH :	**1300**			
JURISDICTION :	**Greeley**			
REACH ID:	**Option 2-Reach1300**	**Sabastian Ortega**	**DATE :**	**5/8/2025**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	**Box Height (ft)**	**No. of Barrels**	**Length (ft)**				
10	4	3	48	L.F.	$4,627.60	$222,125.00	Structure 1301, Reach 1316
Detention/Water Quality Facilities							
Detention (Complete-in-Place)							
Detention Facility 1 (Complete-in-Place)			43	AC-FT	$90,922.00	$3,909,646.00	
Removals							
Removal of culvert pipe (D<48")			48	L.F.	$40.00	$1,920.00	
Landscaping and Maintenance Improvements							
Reclamation & seeding (native grasses)			5	ACRE	$1,994.00	$10,169.00	
Land Acquisition							
Easement/ROW Acquisition			5.10	ACRE	$19,551.00	$99,710.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains			$0.00	
Concrete Box Culverts			$222,125.00	
Hydraulic Structures			$0.00	
Channel Improvements			$0.00	
Detention/Water Quality Facilities			$3,909,646.00	
Removals			$1,920.00	
Landscaping and Maintenance Improvements			$10,169.00	
Special Items (User Defined)			$0.00	
Subtotal Capital Improvement Costs			**$4,143,860.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$207,193.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$207,193.00	
Subtotal Additional Capital Improvement Costs			**$414,386.00**	
Land Acquisition Costs				
ROW/Easements			$99,710.00	
Subtotal Land Acquisition Costs			**$99,710.00**	
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%		$683,737.00	
Legal/Administrative	5%		$227,912.00	

Contract Admin/Construction Management	10%		$455,825.00	
Contingency	25%		$1,139,562.00	
Subtotal Other Costs			**$2,507,036.00**	
Total Capital Improvement Costs			**$7,164,992.00**	

Master Plan Operation and Maintenance Cost Summary					
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, et	48	L.F.	$2.00	$96.00	
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal, st	78.2	ACRE	$2,991.00	$233,896.00	
Total Annual Operation and Maintenance Cost				**$233,992.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$11,699,600.00**	

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$4,558,246.00
ROW/Easements	$99,710.00
Engineering	$683,737.00
Legal/Administrative	$227,912.00
Contract Admin/Construction Management	$455,825.00
Contingency	$1,139,562.00
Total Capital Improvement Costs	$7,164,992.00
Total Annual Operation and Maintenance Cost	$233,992.00
Total Operation and Maintenance Costs Over 50 Years	$11,699,600.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Alteratives Analysis**			
DRAINAGEWAY :	**1300**			
REACH :	**1300**			
JURISDICTION :	**Greeley**			
REACH ID:	**Option 3-Reach1300**	**Sabastian Ortega**	**DATE :**	**5/8/2025**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	**Box Height (ft)**	**No. of Barrels**	**Length (ft)**				
10	8	3	48	L.F.	$6,274.75	$301,188.00	Structure 1301, Reach 1316
Channel Improvements							
Excavation, Mid Range			24376	C.Y.	$48.00	$1,170,058.00	
Removals							
Removal of culvert pipe (D<48")			48	L.F.	$40.00	$1,920.00	
Landscaping and Maintenance Improvements							
Reclamation & seeding (native grasses)			14	ACRE	$1,994.00	$28,714.00	
Land Acquisition							
Easement/ROW Acquisition			14.40	ACRE	$19,551.00	$281,534.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains			$0.00	
Concrete Box Culverts			$301,188.00	
Hydraulic Structures			$0.00	
Channel Improvements			$1,170,058.00	
Detention/Water Quality Facilities			$0.00	
Removals			$1,920.00	
Landscaping and Maintenance Improvements			$28,714.00	
Special Items (User Defined)			$0.00	
Subtotal Capital Improvement Costs			**$1,501,880.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$75,094.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$75,094.00	
Subtotal Additional Capital Improvement Costs			**$150,188.00**	
Land Acquisition Costs				
ROW/Easements			$281,534.00	
Subtotal Land Acquisition Costs			**$281,534.00**	
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%		$247,810.00	
Legal/Administrative	5%		$82,603.00	
Contract Admin/Construction Management	10%		$165,207.00	

Contingency	25%			$413,017.00	
Subtotal Other Costs				**$908,637.00**	
Total Capital Improvement Costs				**$2,842,239.00**	

Master Plan Operation and Maintenance Cost Summary					
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, et	48	L.F.	$2.00	$96.00	
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	5586	L.F.	$4.00	$22,344.00	
Total Annual Operation and Maintenance Cost				**$22,440.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$1,122,000.00**	

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$1,652,068.00
ROW/Easements	$281,534.00
Engineering	$247,810.00
Legal/Administrative	$82,603.00
Contract Admin/Construction Management	$165,207.00
Contingency	$413,017.00
Total Capital Improvement Costs	$2,842,239.00
Total Annual Operation and Maintenance Cost	$22,440.00
Total Operation and Maintenance Costs Over 50 Years	$1,122,000.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Alteratives Analysis**			
DRAINAGEWAY :	**1300**			
REACH :	**1300**			
JURISDICTION :	**Greeley**			
REACH ID:	**Option 4-Reach1300**	**Sabastian Ortega**	**DATE :**	**5/8/2025**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	**Box Height (ft)**	**No. of Barrels**	**Length (ft)**				
10	4	3	48	L.F.	$4,627.60	$222,125.00	Structure 1301, Reach 1316
Detention/Water Quality Facilities							
Detention (Complete-in-Place)							
Detention Facility 1 (Complete-in-Place)			43	AC-FT	$90,922.00	$3,909,646.00	
Removals							
Removal of culvert pipe (D<48")			48	L.F.	$40.00	$1,920.00	
Landscaping and Maintenance Improvements							
Reclamation & seeding (native grasses)			5	ACRE	$1,994.00	$10,169.00	
Land Acquisition							
Easement/ROW Acquisition			5.10	ACRE	$19,551.00	$99,710.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains			$0.00	
Concrete Box Culverts			$222,125.00	
Hydraulic Structures			$0.00	
Channel Improvements			$0.00	
Detention/Water Quality Facilities			$3,909,646.00	
Removals			$1,920.00	
Landscaping and Maintenance Improvements			$10,169.00	
Special Items (User Defined)			$0.00	
Subtotal Capital Improvement Costs			**$4,143,860.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$207,193.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$207,193.00	
Subtotal Additional Capital Improvement Costs			**$414,386.00**	
Land Acquisition Costs				
ROW/Easements			$99,710.00	
Subtotal Land Acquisition Costs			**$99,710.00**	
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%		$683,737.00	
Legal/Administrative	5%		$227,912.00	

Contract Admin/Construction Management	10%		$455,825.00	
Contingency	25%		$1,139,562.00	
Subtotal Other Costs			**$2,507,036.00**	
Total Capital Improvement Costs			**$7,164,992.00**	

Master Plan Operation and Maintenance Cost Summary					
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, et	48	L.F.	$2.00	$96.00	
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal, st	78.1	ACRE	$2,991.00	$233,597.00	
Total Annual Operation and Maintenance Cost				**$233,693.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$11,684,650.00**	

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$4,558,246.00
ROW/Easements	$99,710.00
Engineering	$683,737.00
Legal/Administrative	$227,912.00
Contract Admin/Construction Management	$455,825.00
Contingency	$1,139,562.00
Total Capital Improvement Costs	$7,164,992.00
Total Annual Operation and Maintenance Cost	$233,693.00
Total Operation and Maintenance Costs Over 50 Years	$11,684,650.00

APPENDIX E – 8
Watershed Development Area Map

LARIMER COUNTY

Town of Windsor

E Crossroads Blvd

City of Loveland

Unincorporated Larimer County

Oklahoma Drainage Basin

Unincorporated Weld County

Cache La Poudre River

Oklahoma Drainageway

South Drainageway

South Drainage Basin

City of Greeley

Town of Johnstown

Great Western Railway

34

WELD COUNTY

17

0 ½ 1
Miles

Price: $2,450,700
Date: 10/15/2020

Price: $1,000,000
Date: 12/15/2023

Price: $15,169,500
Date: 12/16/2021

Price: $8,500,000
Date: 3/29/2022

Price: $515,000
Date: 5/25/2021

Price: $375,000
Date: 7/22/2020

Price: $2,400,000
Date: 5/9/2024

Price: $2,500,000
Date: 5/9/2024

Price: $900,000
Date: 7/21/2021

Price: $500,000
Date: 9/24/2021

Price: $600,000
Date: 11/10/21

Price: $17,977,700
Date: 7/8/2024

Price: $808,000
Date: 1/5/2023

Legend

- Recent Sold Parcels
- LREGA
- Study Reaches
- River/Creek/Ditch
- Railroad
- Study Area
- Town of Windsor
- City of Greeley
- Town of Johnstown
- City of Loveland

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No.	DATE	DESCRIPTION	APPR.

Matrix
Excellence by Design

designed by: SL
drawn by: SO
checked by: BL
project no.: 24.906.009
date: 7/17/2025

City of Greeley

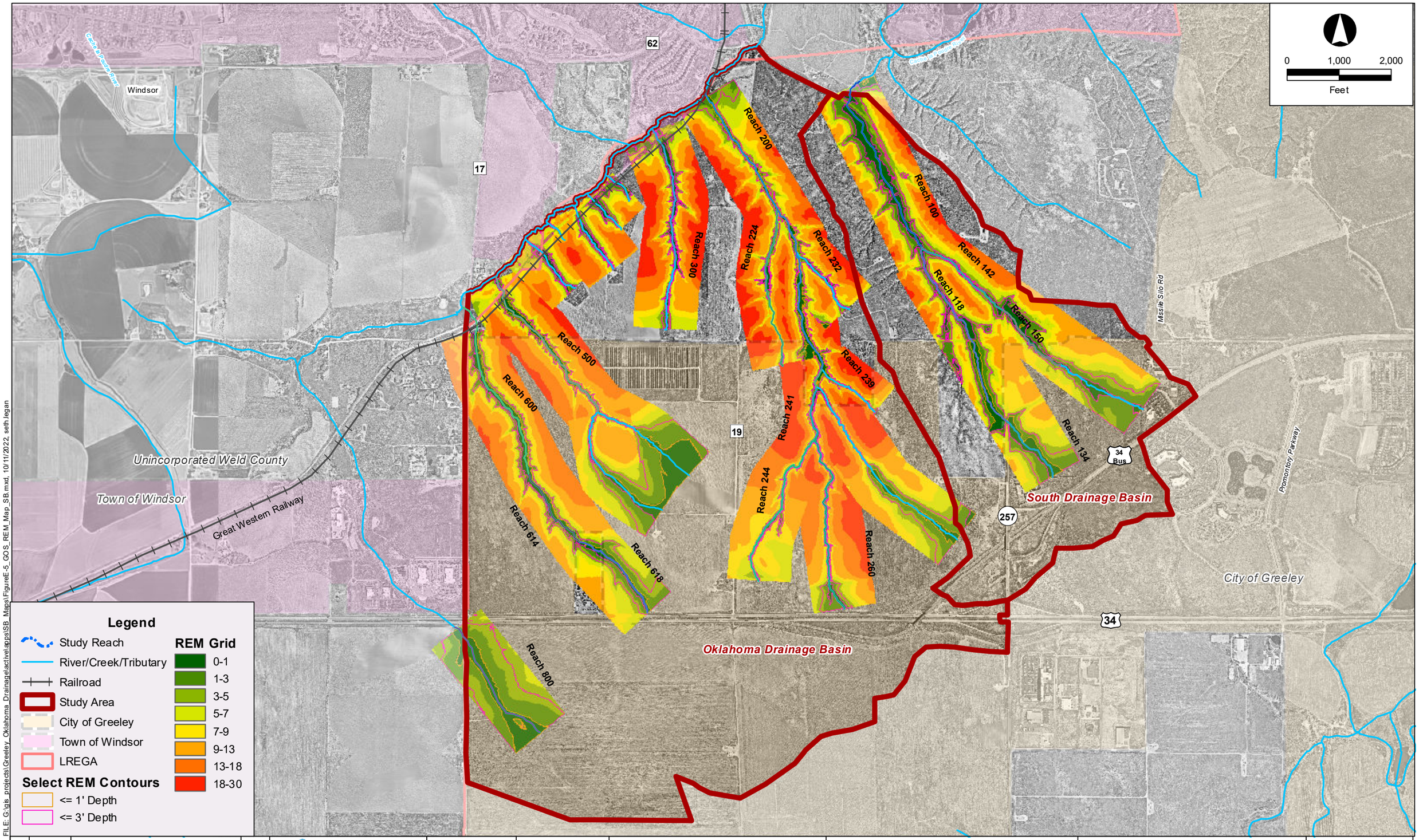
CITY OF GREELEY

COMPREHENSIVE DRAINAGE PLAN
OKLAHOMA & SOUTH BASINS

RECENTLY SOLD PARCELS MAP

FIGURE
E-8

APPENDIX E – 9
REM Analysis



FILE: G:\gis projects\Greeley_Oklahoma_Drainage\active\apps\SB_Maps\FigureE-5_GOS_REM_Map_SB.mxd, 10/11/2022, seth.legan

No.	DATE	DESCRIPTION	APPR.

Matrix Excellence by Design

designed by: _____
drawn by: SL
checked by: BL
project no.: 22.906.007
date: 10/10/2022

Greeley

CITY OF GREELEY

COMPREHENSIVE DRAINAGE PLAN
OKLAHOMA & SOUTH BASINS

RELATIVE ELEVATION MODEL MAP

FIGURE
E-9

APPENDIX F – CONCEPTUAL DESIGN INFORMATION

APPENDIX F-1
Master Plan CUHP

CUHP SUBCATCHMENTS

Columns with this color heading are for required user-input
Columns with this color heading are for optional override values
Columns with this color heading are for program-calculated values

								Maximum Depression Storage (Watershed inches)		Horton's Infiltration Parameters			DCIA
Subcatchment Name	EPA SWMM Target Node	Raingage	Area (mi^2)	Length to Centroid (mi)	Length (mi)	Slope (ft/ft)	Percent Imperviousness	Pervious	Impervious	Initial Rate (in/hr)	Decay Coefficient (1/seconds)	Final Rate (in/hr)	Level 0, 1, or 2
110	110	GOS Greeley	0.111	0.506	0.975	0.027	4.82	0.35	0.1	3.0	0.0018	0.5	1
114	114	GOS Greeley	0.175	0.346	0.914	0.031	3.75	0.40	0.1	3.0	0.0018	0.5	1
118	118	GOS Greeley	0.059	0.278	0.474	0.048	2.00	0.40	0.1	3.0	0.0018	0.5	1
122	122	GOS Greeley	0.192	0.486	1.184	0.027	39.27	0.35	0.1	3.0	0.0018	0.5	1
126	126	GOS Greeley	0.032	0.133	0.286	0.013	21.19	0.40	0.1	4.5	0.0018	0.6	1
130	130	GOS Greeley	0.073	0.318	0.607	0.038	14.31	0.35	0.1	3.0	0.0018	0.5	1
134	134	GOS Greeley	0.084	0.217	0.593	0.028	53.91	0.35	0.1	3.0	0.0018	0.5	1
138	138	GOS Greeley	0.130	0.176	0.483	0.017	69.34	0.35	0.1	3.0	0.0018	0.5	1
142	142	GOS Greeley	0.031	0.233	0.500	0.034	11.91	0.40	0.1	3.0	0.0018	0.5	1
146	146	GOS Greeley	0.062	0.463	0.831	0.033	28.65	0.35	0.1	3.0	0.0018	0.5	1
150	150	GOS Greeley	0.093	0.272	0.641	0.040	20.09	0.35	0.1	3.0	0.0018	0.5	1
154	154	GOS Greeley	0.139	0.231	0.515	0.027	52.98	0.35	0.1	3.0	0.0018	0.5	1
210	210	GOS Greeley	0.076	0.155	0.506	0.042	4.60	0.35	0.1	3.0	0.0018	0.5	1
220	220	GOS Greeley	0.156	0.410	0.800	0.034	2.19	0.40	0.1	3.0	0.0018	0.5	1
224	224	GOS Greeley	0.100	0.239	0.642	0.041	2.80	0.35	0.1	3.0	0.0018	0.5	1
226	226	GOS Greeley	0.095	0.307	0.593	0.034	44.61	0.35	0.1	3.0	0.0018	0.5	1
228	228	GOS Greeley	0.103	0.359	0.664	0.026	40.89	0.35	0.1	3.0	0.0018	0.5	1
232	232	GOS Greeley	0.166	0.432	0.945	0.034	3.62	0.35	0.1	3.0	0.0018	0.5	1
236	236	GOS Greeley	0.094	0.355	0.753	0.036	31.47	0.35	0.1	3.0	0.0018	0.5	1
240	240	GOS Greeley	0.034	0.160	0.395	0.051	2.20	0.40	0.1	3.0	0.0018	0.5	1
244	244	GOS Greeley	0.141	0.480	0.830	0.038	53.85	0.35	0.1	3.0	0.0018	0.5	1
248	248	GOS Greeley	0.151	0.284	0.543	0.016	75.46	0.35	0.1	3.0	0.0018	0.5	1
250	250	GOS Greeley	0.068	0.120	0.339	0.022	66.06	0.35	0.1	3.0	0.0018	0.5	1
252	252	GOS Greeley	0.098	0.393	0.739	0.021	68.62	0.35	0.1	3.0	0.0018	0.5	1
256	256	GOS Greeley	0.146	0.554	0.954	0.032	43.82	0.35	0.1	4.5	0.0018	0.6	1
260	260	GOS Greeley	0.101	0.321	0.670	0.050	9.85	0.35	0.1	3.0	0.0018	0.5	1
264	264	GOS Greeley	0.107	0.331	0.854	0.024	66.33	0.35	0.1	3.0	0.0018	0.5	1
268	268	GOS Greeley	0.092	0.287	0.637	0.018	56.98	0.35	0.1	3.0	0.0018	0.5	1
310	310	GOS Greeley	0.138	0.389	0.760	0.038	2.43	0.40	0.1	4.5	0.0018	0.6	1
314	314	GOS Greeley	0.108	0.245	0.526	0.038	34.99	0.35	0.1	4.5	0.0018	0.6	1
410	410	GOS Greeley	0.021	0.189	0.311	0.073	4.84	0.40	0.1	3.0	0.0018	0.5	1
414	414	GOS Greeley	0.019	0.143	0.263	0.087	2.94	0.40	0.1	3.0	0.0018	0.5	1
418	418	GOS Greeley	0.062	0.276	0.605	0.047	3.68	0.35	0.1	3.0	0.0018	0.5	1
422	422	GOS Greeley	0.006	0.102	0.196	0.097	4.02	0.40	0.1	5.0	0.0007	1.0	1

								Maximum Depression Storage (Watershed inches)		Horton's Infiltration Parameters			DCIA
Subcatchment Name	EPA SWMM Target Node	Raingage	Area (mi^2)	Length to Centroid (mi)	Length (mi)	Slope (ft/ft)	Percent Imperviousness	Pervious	Impervious	Initial Rate (in/hr)	Decay Coefficient (1/seconds)	Final Rate (in/hr)	Level 0, 1, or 2
426	426	GOS Greeley	0.068	0.320	0.635	0.046	4.67	0.35	0.1	4.5	0.0018	0.6	1
510	510	GOS Greeley	0.193	0.483	0.920	0.033	14.92	0.35	0.1	3.0	0.0018	0.5	1
514	514	GOS Greeley	0.138	0.457	0.927	0.025	60.88	0.35	0.1	3.0	0.0018	0.5	1
518	518	GOS Greeley	0.125	0.298	0.642	0.024	51.84	0.35	0.1	3.0	0.0018	0.5	1
610	610	GOS Greeley	0.166	0.452	0.971	0.032	16.82	0.35	0.1	3.0	0.0018	0.5	1
614	614	GOS Greeley	0.157	0.330	0.607	0.036	52.38	0.35	0.1	3.0	0.0018	0.5	1
618	618	GOS Greeley	0.084	0.185	0.446	0.026	76.88	0.35	0.1	3.0	0.0018	0.5	1
620	620	Greeley	0.053	0.272	0.598	0.008	23.48	0.35	0.1	3.0	0.0018	0.5	1
622	622	GOS Greeley	0.161	0.336	0.673	0.019	74.47	0.35	0.1	3.0	0.0018	0.5	1
712	712	Greeley	0.140	0.346	0.764	0.033	30.15	0.35	0.1	3.0	0.0018	0.5	1
714	714	Greeley	0.035	0.091	0.212	0.030	12.53	0.35	0.1	3.0	0.0018	0.5	1
804	804	Greeley	0.040	0.085	0.381	0.018	9.98	0.35	0.1	5.0	0.0007	1.0	1
810	810	Greeley	0.115	0.242	0.599	0.011	48.10	0.35	0.1	3.0	0.0018	0.5	1
820	820	Greeley	0.127	0.170	0.537	0.021	69.77	0.35	0.1	3.0	0.0018	0.5	1
824	824	Greeley	0.068	0.192	0.421	0.017	77.95	0.35	0.1	3.0	0.0018	0.5	1
830	830	Greeley	0.111	0.121	0.541	0.019	67.82	0.35	0.1	3.0	0.0018	0.5	1
840	840	Greeley	0.100	0.339	0.674	0.023	76.53	0.35	0.1	3.0	0.0018	0.5	1
842	842	Greeley	0.173	0.312	0.834	0.016	68.58	0.35	0.1	3.0	0.0018	0.5	1
844	844	Greeley	0.198	0.278	0.542	0.016	76.19	0.35	0.1	3.0	0.0018	0.5	1
850	850	Greeley	0.156	0.361	0.569	0.023	60.07	0.35	0.1	4.5	0.0018	0.6	1
910	910	Greeley	0.159	0.415	0.843	0.019	27.77	0.35	0.1	4.3	0.0014	0.7	0
930	930	Greeley	0.164	0.350	0.704	0.011	76.15	0.35	0.1	3.5	0.0016	0.6	0
940	940	Greeley	0.142	0.346	0.667	0.015	22.49	0.35	0.1	3.7	0.0018	0.5	0
950	950	Greeley	0.173	0.439	0.819	0.011	22.68	0.35	0.1	3.7	0.0018	0.5	0
960	960	Greeley	0.059	0.083	0.394	0.014	26.60	0.35	0.1	3.4	0.0018	0.5	0
1032	1032	Greeley	0.015	0.070	0.215	0.022	47.30	0.35	0.1	5.0	0.0007	1.0	1
1108	1108	Greeley	0.006	0.064	0.152	0.080	35.31	0.35	0.1	5.0	0.0007	1.0	0
1110	1110	Greeley	0.027	0.183	0.364	0.036	46.17	0.35	0.1	5.0	0.0007	1.0	0
1116	1116	Greeley	0.094	0.202	0.577	0.025	40.70	0.35	0.1	4.2	0.0011	0.8	0
1124	1124	Greeley	0.046	0.115	0.500	0.017	56.95	0.35	0.1	4.4	0.001	0.9	0
1132	1132	Greeley	0.040	0.129	0.294	0.028	44.79	0.35	0.1	5.0	0.0007	1.0	0
1126	1126	Greeley	0.094	0.053	0.406	0.019	67.12	0.35	0.1	5.0	0.0007	1.0	0
1140	1140	Greeley	0.188	0.216	0.637	0.016	41.05	0.35	0.1	4.9	0.0008	1.0	0
1142	1142	Greeley	0.029	0.158	0.370	0.018	44.79	0.35	0.1	4.9	0.0007	1.0	0
1144	1144	Greeley	0.127	0.074	0.702	0.009	12.00	0.35	0.1	4.7	0.0008	0.9	0
1148	1148	Greeley	0.170	0.376	0.793	0.016	68.21	0.35	0.1	4.9	0.0008	1.0	0
1150	1150	Greeley	0.088	0.262	0.862	0.010	75.85	0.35	0.1	4.7	0.0011	0.9	0
1152	1152	Greeley	0.033	0.142	0.303	0.028	47.47	0.35	0.1	3.0	0.0018	0.5	0
1154	1154	Greeley	0.085	0.390	0.513	0.019	45.11	0.35	0.1	3.5	0.0016	0.6	0
1156	1156	Greeley	0.121	0.378	0.684	0.018	12.57	0.35	0.1	4.8	0.0009	0.9	0
1164	1164	Greeley	0.184	0.339	0.558	0.017	43.60	0.35	0.1	3.6	0.0018	0.5	0
1172	1172	Greeley	0.077	0.464	0.708	0.026	43.66	0.35	0.1	4.9	0.0007	1.0	0
1180	1180	Greeley	0.021	0.153	0.401	0.035	40.99	0.35	0.1	4.3	0.0011	0.8	0
1208	1208	Greeley	0.099	0.242	0.585	0.029	14.72	0.35	0.1	4.8	0.0008	1.0	1
1210	1210	Greeley	0.152	0.280	0.852	0.009	13.26	0.35	0.1	5.0	0.0008	1.0	1
1216	1216	Greeley	0.201	0.643	0.873	0.005	12.72	0.35	0.1	4.1	0.0013	0.7	1

								Maximum Depression Storage (Watershed inches)		Horton's Infiltration Parameters			DCIA
Subcatchment Name	EPA SWMM Target Node	Raingage	Area (mi^2)	Length to Centroid (mi)	Length (mi)	Slope (ft/ft)	Percent Imperviousness	Pervious	Impervious	Initial Rate (in/hr)	Decay Coefficient (1/seconds)	Final Rate (in/hr)	Level 0, 1, or 2
1224	1224	Greeley	0.126	0.300	0.851	0.013	15.77	0.35	0.1	4.2	0.0018	0.6	1
1226	1226	Greeley	0.071	0.345	0.619	0.013	29.80	0.35	0.1	4.3	0.0018	0.6	1
1228	1228	Greeley	0.057	0.233	0.623	0.012	15.10	0.35	0.1	4.6	0.0016	0.7	1
1230	1230	Greeley	0.049	0.143	0.443	0.022	12.00	0.35	0.1	4.5	0.0017	0.6	1
1232	1232	Greeley	0.195	0.209	0.603	0.019	46.38	0.35	0.1	4.1	0.0018	0.6	1
1234	1234	Greeley	0.076	0.147	0.501	0.016	45.28	0.35	0.1	3.9	0.0018	0.6	1
1236	1236	Greeley	0.119	0.414	0.752	0.014	46.40	0.35	0.1	3.5	0.0017	0.6	1
1238	1238	Greeley	0.124	0.207	0.519	0.002	45.00	0.35	0.1	3.2	0.0018	0.5	1
1240	1240	Greeley	0.039	0.139	0.244	0.015	14.18	0.35	0.1	4.2	0.0018	0.6	1
1248	1248	Greeley	0.047	0.284	0.466	0.015	48.06	0.35	0.1	3.2	0.0018	0.5	1
1256	1256	Greeley	0.092	0.319	0.557	0.011	55.57	0.35	0.1	4.3	0.0018	0.6	1
1258	1258	Greeley	0.088	0.171	0.420	0.007	16.28	0.35	0.1	3.3	0.0018	0.5	1
1260	1260	Greeley	0.099	0.286	0.709	0.011	15.69	0.35	0.1	3.3	0.0018	0.5	1
1264	1264	Greeley	0.062	0.215	0.527	0.028	12.16	0.35	0.1	4.7	0.0013	0.8	1
1272	1272	Greeley	0.036	0.253	0.484	0.029	11.62	0.35	0.1	5.0	0.0008	1.0	1
1274	1274	Greeley	0.031	0.165	0.408	0.012	20.25	0.35	0.1	3.8	0.0018	0.6	1
1308	1308	Greeley	0.098	0.378	0.680	0.019	11.34	0.35	0.1	4.5	0.0016	0.7	1
1310	1310	Greeley	0.057	0.241	0.486	0.017	13.03	0.35	0.1	4.1	0.0018	0.6	1
1316	1316	Greeley	0.159	0.339	0.650	0.014	12.99	0.35	0.1	4.2	0.0018	0.6	1
1318	1318	Greeley	0.051	0.228	0.406	0.012	12.45	0.35	0.1	4.4	0.0018	0.6	1
1320	1320	Greeley	0.087	0.094	0.369	0.023	12.07	0.35	0.1	4.5	0.0018	0.6	1
1322	1322	Greeley	0.111	0.234	0.582	0.016	12.00	0.35	0.1	3.5	0.0018	0.5	1
1324	1324	Greeley	0.082	0.182	0.397	0.011	12.00	0.35	0.1	3.8	0.0018	0.6	1
1328	1328	Greeley	0.012	0.167	0.289	0.006	20.79	0.35	0.1	3.0	0.0018	0.5	1
1340	D_1340	Greeley	0.178	0.227	1.029	0.008	53.77	0.35	0.1	4.2	0.0018	0.6	1
1348	1348	Greeley	0.109	0.234	0.535	0.015	13.65	0.35	0.1	3.4	0.0018	0.5	1
1349	1349	Greeley	0.054	0.159	0.399	0.013	13.33	0.35	0.1	3.4	0.0018	0.5	1
1352	1352	Greeley	0.184	0.396	0.801	0.013	12.00	0.35	0.1	3.5	0.0018	0.5	1
1354	1354	Greeley	0.102	0.237	0.660	0.018	12.00	0.35	0.1	3.5	0.0018	0.5	1
1356	1356	Greeley	0.148	0.269	0.586	0.010	14.33	0.35	0.1	3.6	0.0018	0.5	1
1358	1358	Greeley	0.173	0.440	0.675	0.012	13.32	0.35	0.1	3.6	0.0018	0.5	1
1368	1368	Greeley	0.046	0.184	0.389	0.013	69.37	0.35	0.1	3.0	0.0018	0.5	1
1364	1364	Greeley	0.070	0.113	0.457	0.007	77.13	0.35	0.1	3.4	0.0018	0.5	1
1372	1372	Greeley	0.190	0.306	0.504	0.005	12.46	0.35	0.1	3.4	0.0018	0.5	1
1362	1362	Greeley	0.030	0.265	0.400	0.009	16.08	0.35	0.1	3.5	0.0018	0.5	1
1382	1382	Greeley	0.143	0.590	0.881	0.014	11.97	0.35	0.1	4.5	0.0017	0.6	1
1386	1386	Greeley	0.058	0.181	0.708	0.006	12.07	0.35	0.1	3.4	0.0018	0.5	1
1388	1388	Greeley	0.185	0.300	0.506	0.019	12.77	0.35	0.1	3.3	0.0018	0.5	1
1392	1392	Greeley	0.129	0.204	0.668	0.014	27.10	0.35	0.1	4.0	0.0017	0.6	1
1394	1394	Greeley	0.160	0.234	1.013	0.009	25.59	0.35	0.1	3.4	0.0018	0.5	1
1396	1396	Greeley	0.121	0.336	0.678	0.012	76.60	0.35	0.1	3.0	0.0018	0.5	1
1398	1398	Greeley	0.082	0.188	0.534	0.008	75.63	0.35	0.1	3.0	0.0018	0.5	1

RUN MULTIPLE CUHP AND SWMM SCENARIOS

Columns with this color heading are for required user-input
Columns with this color heading are for program-calculated values

SWMM Run Wait Time (sec)	(Optional) SWMM Time Series Inflow "Modification Type" (LU, RP, or LU&RP)
60	

Subcatchment Name	Existing Landuse % Imperviousness	Future Landuse % Imperviousness
110	4.76	4.82
114	3.75	3.75
118	2.00	2.00
122	4.40	39.27
126	21.19	21.19
130	7.87	14.31
134	11.01	53.91
138	23.69	69.34
142	11.91	11.91
146	6.95	28.65
150	5.67	20.09
154	20.58	52.98
210	4.60	4.60
220	2.16	2.19
224	2.00	2.80
226	32.64	44.61
228	2.00	40.89
232	2.00	3.62
236	2.00	31.47
240	2.00	2.20
244	5.47	53.85
248	4.03	75.46
250	2.00	66.06
252	5.11	68.62
256	2.00	43.82
260	2.00	9.85
264	16.25	66.33
268	17.06	56.98
310	2.43	2.43
314	31.27	34.99
410	4.84	4.84
414	2.94	2.94
418	2.96	3.68
422	3.83	4.02
426	4.67	4.67
510	14.57	14.92
514	2.11	60.88
518	3.96	51.84
610	4.37	16.82
614	16.97	52.38
618	7.64	76.88

Raingage	Return Period (Years)	1 Hr Depths (in)	6 Hr Depths (in)
Greeley	WQ	0.6	N/A
	2	0.844	1.28
	5	1.12	1.67
	10	1.4	2.08
	25	1.87	2.78
	50	2.31	3.41
	100	2.8	4.13
	500	4.18	6.19
GOS Greeley	WQ	0.6	N/A
	2	0.845	1.28
	5	1.12	1.67
	10	1.4	2.08
	25	1.87	2.77
	50	2.3	3.39
	100	2.79	4.11
	500	4.16	6.13

Enter "X" to Run Scenario	Scenario ID	Land Use (E or F)	Return Period (yr)	Correction Area (Sq.Mi.)	(Optional) SWMM Time Series Inflow Table "NAME"
X	1	E	WQ	0	
X	2	E	2	0	
X	3	E	5	0	
X	4	E	10	0	
X	5	E	25	0	
X	6	E	50	0	
X	7	E	100	0	
X	8	E	500	0	
X	9	F	WQ	0	
X	10	F	2	0	
X	11	F	5	0	
X	12	F	10	0	
X	13	F	25	0	
X	14	F	50	0	
X	15	F	100	0	
X	16	F	500	0	

Subcatchment Name	Existing Landuse % Imperviousness	Future Landuse % Imperviousness
620	23.42	23.48
622	4.86	74.47
712	27.31	30.15
714	5.01	12.53
804	9.96	9.98
810	4.67	48.10
820	52.02	69.77
824	13.57	77.95
830	50.62	67.82
840	8.02	76.53
842	2.61	68.58
844	6.68	76.19
850	2.00	60.07
910	4.81	27.77
930	9.92	76.15
940	5.05	22.49
950	5.28	22.68
960	25.15	26.60
1032	44.97	47.30
1108	15.95	35.31
1180	18.46	40.99
1172	22.92	43.66
1110	10.18	46.17
1116	10.92	40.70
1124	7.94	56.95
1132	7.74	44.79
1126	47.82	67.12
1140	19.97	41.05
1142	21.66	44.79
1144	12.00	12.00
1148	7.75	68.21
1150	13.28	75.85
1152	45.12	47.47
1154	44.59	45.11
1156	11.36	12.57
1164	42.89	43.60
1208	14.72	36.04
1210	3.89	13.26
1216	2.81	12.72
1224	5.02	15.77
1226	4.36	29.80
1228	6.46	15.10
1230	2.14	12.00
1232	42.24	46.38
1234	45.18	45.28
1236	45.70	46.40
1238	45.00	45.00
1240	9.19	14.18
1248	45.20	48.06
1256	47.36	55.57
1258	16.28	16.28
1260	15.19	15.69

Raingage	Return Period (Years)	1 Hr Depths (in)	6 Hr Depths (in)

Enter "X" to Run Scenario	Scenario ID	Land Use (E or F)	Return Period (yr)	Correction Area (Sq.Mi.)

(Optional) SWMM Time Series Inflow Table "NAME"

Subcatchment Name	Existing Landuse % Imperviousness	Future Landuse % Imperviousness
1264	2.35	12.16
1272	2.05	11.62
1274	11.46	20.25
1308	4.79	11.34
1310	6.83	13.03
1316	6.89	12.99
1318	6.65	12.45
1320	7.03	12.07
1322	8.11	12.00
1324	2.00	12.00
1328	20.79	20.79
1340	52.18	53.77
1348	9.18	13.65
1349	9.72	13.33
1352	4.36	12.00
1354	3.82	12.00
1356	9.73	14.33
1358	4.83	13.32
1368	42.35	69.37
1364	61.88	77.13
1372	3.98	12.46
1362	9.40	16.08
1382	5.06	11.97
1386	12.01	12.07
1388	3.41	12.77
1392	5.68	27.10
1394	3.48	25.59
1396	3.33	76.60
1398	14.06	75.63

Raingage	Return Period (Years)	1 Hr Depths (in)	6 Hr Depths (in)

Enter "X" to Run Scenario	Scenario ID	Land Use (E or F)	Return Period (yr)	Correction Area (Sq.Mi.)

(Optional) SWMM Time Series Inflow Table "NAME"

		Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
Catchment Name/ID	User Comment for Catchment	CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
110		0.147	0.164	71.2	10.49	37.0	7.42	17.5	47	257,766	1.84	473,338	65.0	73	473,245	1.02
114		0.151	0.206	45.3	8.67	23.5	6.13	14.4	116	406,013	1.78	721,528	50.0	157	721,151	1.41
118		0.156	0.131	43.8	5.91	22.8	4.18	9.9	40	136,996	1.76	240,856	50.0	53	240,835	1.41
122		0.094	0.218	37.1	7.71	19.3	5.45	12.8	155	445,075	2.23	994,334	45.0	232	993,705	1.89
126		0.112	0.078	40.0	3.88	20.8	2.74	6.5	24	74,154	1.83	135,547	45.0	31	135,166	1.51
130		0.121	0.116	48.7	5.84	25.3	4.13	9.7	45	169,548	1.94	329,048	50.0	65	328,917	1.40
134		0.087	0.182	19.8	4.27	10.3	3.01	7.1	127	194,175	2.41	467,672	35.0	158	464,232	2.95
138		0.081	0.245	12.6	3.88	6.6	2.74	6.5	309	301,853	2.59	783,054	35.0	337	768,468	4.05
142		0.125	0.080	58.4	5.10	30.4	3.60	8.5	16	71,765	1.87	134,112	50.0	23	133,907	1.17
146		0.102	0.109	63.3	6.79	32.9	4.80	11.3	29	143,818	2.11	303,229	55.0	48	303,224	1.21
150		0.112	0.126	39.3	5.30	20.4	3.75	8.8	71	216,576	2.01	434,934	45.0	100	434,158	1.67
154		0.088	0.227	15.6	4.22	8.1	2.98	7.0	268	323,632	2.40	775,838	35.0	314	773,687	3.52
210		0.148	0.140	31.3	4.85	16.3	3.43	8.1	73	177,186	1.83	324,965	45.0	90	324,052	1.85
220		0.156	0.202	47.5	8.89	24.7	6.28	14.8	99	363,101	1.76	639,124	50.0	134	638,747	1.34
224		0.154	0.163	38.6	6.35	20.1	4.49	10.6	77	231,887	1.82	420,951	45.0	102	421,133	1.60
226		0.092	0.175	24.4	4.78	12.7	3.38	8.0	117	221,759	2.30	509,470	40.0	155	508,247	2.55
228		0.094	0.172	30.7	5.55	16.0	3.92	9.3	101	240,005	2.25	540,783	45.0	141	540,071	2.13
232		0.151	0.202	51.6	9.50	26.8	6.71	15.8	96	384,902	1.82	702,016	55.0	139	701,742	1.31
236		0.100	0.139	39.6	5.73	20.6	4.05	9.5	71	217,622	2.14	466,071	45.0	104	465,681	1.74
240		0.156	0.102	38.8	4.54	20.2	3.21	7.6	26	79,324	1.76	139,630	45.0	33	139,293	1.53
244		0.087	0.230	25.1	5.93	13.1	4.19	9.9	169	328,035	2.41	789,839	40.0	235	788,745	2.60
248		0.079	0.269	15.0	4.59	7.8	3.25	7.7	303	350,880	2.67	936,288	35.0	372	934,635	3.85
250		0.082	0.180	11.4	3.08	5.9	2.18	5.1	179	158,220	2.55	404,169	35.0	181	394,372	4.16
252		0.081	0.216	24.7	5.59	12.8	3.95	9.3	120	228,783	2.59	591,507	40.0	172	590,560	2.73
256		0.093	0.208	35.2	7.12	18.3	5.03	11.9	125	339,970	2.17	738,960	45.0	180	737,894	1.92
260		0.131	0.142	42.3	6.11	22.0	4.32	10.2	72	234,503	1.89	442,967	50.0	99	443,000	1.53
264		0.082	0.222	23.2	5.44	12.0	3.84	9.1	139	249,635	2.56	638,512	40.0	195	638,136	2.83
268		0.086	0.194	24.0	5.07	12.5	3.59	8.5	115	212,597	2.45	519,866	40.0	157	518,851	2.68
310		0.155	0.190	46.6	8.32	24.2	5.88	13.9	89	319,565	1.59	507,766	50.0	111	507,556	1.26
314		0.097	0.157	23.9	4.38	12.4	3.10	7.3	136	251,527	2.05	516,373	40.0	166	514,876	2.39
410		0.147	0.078	42.8	4.05	22.3	2.86	6.8	15	48,596	1.79	86,935	45.0	19	86,728	1.43
414		0.153	0.077	34.7	3.55	18.0	2.51	5.9	16	43,852	1.77	77,546	45.0	20	77,272	1.64
418		0.151	0.129	48.3	6.30	25.1	4.45	10.5	38	143,829	1.82	262,413	50.0	54	262,486	1.36
422		0.152	0.047	40.3	2.96	21.0	2.09	4.9	5	15,040	0.70	10,486	40.0	3	10,403	0.70
426		0.148	0.133	51.1	6.71	26.6	4.74	11.2	40	157,878	1.66	262,320	50.0	53	262,391	1.21
510		0.120	0.176	49.0	8.13	25.5	5.75	13.6	118	448,125	1.95	872,868	50.0	175	872,345	1.41
514		0.084	0.240	26.2	6.35	13.6	4.48	10.6	158	321,518	2.49	801,281	40.0	228	799,650	2.57
518		0.088	0.213	21.4	5.01	11.1	3.54	8.3	174	289,290	2.38	689,564	40.0	225	686,541	2.83
610		0.117	0.165	51.1	7.99	26.6	5.65	13.3	97	384,646	1.97	757,751	50.0	146	757,266	1.37
614		0.088	0.238	17.8	4.76	9.3	3.36	7.9	263	364,132	2.39	870,328	35.0	319	866,011	3.18
618		0.078	0.208	12.9	3.55	6.7	2.51	5.9	196	195,193	2.69	524,214	35.0	217	512,807	4.03
620		0.108	0.097	70.4	6.72	36.6	4.75	11.2	22	122,352	2.06	251,828	60.0	37	251,875	1.10

		Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
Catchment Name/ID	User Comment for Catchment	CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
622		0.079	0.276	17.1	5.12	8.9	3.62	8.5	282	373,312	2.66	991,623	35.0	359	984,692	3.49
712		0.101	0.162	35.0	5.86	18.2	4.14	9.8	120	325,181	2.14	694,753	45.0	171	694,138	1.91
714		0.124	0.085	23.8	3.05	12.4	2.16	5.1	45	82,342	1.93	158,953	40.0	52	156,881	2.27
804		0.135	0.096	33.2	3.95	17.2	2.79	6.6	36	92,961	0.86	79,978	40.0	25	79,718	0.99
810		0.090	0.198	25.1	5.32	13.0	3.76	8.9	138	267,236	2.35	627,887	40.0	188	626,375	2.55
820		0.081	0.243	12.4	3.82	6.5	2.70	6.4	307	295,500	2.61	771,295	35.0	332	753,111	4.07
824		0.078	0.189	15.2	3.72	7.9	2.63	6.2	133	157,588	2.71	426,988	35.0	165	424,631	3.80
830		0.081	0.226	11.8	3.55	6.1	2.51	5.9	281	256,828	2.59	664,304	35.0	293	647,959	4.15
840		0.078	0.224	20.0	4.93	10.4	3.48	8.2	150	231,423	2.69	623,051	40.0	200	618,472	3.13
842		0.081	0.278	19.3	5.62	10.0	3.97	9.4	269	402,357	2.60	1,044,424	40.0	353	1,040,010	3.18
844		0.079	0.299	13.4	4.57	7.0	3.23	7.6	444	460,600	2.69	1,238,160	35.0	523	1,234,651	4.12
850		0.085	0.252	18.2	5.01	9.4	3.54	8.4	258	362,833	2.41	874,190	35.0	313	869,553	3.13
910		0.103	0.163	46.4	7.32	24.1	5.17	12.2	103	369,353	1.84	679,359	50.0	141	679,244	1.38
930		0.078	0.280	19.6	5.72	10.2	4.04	9.5	251	381,368	2.65	1,008,830	40.0	335	1,005,595	3.19
940		0.109	0.151	45.6	6.80	23.7	4.80	11.3	94	330,766	2.02	669,613	50.0	137	669,345	1.51
950		0.109	0.165	55.2	8.51	28.7	6.01	14.2	94	402,531	2.03	815,786	55.0	146	815,288	1.31
960		0.104	0.103	25.5	3.51	13.2	2.48	5.8	69	136,125	2.09	283,940	40.0	86	282,519	2.29
1,032		0.092	0.076	18.8	2.60	9.8	1.84	4.3	24	34,775	1.66	57,828	35.0	22	56,325	2.29
1,108		0.097	0.044	20.6	2.20	10.7	1.55	3.7	9	14,665	1.44	21,063	35.0	8	20,338	1.88
1,110		0.094	0.094	28.3	3.54	14.7	2.50	5.9	29	62,872	1.58	99,278	40.0	29	98,824	1.65
1,116		0.092	0.173	21.6	4.36	11.2	3.08	7.3	131	218,962	1.97	432,140	40.0	145	429,577	2.40
1,124		0.091	0.128	22.5	3.71	11.7	2.62	6.2	61	105,996	1.93	204,711	40.0	66	202,945	2.26
1,132		0.094	0.111	19.5	3.16	10.1	2.24	5.3	61	92,384	1.57	145,266	35.0	54	143,657	2.14
1,126		0.086	0.197	8.4	2.77	4.4	1.96	4.6	336	218,889	1.95	427,542	30.0	232	413,125	3.84
1,140		0.092	0.235	19.1	4.95	10.0	3.50	8.3	295	437,451	1.73	758,025	40.0	278	753,009	2.31
1,142		0.082	0.124	20.8	3.48	10.8	2.46	5.8	42	68,026	2.20	149,410	35.0	49	148,289	2.59
1,144		0.094	0.189	17.2	3.99	8.9	2.82	6.7	221	294,502	1.71	503,546	35.0	204	499,679	2.51
1,148		0.092	0.227	28.8	6.52	15.0	4.61	10.9	177	394,944	1.73	684,443	40.0	194	684,713	1.79
1,150		0.125	0.129	67.5	8.19	35.1	5.79	13.7	39	205,095	1.32	270,105	55.0	44	270,009	0.78
1,152		0.081	0.132	14.9	3.01	7.8	2.13	5.0	67	76,883	2.60	199,613	35.0	77	195,257	3.66
1,154		0.078	0.209	21.0	4.87	10.9	3.44	8.1	122	198,597	2.64	524,505	40.0	165	521,839	3.01
1,156		0.090	0.202	28.7	5.95	14.9	4.21	9.9	127	281,761	1.89	532,594	40.0	148	532,212	1.91
1,164		0.091	0.239	21.5	5.44	11.2	3.85	9.1	257	427,396	2.30	984,394	40.0	328	981,834	2.78
1,172		0.125	0.122	67.8	7.83	35.2	5.53	13.0	34	179,358	0.93	167,331	50.0	28	167,288	0.57
1,180		0.092	0.087	29.0	3.44	15.1	2.43	5.7	21	47,916	1.97	94,246	40.0	26	93,767	1.95
1,208		0.098	0.149	28.2	4.72	14.7	3.33	7.9	105	228,982	1.49	342,050	40.0	105	340,930	1.66
1,210		0.125	0.165	55.2	8.49	28.7	6.00	14.2	83	353,344	1.02	358,901	50.0	73	358,679	0.75
1,216		0.124	0.182	85.6	13.48	44.5	9.53	22.5	70	467,181	1.58	738,818	70.0	100	738,758	0.78
1,224		0.119	0.147	56.1	7.86	29.2	5.55	13.1	67	292,614	1.81	530,905	55.0	97	530,753	1.20
1,226		0.102	0.118	55.3	6.50	28.8	4.59	10.8	39	165,710	2.00	331,083	50.0	59	330,973	1.29
1,228		0.121	0.104	62.8	6.52	32.7	4.61	10.9	27	132,967	1.67	221,737	55.0	38	221,788	1.02
1,230		0.125	0.099	39.5	4.50	20.6	3.18	7.5	37	113,474	1.74	197,125	45.0	47	196,585	1.49

		Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
Catchment Name/ID	User Comment for Catchment	CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
1,232		0.091	0.241	17.0	4.65	8.8	3.28	7.7	345	454,149	2.23	1,011,693	35.0	396	1,004,549	3.17
1,234		0.092	0.159	21.1	4.07	11.0	2.87	6.8	109	177,507	2.22	393,817	40.0	131	390,987	2.68
1,236		0.091	0.196	34.7	6.73	18.0	4.76	11.2	103	276,025	2.24	616,950	45.0	150	616,395	1.98
1,238		0.092	0.197	32.4	6.42	16.9	4.54	10.7	115	288,367	2.31	665,196	45.0	168	665,471	2.12
1,240		0.122	0.088	35.2	3.87	18.3	2.73	6.4	33	90,060	1.79	161,500	45.0	41	161,057	1.66
1,248		0.090	0.133	33.0	4.86	17.2	3.44	8.1	43	109,735	2.34	257,164	45.0	63	256,574	2.07
1,256		0.087	0.191	27.2	5.50	14.2	3.89	9.2	101	213,045	2.35	500,670	40.0	140	499,055	2.39
1,258		0.118	0.125	41.5	5.48	21.6	3.87	9.1	64	204,514	1.96	400,984	45.0	89	400,560	1.58
1,260		0.119	0.132	58.3	7.41	30.3	5.24	12.3	51	229,598	1.95	448,553	55.0	78	448,525	1.23
1,264		0.126	0.110	44.2	5.24	23.0	3.70	8.7	42	143,494	1.46	210,119	45.0	47	209,864	1.20
1,272		0.130	0.089	58.6	5.49	30.5	3.88	9.2	18	83,926	0.99	82,729	50.0	16	82,662	0.69
1,274		0.113	0.076	55.2	4.74	28.7	3.35	7.9	17	71,438	1.89	135,003	50.0	24	134,809	1.24
1,308		0.127	0.137	59.0	7.70	30.7	5.44	12.8	50	227,565	1.62	369,469	55.0	67	369,377	1.06
1,310		0.123	0.105	52.5	5.73	27.3	4.05	9.6	33	132,205	1.78	235,526	50.0	45	235,433	1.24
1,316		0.123	0.167	46.8	7.49	24.3	5.29	12.5	102	369,607	1.78	656,996	50.0	140	656,898	1.37
1,318		0.124	0.101	53.2	5.61	27.7	3.97	9.4	29	119,028	1.76	209,981	50.0	40	209,858	1.22
1,320		0.125	0.128	22.4	3.71	11.6	2.62	6.2	117	202,881	1.76	356,227	40.0	125	353,085	2.24
1,322		0.125	0.143	42.5	6.16	22.1	4.35	10.3	79	258,202	1.90	490,730	50.0	109	490,790	1.53
1,324		0.125	0.125	39.3	5.27	20.4	3.72	8.8	63	190,648	1.78	339,747	45.0	81	339,107	1.55
1,328		0.112	0.050	83.2	4.71	43.3	3.33	7.9	4	28,350	2.03	57,461	65.0	7	57,408	0.95
1,340		0.088	0.254	25.9	6.54	13.4	4.62	10.9	206	412,985	2.33	960,976	40.0	284	959,055	2.49
1,348		0.122	0.140	41.7	5.98	21.7	4.22	10.0	78	252,793	1.92	486,605	45.0	108	486,613	1.56
1,349		0.122	0.102	42.7	4.84	22.2	3.42	8.1	38	124,654	1.92	239,468	45.0	52	239,017	1.52
1,352		0.125	0.179	52.8	8.77	27.5	6.20	14.6	105	427,614	1.90	812,710	55.0	155	812,135	1.31
1,354		0.125	0.138	46.0	6.37	23.9	4.50	10.6	67	238,092	1.90	452,509	50.0	95	452,315	1.44
1,356		0.121	0.160	44.1	6.91	22.9	4.89	11.5	101	344,233	1.92	662,217	50.0	143	662,082	1.50
1,358		0.123	0.173	54.0	8.66	28.1	6.12	14.4	96	401,696	1.91	767,903	55.0	143	767,390	1.29
1,368		0.081	0.153	19.9	3.84	10.3	2.71	6.4	69	106,686	2.61	277,940	35.0	91	275,951	3.10
1,364		0.078	0.191	15.0	3.70	7.8	2.61	6.2	140	162,551	2.69	438,018	35.0	171	434,991	3.82
1,372		0.124	0.179	46.7	7.91	24.3	5.59	13.2	122	441,626	1.91	843,812	50.0	176	843,536	1.45
1,362		0.118	0.077	75.2	5.93	39.1	4.19	9.9	12	69,006	1.95	134,510	60.0	19	134,481	1.00
1,382		0.125	0.161	74.1	10.64	38.5	7.52	17.7	58	332,581	1.74	577,633	65.0	87	577,506	0.95
1,386		0.125	0.107	69.3	7.17	36.0	5.07	11.9	25	134,746	1.91	256,843	60.0	39	256,866	1.06
1,388		0.123	0.178	34.1	6.17	17.7	4.36	10.3	163	428,848	1.92	822,979	45.0	215	823,086	1.82
1,392		0.105	0.144	36.0	5.49	18.7	3.88	9.2	107	299,039	1.96	585,188	45.0	144	584,270	1.75
1,394		0.106	0.159	48.9	7.47	25.4	5.28	12.5	98	372,438	2.07	769,830	50.0	150	769,723	1.46
1,396		0.078	0.244	21.3	5.49	11.1	3.88	9.1	170	280,490	2.69	755,377	40.0	238	753,350	3.08
1,398		0.079	0.204	19.0	4.48	9.9	3.17	7.5	129	190,139	2.68	509,806	35.0	170	507,068	3.25

								Depression Storage		Horton's Infiltration Parameters			DCIA Level and Fractions			
Catchment Name/ID	SWMM Node/ID	Raingage Name/ID	Area (sq.mi.)	Dist. to Centroid (miles)	Length (miles)	Slope (ft./ft.)	Percent Imperv.	Pervious (inches)	Imperv. (inches)	Initial Rate (in./hr.)	Final Rate (in.hr.)	Decay Coeff. (1/sec.)	DCIA Level	Dir. Con'ct Imperv. Fraction	Receiv. Perv. Fraction	Percent Eff. Imperv.
110	110	GOS GREELEY	0.111	0.506	0.975	0.027	4.8	0.35	0.10	3.00	0.50	0.0018	1.00	0.05	0.10	4.26
114	114	GOS GREELEY	0.175	0.346	0.914	0.031	3.8	0.40	0.10	3.00	0.50	0.0018	1.00	0.04	0.08	3.31
118	118	GOS GREELEY	0.059	0.278	0.474	0.048	2.0	0.40	0.10	3.00	0.50	0.0018	1.00	0.02	0.04	1.76
122	122	GOS GREELEY	0.192	0.486	1.184	0.027	39.3	0.35	0.10	3.00	0.50	0.0018	1.00	0.49	0.33	37.34
126	126	GOS GREELEY	0.032	0.133	0.286	0.013	21.2	0.40	0.10	4.50	0.60	0.0018	1.00	0.25	0.25	19.05
130	130	GOS GREELEY	0.073	0.318	0.607	0.038	14.3	0.35	0.10	3.00	0.50	0.0018	1.00	0.16	0.22	12.94
134	134	GOS GREELEY	0.084	0.217	0.593	0.028	53.9	0.35	0.10	3.00	0.50	0.0018	1.00	0.65	0.40	52.10
138	138	GOS GREELEY	0.130	0.176	0.483	0.017	69.3	0.35	0.10	3.00	0.50	0.0018	1.00	0.77	0.47	67.86
142	142	GOS GREELEY	0.031	0.233	0.500	0.034	11.9	0.40	0.10	3.00	0.50	0.0018	1.00	0.13	0.21	10.68
146	146	GOS GREELEY	0.062	0.463	0.831	0.033	28.7	0.35	0.10	3.00	0.50	0.0018	1.00	0.35	0.28	26.79
150	150	GOS GREELEY	0.093	0.272	0.641	0.040	20.1	0.35	0.10	3.00	0.50	0.0018	1.00	0.23	0.24	18.46
154	154	GOS GREELEY	0.139	0.231	0.515	0.027	53.0	0.35	0.10	3.00	0.50	0.0018	1.00	0.64	0.39	51.15
210	210	GOS GREELEY	0.076	0.155	0.506	0.042	4.6	0.35	0.10	3.00	0.50	0.0018	1.00	0.05	0.09	4.06
220	220	GOS GREELEY	0.156	0.410	0.800	0.034	2.2	0.40	0.10	3.00	0.50	0.0018	1.00	0.02	0.04	1.93
224	224	GOS GREELEY	0.100	0.239	0.642	0.041	2.8	0.35	0.10	3.00	0.50	0.0018	1.00	0.03	0.06	2.46
226	226	GOS GREELEY	0.095	0.307	0.593	0.034	44.6	0.35	0.10	3.00	0.50	0.0018	1.00	0.55	0.35	42.69
228	228	GOS GREELEY	0.103	0.359	0.664	0.026	40.9	0.35	0.10	3.00	0.50	0.0018	1.00	0.51	0.33	38.96
232	232	GOS GREELEY	0.166	0.432	0.945	0.034	3.6	0.35	0.10	3.00	0.50	0.0018	1.00	0.04	0.07	3.19
236	236	GOS GREELEY	0.094	0.355	0.753	0.036	31.5	0.35	0.10	3.00	0.50	0.0018	1.00	0.39	0.30	29.57
240	240	GOS GREELEY	0.034	0.160	0.395	0.051	2.2	0.40	0.10	3.00	0.50	0.0018	1.00	0.02	0.04	1.93
244	244	GOS GREELEY	0.141	0.480	0.830	0.038	53.9	0.35	0.10	3.00	0.50	0.0018	1.00	0.64	0.40	52.04
248	248	GOS GREELEY	0.151	0.284	0.543	0.016	75.5	0.35	0.10	3.00	0.50	0.0018	1.00	0.81	0.49	74.19
250	250	GOS GREELEY	0.068	0.120	0.339	0.022	66.1	0.35	0.10	3.00	0.50	0.0018	1.00	0.74	0.45	64.49
252	252	GOS GREELEY	0.098	0.393	0.739	0.021	68.6	0.35	0.10	3.00	0.50	0.0018	1.00	0.76	0.46	67.12
256	256	GOS GREELEY	0.146	0.554	0.954	0.032	43.8	0.35	0.10	4.50	0.60	0.0018	1.00	0.54	0.35	41.34
260	260	GOS GREELEY	0.101	0.321	0.670	0.050	9.8	0.35	0.10	3.00	0.50	0.0018	1.00	0.11	0.20	8.76
264	264	GOS GREELEY	0.107	0.331	0.854	0.024	66.3	0.35	0.10	3.00	0.50	0.0018	1.00	0.74	0.45	64.77
268	268	GOS GREELEY	0.092	0.287	0.637	0.018	57.0	0.35	0.10	3.00	0.50	0.0018	1.00	0.67	0.41	55.22
310	310	GOS GREELEY	0.138	0.389	0.760	0.038	2.4	0.40	0.10	4.50	0.60	0.0018	1.00	0.03	0.05	2.06
314	314	GOS GREELEY	0.108	0.245	0.526	0.038	35.0	0.35	0.10	4.50	0.60	0.0018	1.00	0.43	0.31	32.50
410	410	GOS GREELEY	0.021	0.189	0.311	0.073	4.8	0.40	0.10	3.00	0.50	0.0018	1.00	0.05	0.10	4.27
414	414	GOS GREELEY	0.019	0.143	0.263	0.087	2.9	0.40	0.10	3.00	0.50	0.0018	1.00	0.03	0.06	2.59
418	418	GOS GREELEY	0.062	0.276	0.605	0.047	3.7	0.35	0.10	3.00	0.50	0.0018	1.00	0.04	0.07	3.24
422	422	GOS GREELEY	0.006	0.102	0.196	0.097	4.0	0.40	0.10	5.00	1.00	0.0007	1.00	0.04	0.08	2.95
426	426	GOS GREELEY	0.068	0.320	0.635	0.046	4.7	0.35	0.10	4.50	0.60	0.0018	1.00	0.05	0.09	3.98
510	510	GOS GREELEY	0.193	0.483	0.920	0.033	14.9	0.35	0.10	3.00	0.50	0.0018	1.00	0.17	0.22	13.52
514	514	GOS GREELEY	0.138	0.457	0.927	0.025	60.9	0.35	0.10	3.00	0.50	0.0018	1.00	0.71	0.42	59.20
518	518	GOS GREELEY	0.125	0.298	0.642	0.024	51.8	0.35	0.10	3.00	0.50	0.0018	1.00	0.63	0.39	50.00
610	610	GOS GREELEY	0.166	0.452	0.971	0.032	16.8	0.35	0.10	3.00	0.50	0.0018	1.00	0.19	0.23	15.33
614	614	GOS GREELEY	0.157	0.330	0.607	0.036	52.4	0.35	0.10	3.00	0.50	0.0018	1.00	0.63	0.39	50.55
618	618	GOS GREELEY	0.084	0.185	0.446	0.026	76.9	0.35	0.10	3.00	0.50	0.0018	1.00	0.83	0.50	75.66
620	620	GREELEY	0.053	0.272	0.598	0.008	23.5	0.35	0.10	3.00	0.50	0.0018	1.00	0.28	0.26	21.74

								Depression Storage		Horton's Infiltration Parameters			DCIA Level and Fractions			
Catchment Name/ID	SWMM Node/ID	Raingage Name/ID	Area (sq.mi.)	Dist. to Centroid (miles)	Length (miles)	Slope (ft./ft.)	Percent Imperv.	Pervious (inches)	Imperv. (inches)	Initial Rate (in./hr.)	Final Rate (in.hr.)	Decay Coeff. (1/sec.)	DCIA Level	Dir. Con'ct Imperv. Fraction	Receiv. Perv. Fraction	Percent Eff. Imperv.
622	622	GOS GREELEY	0.161	0.336	0.673	0.019	74.5	0.35	0.10	3.00	0.50	0.0018	1.00	0.81	0.49	73.16
712	712	GREELEY	0.140	0.346	0.764	0.033	30.2	0.35	0.10	3.00	0.50	0.0018	1.00	0.37	0.29	28.27
714	714	GREELEY	0.035	0.091	0.212	0.030	12.5	0.35	0.10	3.00	0.50	0.0018	1.00	0.14	0.21	11.27
804	804	GREELEY	0.040	0.085	0.381	0.018	10.0	0.35	0.10	5.00	1.00	0.0007	1.00	0.11	0.20	7.52
810	810	GREELEY	0.115	0.242	0.599	0.011	48.1	0.35	0.10	3.00	0.50	0.0018	1.00	0.59	0.37	46.22
820	820	GREELEY	0.127	0.170	0.537	0.021	69.8	0.35	0.10	3.00	0.50	0.0018	1.00	0.77	0.47	68.30
824	824	GREELEY	0.068	0.192	0.421	0.017	78.0	0.35	0.10	3.00	0.50	0.0018	1.00	0.83	0.50	76.78
830	830	GREELEY	0.111	0.121	0.541	0.019	67.8	0.35	0.10	3.00	0.50	0.0018	1.00	0.75	0.46	66.30
840	840	GREELEY	0.100	0.339	0.674	0.023	76.5	0.35	0.10	3.00	0.50	0.0018	1.00	0.82	0.50	75.31
842	842	GREELEY	0.173	0.312	0.834	0.016	68.6	0.35	0.10	3.00	0.50	0.0018	1.00	0.76	0.46	67.08
844	844	GREELEY	0.198	0.278	0.542	0.016	76.2	0.35	0.10	3.00	0.50	0.0018	1.00	0.82	0.49	74.96
850	850	GREELEY	0.156	0.361	0.569	0.023	60.1	0.35	0.10	4.50	0.60	0.0018	1.00	0.70	0.42	57.88
910	910	GREELEY	0.159	0.415	0.843	0.019	27.8	0.35	0.10	4.30	0.70	0.0014	0.00	0.56	0.16	26.02
930	930	GREELEY	0.164	0.350	0.704	0.011	76.2	0.35	0.10	3.50	0.60	0.0016	0.00	0.93	0.32	75.45
940	940	GREELEY	0.142	0.346	0.667	0.015	22.5	0.35	0.10	3.70	0.50	0.0018	0.00	0.45	0.14	21.28
950	950	GREELEY	0.173	0.439	0.819	0.011	22.7	0.35	0.10	3.70	0.50	0.0018	0.00	0.45	0.14	21.46
960	960	GREELEY	0.059	0.083	0.394	0.014	26.6	0.35	0.10	3.40	0.50	0.0018	0.00	0.53	0.16	25.39
1,032	1,032	GREELEY	0.015	0.070	0.215	0.022	47.3	0.35	0.10	5.00	1.00	0.0007	1.00	0.58	0.37	42.78
1,108	1,108	GREELEY	0.006	0.064	0.152	0.080	35.3	0.35	0.10	5.00	1.00	0.0007	0.00	0.71	0.19	32.82
1,110	1,110	GREELEY	0.027	0.183	0.364	0.036	41.0	0.35	0.10	5.00	1.00	0.0007	0.00	0.80	0.20	38.93
1,116	1,116	GREELEY	0.094	0.202	0.577	0.025	43.7	0.35	0.10	4.20	0.80	0.0011	0.00	0.82	0.21	42.17
1,124	1,124	GREELEY	0.046	0.115	0.500	0.017	46.2	0.35	0.10	4.40	0.90	0.0010	0.00	0.83	0.22	44.55
1,132	1,132	GREELEY	0.040	0.129	0.294	0.028	40.7	0.35	0.10	5.00	1.00	0.0007	0.00	0.80	0.20	38.64
1,126	1,126	GREELEY	0.094	0.053	0.406	0.019	56.9	0.35	0.10	5.00	1.00	0.0007	0.00	0.88	0.26	55.20
1,140	1,140	GREELEY	0.188	0.216	0.637	0.016	44.8	0.35	0.10	4.90	1.00	0.0008	0.00	0.82	0.21	42.86
1,142	1,142	GREELEY	0.029	0.158	0.370	0.018	67.1	0.35	0.10	4.90	1.00	0.0007	0.00	0.91	0.29	65.61
1,144	1,144	GREELEY	0.127	0.074	0.702	0.009	41.0	0.35	0.10	4.70	0.90	0.0008	0.00	0.81	0.20	39.21
1,148	1,148	GREELEY	0.170	0.376	0.793	0.016	44.8	0.35	0.10	4.90	1.00	0.0008	0.00	0.82	0.21	42.87
1,150	1,150	GREELEY	0.088	0.262	0.862	0.010	12.0	0.35	0.10	4.70	0.90	0.0011	0.00	0.24	0.11	10.31
1,152	1,152	GREELEY	0.033	0.142	0.303	0.028	68.2	0.35	0.10	3.00	0.50	0.0018	0.00	0.92	0.29	67.55
1,154	1,154	GREELEY	0.085	0.390	0.513	0.019	75.8	0.35	0.10	3.50	0.60	0.0016	0.00	0.93	0.32	75.14
1,156	1,156	GREELEY	0.121	0.378	0.684	0.018	47.5	0.35	0.10	4.80	0.90	0.0009	0.00	0.84	0.22	45.75
1,164	1,164	GREELEY	0.184	0.339	0.558	0.017	45.1	0.35	0.10	3.60	0.50	0.0018	0.00	0.83	0.22	44.17
1,172	1,172	GREELEY	0.077	0.464	0.708	0.026	12.6	0.35	0.10	4.90	1.00	0.0007	0.00	0.25	0.11	10.43
1,180	1,180	GREELEY	0.021	0.153	0.401	0.035	43.6	0.35	0.10	4.30	0.80	0.0011	0.00	0.82	0.21	42.10
1,208	1,208	GREELEY	0.099	0.242	0.585	0.029	36.0	0.35	0.10	4.80	1.00	0.0008	1.00	0.45	0.31	31.75
1,210	1,210	GREELEY	0.152	0.280	0.852	0.009	13.3	0.35	0.10	5.00	1.00	0.0008	1.00	0.15	0.21	10.43
1,216	1,216	GREELEY	0.201	0.643	0.873	0.005	12.7	0.35	0.10	4.10	0.70	0.0013	1.00	0.14	0.21	10.85
1,224	1,224	GREELEY	0.126	0.300	0.851	0.013	15.8	0.35	0.10	4.20	0.60	0.0018	1.00	0.18	0.22	13.99
1,226	1,226	GREELEY	0.071	0.345	0.619	0.013	29.8	0.35	0.10	4.30	0.60	0.0018	1.00	0.37	0.29	27.43
1,228	1,228	GREELEY	0.057	0.233	0.623	0.012	15.1	0.35	0.10	4.60	0.70	0.0016	1.00	0.17	0.22	13.07
1,230	1,230	GREELEY	0.049	0.143	0.443	0.022	12.0	0.35	0.10	4.50	0.60	0.0017	1.00	0.13	0.21	10.42

								Depression Storage		Horton's Infiltration Parameters			DCIA Level and Fractions			
Catchment Name/ID	SWMM Node/ID	Raingage Name/ID	Area (sq.mi.)	Dist. to Centroid (miles)	Length (miles)	Slope (ft./ft.)	Percent Imperv.	Pervious (inches)	Imperv. (inches)	Initial Rate (in./hr.)	Final Rate (in.hr.)	Decay Coeff. (1/sec.)	DCIA Level	Dir. Con'ct Imperv. Fraction	Receiv. Perv. Fraction	Percent Eff. Imperv.
1,232	1,232	GREELEY	0.195	0.209	0.603	0.019	46.4	0.35	0.10	4.10	0.60	0.0018	1.00	0.57	0.36	44.00
1,234	1,234	GREELEY	0.076	0.147	0.501	0.016	45.3	0.35	0.10	3.90	0.60	0.0018	1.00	0.56	0.36	42.93
1,236	1,236	GREELEY	0.119	0.414	0.752	0.014	46.4	0.35	0.10	3.50	0.60	0.0017	1.00	0.57	0.36	44.11
1,238	1,238	GREELEY	0.124	0.207	0.519	0.002	45.0	0.35	0.10	3.20	0.50	0.0018	1.00	0.56	0.36	43.05
1,240	1,240	GREELEY	0.039	0.139	0.244	0.015	14.2	0.35	0.10	4.20	0.60	0.0018	1.00	0.16	0.22	12.50
1,248	1,248	GREELEY	0.047	0.284	0.466	0.015	48.1	0.35	0.10	3.20	0.50	0.0018	1.00	0.59	0.37	46.13
1,256	1,256	GREELEY	0.092	0.319	0.557	0.011	55.6	0.35	0.10	4.30	0.60	0.0018	1.00	0.66	0.40	53.31
1,258	1,258	GREELEY	0.088	0.171	0.420	0.007	16.3	0.35	0.10	3.30	0.50	0.0018	1.00	0.19	0.23	14.77
1,260	1,260	GREELEY	0.099	0.286	0.709	0.011	15.7	0.35	0.10	3.30	0.50	0.0018	1.00	0.18	0.22	14.21
1,264	1,264	GREELEY	0.062	0.215	0.527	0.028	12.2	0.35	0.10	4.70	0.80	0.0013	1.00	0.14	0.21	10.13
1,272	1,272	GREELEY	0.036	0.253	0.484	0.029	11.6	0.35	0.10	5.00	1.00	0.0008	1.00	0.13	0.21	9.01
1,274	1,274	GREELEY	0.031	0.165	0.408	0.012	20.3	0.35	0.10	3.80	0.60	0.0018	1.00	0.23	0.24	18.28
1,308	1,308	GREELEY	0.098	0.378	0.680	0.019	11.3	0.35	0.10	4.50	0.70	0.0016	1.00	0.13	0.21	9.65
1,310	1,310	GREELEY	0.057	0.241	0.486	0.017	13.0	0.35	0.10	4.10	0.60	0.0018	1.00	0.15	0.21	11.45
1,316	1,316	GREELEY	0.159	0.339	0.650	0.014	13.0	0.35	0.10	4.20	0.60	0.0018	1.00	0.15	0.21	11.39
1,318	1,318	GREELEY	0.051	0.228	0.406	0.012	12.5	0.35	0.10	4.40	0.60	0.0018	1.00	0.14	0.21	10.87
1,320	1,320	GREELEY	0.087	0.094	0.369	0.023	12.1	0.35	0.10	4.50	0.60	0.0018	1.00	0.13	0.21	10.50
1,322	1,322	GREELEY	0.111	0.234	0.582	0.016	12.0	0.35	0.10	3.50	0.50	0.0018	1.00	0.13	0.21	10.71
1,324	1,324	GREELEY	0.082	0.182	0.397	0.011	12.0	0.35	0.10	3.80	0.60	0.0018	1.00	0.13	0.21	10.53
1,328	1,328	GREELEY	0.012	0.167	0.289	0.006	20.8	0.35	0.10	3.00	0.50	0.0018	1.00	0.24	0.24	19.14
1,340	D_1340	GREELEY	0.178	0.227	1.029	0.008	53.8	0.35	0.10	4.20	0.60	0.0018	1.00	0.64	0.40	51.48
1,348	1,348	GREELEY	0.109	0.234	0.535	0.015	13.7	0.35	0.10	3.40	0.50	0.0018	1.00	0.15	0.21	12.27
1,349	1,349	GREELEY	0.054	0.159	0.399	0.013	13.3	0.35	0.10	3.40	0.50	0.0018	1.00	0.15	0.21	11.96
1,352	1,352	GREELEY	0.184	0.396	0.801	0.013	12.0	0.35	0.10	3.50	0.50	0.0018	1.00	0.13	0.21	10.71
1,354	1,354	GREELEY	0.102	0.237	0.660	0.018	12.0	0.35	0.10	3.50	0.50	0.0018	1.00	0.13	0.21	10.71
1,356	1,356	GREELEY	0.148	0.269	0.586	0.010	14.3	0.35	0.10	3.60	0.50	0.0018	1.00	0.16	0.22	12.88
1,358	1,358	GREELEY	0.173	0.440	0.675	0.012	13.3	0.35	0.10	3.60	0.50	0.0018	1.00	0.15	0.21	11.93
1,368	1,368	GREELEY	0.046	0.184	0.389	0.013	69.4	0.35	0.10	3.00	0.50	0.0018	1.00	0.77	0.47	67.88
1,364	1,364	GREELEY	0.070	0.113	0.457	0.007	77.1	0.35	0.10	3.40	0.50	0.0018	1.00	0.83	0.50	75.88
1,372	1,372	GREELEY	0.190	0.306	0.504	0.005	12.5	0.35	0.10	3.40	0.50	0.0018	1.00	0.14	0.21	11.14
1,362	1,362	GREELEY	0.030	0.265	0.400	0.009	16.1	0.35	0.10	3.50	0.50	0.0018	1.00	0.18	0.22	14.55
1,382	1,382	GREELEY	0.143	0.590	0.881	0.014	12.0	0.35	0.10	4.50	0.60	0.0017	1.00	0.13	0.21	10.39
1,386	1,386	GREELEY	0.058	0.181	0.708	0.006	12.1	0.35	0.10	3.40	0.50	0.0018	1.00	0.13	0.21	10.78
1,388	1,388	GREELEY	0.185	0.300	0.506	0.019	12.8	0.35	0.10	3.30	0.50	0.0018	1.00	0.14	0.21	11.45
1,392	1,392	GREELEY	0.129	0.204	0.668	0.014	27.1	0.35	0.10	4.00	0.60	0.0017	1.00	0.33	0.28	24.81
1,394	1,394	GREELEY	0.160	0.234	1.013	0.009	25.6	0.35	0.10	3.40	0.50	0.0018	1.00	0.31	0.27	23.72
1,396	1,396	GREELEY	0.121	0.336	0.678	0.012	76.6	0.35	0.10	3.00	0.50	0.0018	1.00	0.82	0.50	75.38
1,398	1,398	GREELEY	0.082	0.188	0.534	0.008	75.6	0.35	0.10	3.00	0.50	0.0018	1.00	0.82	0.49	74.37

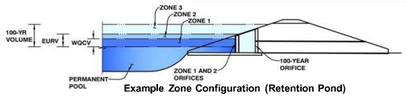
APPENDIX F-2
Master Plan Detention

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: DP 122 (Basins 122+126), EURV



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	143.04	acres
Watershed Length =	6,251	ft
Watershed Length to Centroid =	2,567	ft
Watershed Slope =	0.025	ft/ft
Watershed Imperviousness =	36.36%	percent
Percentage Hydrologic Soil Group A =	36.8%	percent
Percentage Hydrologic Soil Group B =	55.2%	percent
Percentage Hydrologic Soil Groups C/D =	8.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	2.027 acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	5.394 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	2.864 acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	4.183 acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	5.948 acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	11.597 acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	16.409 acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	22.961 acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	39.704 acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	2.712 acre-feet		
Approximate 5-yr Detention Volume =	3.961 acre-feet		
Approximate 10-yr Detention Volume =	5.619 acre-feet		
Approximate 25-yr Detention Volume =	7.642 acre-feet		
Approximate 50-yr Detention Volume =	9.010 acre-feet		
Approximate 100-yr Detention Volume =	11.395 acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	2.027	acre-feet
Zone 2 Volume (EURV - Zone 1) =	3.367	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	6.001	acre-feet
Total Detention Basin Volume =	11.395	acre-feet
Initial Surcharge Volume (ISV) =	265	ft^3
Initial Surcharge Depth (ISD) =	0.50	ft
Total Available Detention Depth (H_{total}) =	6.50	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.008	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Initial Surcharge Area (A_{ISV}) =	530	ft^2
Surcharge Volume Length (L_{ISV}) =	23.0	ft
Surcharge Volume Width (W_{ISV}) =	23.0	ft
Depth of Basin Floor (H_{FLOOR}) =	4.78	ft
Length of Basin Floor (L_{FLOOR}) =	639.6	ft
Width of Basin Floor (W_{FLOOR}) =	321.8	ft
Area of Basin Floor (A_{FLOOR}) =	205,812	ft^2
Volume of Basin Floor (V_{FLOOR}) =	345,408	ft^3
Depth of Main Basin (H_{MAIN}) =	0.72	ft
Length of Main Basin (L_{MAIN}) =	645.4	ft
Width of Main Basin (W_{MAIN}) =	327.5	ft
Area of Main Basin (A_{MAIN}) =	211,383	ft^2
Volume of Main Basin (V_{MAIN}) =	150,186	ft^3
Calculated Total Basin Volume (V_{total}) =	**11.389**	acre-feet

Depth Increment = 0.25 ft

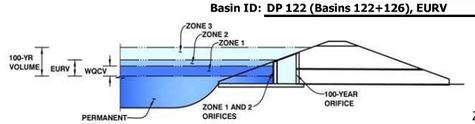
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		23.0	23.0	530		0.012		
ISV	0.50		23.0	23.0	530		0.012	265	0.006
	0.75		23.0	23.0	530		0.012	397	0.009
	1.00		23.0	23.0	530		0.012	530	0.012
	1.25		55.3	38.6	2,135		0.049	842	0.019
	1.50		87.5	54.3	4,749		0.109	1,681	0.039
	1.75		119.8	69.9	8,370		0.192	3,300	0.076
	2.00		152.0	85.5	13,000		0.298	5,951	0.137
	2.25		184.3	101.1	18,637		0.428	9,884	0.227
	2.50		216.5	116.8	25,281		0.580	15,353	0.352
	2.75		248.8	132.4	32,934		0.756	22,609	0.519
	3.00		281.0	148.0	41,595		0.955	31,904	0.732
	3.25		313.3	163.6	51,263		1.177	43,490	0.998
	3.50		345.5	179.3	61,939		1.422	57,619	1.323
	3.75		377.8	194.9	73,623		1.690	74,544	1.711
	4.00		410.0	210.5	86,315		1.982	94,515	2.170
	4.25		442.3	226.1	100,014		2.296	117,785	2.704
Zone 1 (WQCV)	4.37		457.7	233.6	106,948		2.455	130,200	2.989
	4.50		474.5	241.8	114,721		2.634	144,606	3.320
	4.75		506.8	257.4	130,437		2.994	175,230	4.023
	5.00		539.0	273.0	147,159		3.378	209,908	4.819
	5.25		571.3	288.6	164,890		3.785	248,893	5.714
	5.50		603.5	304.3	183,629		4.216	292,437	6.713
	5.75		635.8	319.9	203,375		4.669	340,792	7.823
Zone 2 (EURV)	5.80		639.8	321.9	205,966		4.728	351,047	8.059
	6.00		641.4	323.5	207,508		4.764	392,394	9.008
	6.25		643.4	325.5	209,441		4.808	444,513	10.205
Floor	6.50		645.4	327.5	211,383		4.853	497,116	11.412
	6.75		647.4	329.5	213,333		4.897	550,205	12.631
	7.00		649.4	331.5	215,291		4.942	603,783	13.861
	7.25		651.4	333.5	217,257		4.988	657,851	15.102
Zone 3 (100-year)	7.34		652.1	334.2	217,967		5.004	677,437	15.552
	7.50		653.4	335.5	219,231		5.033	712,412	16.355
	7.75		655.4	337.5	221,213		5.078	767,467	17.619
	8.00		657.4	339.5	223,202		5.124	823,019	18.894
	8.25		659.4	341.5	225,200		5.170	879,069	20.181
	8.50		661.4	343.5	227,206		5.216	935,620	21.479
	8.75		663.4	345.5	229,220		5.262	992,673	22.789
	9.00		665.4	347.5	231,242		5.309	1,050,231	24.110
	9.25		667.4	349.5	233,272		5.355	1,108,295	25.443
	9.50		669.4	351.5	235,309		5.402	1,166,867	26.788
	9.75		671.4	353.5	237,355		5.449	1,225,950	28.144
	10.00		673.4	355.5	239,409		5.496	1,285,545	29.512
	10.25		675.4	357.5	241,471		5.543	1,345,655	30.892
	10.50		677.4	359.5	243,541		5.591	1,406,281	32.284
	10.75		679.4	361.5	245,619		5.639	1,467,426	33.687
	11.00		681.4	363.5	247,704		5.687	1,529,091	35.103
	11.25		683.4	365.5	249,798		5.735	1,591,279	36.531
	11.50		685.4	367.5	251,900		5.783	1,653,991	37.970
	11.75		687.4	369.5	254,010		5.831	1,717,230	39.422
	12.00		689.4	371.5	256,128		5.880	1,780,997	40.886
	12.25		691.4	373.5	258,254		5.929	1,845,294	42.362
	12.50		693.4	375.5	260,388		5.978	1,910,124	43.850
	12.75		695.4	377.5	262,529		6.027	1,975,489	45.351
	13.00		697.4	379.5	264,679		6.076	2,041,390	46.864
	13.25		699.4	381.5	266,837		6.126	2,107,829	48.389
	13.50		701.4	383.5	269,003		6.175	2,174,809	49.927
	13.75		703.4	385.5	271,177		6.225	2,242,331	51.477
	14.00		705.4	387.5	273,359		6.275	2,310,398	53.039
	14.25		707.4	389.5	275,548		6.326	2,379,011	54.615
	14.50		709.4	391.5	277,746		6.376	2,448,173	56.202
	14.75		711.4	393.5	279,952		6.427	2,517,885	57.803
	15.00		713.4	395.5	282,166		6.478	2,588,150	59.416
	15.25		715.4	397.5	284,388		6.529	2,658,969	61.042
	15.50		717.4	399.5	286,618		6.580	2,730,344	62.680
	15.75		719.4	401.5	288,855		6.631	2,802,278	64.331
	16.00		721.4	403.5	291,101		6.683	2,874,773	65.996
	16.25		723.4	405.5	293,355		6.735	2,947,829	67.673
	16.50		725.4	407.5	295,617		6.786	3,021,451	69.363
	16.75		727.4	409.5	297,887		6.839	3,095,639	71.066
	17.00		729.4	411.5	300,165		6.891	3,170,395	72.782
	17.25		731.4	413.5	302,451		6.943	3,245,722	74.512
	17.50		733.4	415.5	304,744		6.996	3,321,621	76.254
	17.75		735.4	417.5	307,046		7.049	3,398,094	78.010
	18.00		737.4	419.5	309,356		7.102	3,475,145	79.778
	18.25		739.4	421.5	311,674		7.155	3,552,773	81.560
	18.50		741.4	423.5	314,000		7.208	3,630,982	83.356
	18.75		743.4	425.5	316,334		7.262	3,709,774	85.165
	19.00		745.4	427.5	318,675		7.316	3,789,150	86.987
	19.25		747.4	429.5	321,025		7.370	3,869,112	88.823
	19.50		749.4	431.5	323,383		7.424	3,949,663	90.672
	19.75		751.4	433.5	325,749		7.478	4,030,804	92.535
	20.00		753.4	435.5	328,123		7.533	4,112,538	94.411
	20.25		755.4	437.5	330,505		7.587	4,194,866	96.301
	20.50		757.4	439.5	332,894		7.642	4,277,791	98.205
	20.75		759.4	441.5	335,292		7.697	4,361,314	100.122
	21.00		761.4	443.5	337,698		7.752	4,445,438	102.053
	21.25		763.4	445.5	340,112		7.808	4,530,164	103.998
	21.50		765.4	447.5	342,534		7.863	4,615,494	105.957
	21.75		767.4	449.5	344,964		7.919	4,701,431	107.930
	22.00		769.4	451.5	347,401		7.975	4,787,977	109.917
	22.25		771.4	453.5	349,847		8.031	4,875,133	111.918
	22.50		773.4	455.5	352,301		8.088	4,962,901	113.933
	22.75		775.4	457.5	354,763		8.144	5,051,284	115.962
	23.00		777.4	459.5	357,233		8.201	5,140,283	118.005
	23.25		779.4	461.5	359,711		8.258	5,229,901	120.062
	23.50		781.4	463.5	362,197		8.315	5,320,139	122.134
	23.75		783.4	465.5	364,690		8.372	5,411,000	124.219
	24.00		785.4	467.5	367,192		8.430	5,502,485	126.320

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: DP 122 (Basins 122+126), EURV



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.93	2.027	Orifice Plate
Zone 2 (EURV)	5.17	3.367	Weir&Pipe (Restrict)
Zone 3 (100-year)	6.50	6.001	Not Utilized
Total (all zones)		11.395	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	
Underdrain Orifice Diameter =	N/A	inches	

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	
Depth at top of Zone using Orifice Plate =	3.93	ft (relative to basin bottom at Stage = 0 ft)	
Orifice Plate: Orifice Vertical Spacing =	15.70	inches	
Orifice Plate: Orifice Area per Row =	5.17	sq. inches (use rectangular openings)	

Calculated Parameters for Plate

WQ Orifice Area per Row =	3.590E-02	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.31	2.62					
Orifice Area (sq. inches)	5.17	5.17	5.17					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft^2
Vertical Orifice Centroid =	N/A	N/A	feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.93	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	4.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	4.00	N/A	feet
Overflow Grate Type =	Type C Grate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 2 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	3.93	N/A	feet
Overflow Weir Slope Length =	4.00	N/A	feet
Grate Open Area / 100-yr Orifice Area =	70.77	N/A	
Overflow Grate Open Area w/o Debris =	11.14	N/A	ft^2
Overflow Grate Open Area w/ Debris =	5.57	N/A	ft^2

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	2.60		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 2 Restrictor	Not Selected	
Outlet Orifice Area =	0.16	N/A	ft^2
Outlet Orifice Centroid =	0.13	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	0.78	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	5.18	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	1000.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	2.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth=	0.18	feet
Stage at Top of Freeboard =	7.36	feet
Basin Area at Top of Freeboard =	5.01	acres
Basin Volume at Top of Freeboard =	15.60	acre-ft

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

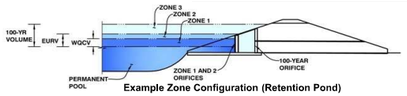
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	2.027	5.394	2.864	4.183	5.948	11.597	16.409	22.961	39.704
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	2.864	4.183	5.948	11.597	16.409	22.961	39.704
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.6	1.2	5.8	52.5	88.4	137.3	255.5
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.01	0.04	0.37	0.62	0.96	1.79
Peak Inflow Q (cfs) =	N/A	N/A	24.6	36.7	52.8	119.3	170.0	234.9	399.3
Peak Outflow Q (cfs) =	0.8	2.1	1.9	2.0	2.8	87.4	160.8	258.9	413.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.7	0.5	1.7	1.8	1.9	1.6
Structure Controlling Flow =	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	0.10	0.10	0.1	0.1	0.1	0.1	0.1	0.1
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	56	45	51	60	55	51	47	39
Time to Drain 99% of Inflow Volume (hours) =	**40**	60	47	54	64	62	60	58	54
Maximum Ponding Depth (ft) =	3.93	5.17	4.18	4.66	5.18	5.27	5.32	5.37	5.45
Area at Maximum Ponding Depth (acres) =	1.90	3.65	2.19	2.86	3.67	3.82	3.90	3.99	4.11
Maximum Volume Stored (acre-ft) =	2.034	5.416	2.524	3.759	5.453	5.790	5.983	6.180	6.464

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: DP 134 (Basins 134+138), 100-yr Only



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	No BMP	
Watershed Area =	136.65	acres
Watershed Length =	3,476	ft
Watershed Length to Centroid =	1,780	ft
Watershed Slope =	0.021	ft/ft
Watershed Imperviousness =	63.30%	percent
Percentage Hydrologic Soil Group A =	38.5%	percent
Percentage Hydrologic Soil Group B =	39.0%	percent
Percentage Hydrologic Soil Groups C/D =	22.5%	percent
Target WQCV Drain Time =	N/A	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Flood Control Only

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	1.693	acre-feet	1.693	acre-feet
Excess Urban Runoff Volume (EURV) =	9.653	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	5.494	acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	7.678	acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	10.140	acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	15.763	acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	20.653	acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	26.847	acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	43.260	acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	5.132	acre-feet		
Approximate 5-yr Detention Volume =	7.236	acre-feet		
Approximate 10-yr Detention Volume =	9.456	acre-feet		
Approximate 25-yr Detention Volume =	12.392	acre-feet		
Approximate 50-yr Detention Volume =	14.396	acre-feet		
Approximate 100-yr Detention Volume =	17.041	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (100-year) =	17.041	acre-feet
Select Zone 2 Storage Volume (Optional) =		acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	17.041	acre-feet
Initial Surcharge Volume (ISV) =	N/A	ft^3
Initial Surcharge Depth (ISD) =	N/A	ft
Total Available Detention Depth (H_{total}) =	15.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.010	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Initial Surcharge Area (A_{ISV}) =	0	ft^2
Surcharge Volume Length (L_{ISV}) =	0.0	ft
Surcharge Volume Width (W_{ISV}) =	0.0	ft
Depth of Basin Floor (H_{FLOOR}) =	0.00	ft
Length of Basin Floor (L_{FLOOR}) =	222.7	ft
Width of Basin Floor (W_{FLOOR}) =	111.4	ft
Area of Basin Floor (A_{FLOOR}) =	24,808	ft^2
Volume of Basin Floor (V_{FLOOR}) =	0	ft^3
Depth of Main Basin (H_{MAIN}) =	15.00	ft
Length of Main Basin (L_{MAIN}) =	342.7	ft
Width of Main Basin (W_{MAIN}) =	231.4	ft
Area of Main Basin (A_{MAIN}) =	79,302	ft^2
Volume of Main Basin (V_{MAIN}) =	742,323	ft^3
Calculated Total Basin Volume (V_{total}) =	**17.041**	acre-feet

Depth Increment = 0.25 ft

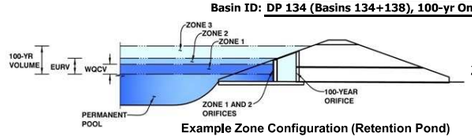
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Media Surface	0.00		222.7	111.4	24,808		0.570		
	0.25		224.7	113.4	25,480		0.585	6,286	0.144
	0.50		226.7	115.4	26,160		0.601	12,741	0.292
	0.75		228.7	117.4	26,849		0.616	19,367	0.445
	1.00		230.7	119.4	27,545		0.632	26,166	0.601
	1.25		232.7	121.4	28,249		0.649	33,140	0.761
	1.50		234.7	123.4	28,961		0.665	40,291	0.925
	1.75		236.7	125.4	29,682		0.681	47,621	1.093
	2.00		238.7	127.4	30,410		0.698	55,132	1.266
	2.25		240.7	129.4	31,146		0.715	62,827	1.442
	2.50		242.7	131.4	31,890		0.732	70,706	1.623
	2.75		244.7	133.4	32,643		0.749	78,773	1.808
	3.00		246.7	135.4	33,403		0.767	87,028	1.998
	3.25		248.7	137.4	34,171		0.784	95,475	2.192
	3.50		250.7	139.4	34,947		0.802	104,114	2.390
	3.75		252.7	141.4	35,731		0.820	112,949	2.593
	4.00		254.7	143.4	36,524		0.838	121,981	2.800
	4.25		256.7	145.4	37,324		0.857	131,211	3.012
	4.50		258.7	147.4	38,132		0.875	140,643	3.229
	4.75		260.7	149.4	38,948		0.894	150,278	3.450
	5.00		262.7	151.4	39,773		0.913	160,118	3.676
	5.25		264.7	153.4	40,605		0.932	170,165	3.906
	5.50		266.7	155.4	41,445		0.951	180,421	4.142
	5.75		268.7	157.4	42,293		0.971	190,888	4.382
	6.00		270.7	159.4	43,150		0.991	201,569	4.627
	6.25		272.7	161.4	44,014		1.010	212,464	4.878
	6.50		274.7	163.4	44,886		1.030	223,576	5.133
	6.75		276.7	165.4	45,766		1.051	234,908	5.393
	7.00		278.7	167.4	46,655		1.071	246,460	5.658
	7.25		280.7	169.4	47,551		1.092	258,236	5.928
	7.50		282.7	171.4	48,455		1.112	270,236	6.204
	7.75		284.7	173.4	49,367		1.133	282,464	6.484
	8.00		286.7	175.4	50,288		1.154	294,920	6.770
	8.25		288.7	177.4	51,216		1.176	307,608	7.062
	8.50		290.7	179.4	52,152		1.197	320,529	7.358
	8.75		292.7	181.4	53,096		1.219	333,685	7.660
	9.00		294.7	183.4	54,048		1.241	347,078	7.968
	9.25		296.7	185.4	55,009		1.263	360,710	8.281
	9.50		298.7	187.4	55,977		1.285	374,583	8.599
	9.75		300.7	189.4	56,953		1.307	388,699	8.923
Zone 1 (100-year)	10.00		302.7	191.4	57,937		1.330	403,060	9.253
	10.25		304.7	193.4	58,930		1.353	417,668	9.588
	10.50		306.7	195.4	59,930		1.376	432,526	9.929
	10.75		308.7	197.4	60,938		1.399	447,634	10.276
	11.00		310.7	199.4	61,954		1.422	462,995	10.629
	11.25		312.7	201.4	62,979		1.446	478,612	10.987
	11.50		314.7	203.4	64,011		1.469	494,485	11.352
	11.75		316.7	205.4	65,051		1.493	510,618	11.722
	12.00		318.7	207.4	66,099		1.517	527,012	12.099
	12.25		320.7	209.4	67,156		1.542	543,668	12.481
	12.50		322.7	211.4	68,220		1.566	560,590	12.869
	12.75		324.7	213.4	69,292		1.591	577,779	13.264
	13.00		326.7	215.4	70,372		1.616	595,237	13.665
	13.25		328.7	217.4	71,461		1.641	612,966	14.072
	13.50		330.7	219.4	72,557		1.666	630,968	14.485
	13.75		332.7	221.4	73,661		1.691	649,245	14.905
	14.00		334.7	223.4	74,773		1.717	667,799	15.331
	14.25		336.7	225.4	75,893		1.742	686,632	15.763
	14.50		338.7	227.4	77,022		1.768	705,746	16.202
	14.75		340.7	229.4	78,158		1.794	725,144	16.647
	15.00		342.7	231.4	79,302		1.821	744,826	17.099
	15.25		344.7	233.4	80,454		1.847	764,795	17.557
	15.50		346.7	235.4	81,615		1.874	785,054	18.022
	15.75		348.7	237.4	82,783		1.900	805,603	18.494
	16.00		350.7	239.4	83,959		1.927	826,446	18.973
	16.25		352.7	241.4	85,143		1.955	847,584	19.458
	16.50		354.7	243.4	86,336		1.982	869,018	19.950
	16.75		356.7	245.4	87,536		2.010	890,752	20.449
	17.00		358.7	247.4	88,744		2.037	912,787	20.955
	17.25		360.7	249.4	89,960		2.065	935,125	21.468
	17.50		362.7	251.4	91,185		2.093	957,768	21.987
	17.75		364.7	253.4	92,417		2.122	980,718	22.514
	18.00		366.7	255.4	93,657		2.150	1,003,977	23.048
	18.25		368.7	257.4	94,905		2.179	1,027,547	23.589
	18.50		370.7	259.4	96,162		2.208	1,051,430	24.138
	18.75		372.7	261.4	97,426		2.237	1,075,628	24.693
	19.00		374.7	263.4	98,698		2.266	1,100,144	25.256
	19.25		376.7	265.4	99,978		2.295	1,124,978	25.826
	19.50		378.7	267.4	101,266		2.325	1,150,134	26.403
	19.75		380.7	269.4	102,563		2.355	1,175,612	26.988
	20.00		382.7	271.4	103,867		2.384	1,201,416	27.581
	20.25		384.7	273.4	105,179		2.415	1,227,546	28.181
	20.50		386.7	275.4	106,499		2.445	1,254,006	28.788
	20.75		388.7	277.4	107,828		2.475	1,280,797	29.403
	21.00		390.7	279.4	109,164		2.506	1,307,920	30.026
	21.25		392.7	281.4	110,508		2.537	1,335,379	30.656
	21.50		394.7	283.4	111,860		2.568	1,363,175	31.294
	21.75		396.7	285.4	113,221		2.599	1,391,310	31.940
	22.00		398.7	287.4	114,589		2.631	1,419,786	32.594
	22.25		400.7	289.4	115,965		2.662	1,448,605	33.255
	22.50		402.7	291.4	117,349		2.694	1,477,769	33.925
	22.75		404.7	293.4	118,742		2.726	1,507,281	34.602
	23.00		406.7	295.4	120,142		2.758	1,537,141	35.288
	23.25		408.7	297.4	121,550		2.790	1,567,352	35.981
	23.50		410.7	299.4	122,966		2.823	1,597,916	36.683
	23.75		412.7	301.4	124,391		2.856	1,628,836	37.393
	24.00		414.7	303.4	125,823		2.888	1,660,112	38.111
	24.25		416.7	305.4	127,263		2.922	1,691,748	38.837
	24.50		418.7	307.4	128,711		2.955	1,723,745	39.572

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: DP 134 (Basins 134+138), 100-yr Only



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (100-year)	14.97	17.041	Rectangular Orifice
Zone 2			
Zone 3			
Total (all zones)		17.041	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	N/A	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	N/A	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (optional)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 1 Rectangular	Not Selected		Calculated Parameters for Vertical Orifice	Zone 1 Rectangular	Not Selected	
Invert of Vertical Orifice =	0.00		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	20.00		ft^2
Depth at top of Zone using Vertical Orifice =	6.50		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	2.00		feet
Vertical Orifice Height =	48.00		inches				
Vertical Orifice Width =	60.00		inches				

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Not Selected	Not Selected		Calculated Parameters for Overflow Weir	Not Selected	Not Selected	
Overflow Weir Front Edge Height, Ho =			ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =			feet
Overflow Weir Front Edge Length =			feet	Overflow Weir Slope Length =			feet
Overflow Weir Grate Slope =			H:V	Grate Open Area / 100-yr Orifice Area =			
Horiz. Length of Weir Sides =			feet	Overflow Grate Open Area w/o Debris =			ft^2
Overflow Grate Type =				Overflow Grate Open Area w/ Debris =			ft^2
Debris Clogging % =			%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Not Selected	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =			ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =			ft^2
Circular Orifice Diameter =			inches	Outlet Orifice Centroid =			feet
				Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=		ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=		feet
Spillway Crest Length =		feet	Stage at Top of Freeboard =		feet
Spillway End Slopes =		H:V	Basin Area at Top of Freeboard =		acres
Freeboard above Max Water Surface =		feet	Basin Volume at Top of Freeboard =		acre-ft

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

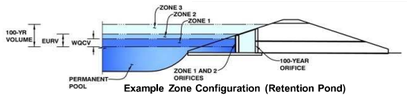
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	1.693	9.653	5.494	7.678	10.140	15.763	20.653	26.847	43.260
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	5.494	7.678	10.140	15.763	20.653	26.847	43.260
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.8	1.7	9.2	71.1	117.8	180.1	329.7
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.01	0.07	0.52	0.86	1.32	2.41
Peak Inflow Q (cfs) =	N/A	N/A	85.2	119.7	157.4	261.6	346.5	362.2	715.3
Peak Outflow Q (cfs) =	52.0	265.6	54.6	80.2	109.6	178.7	217.5	209.4	341.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	48.0	11.9	2.5	1.8	1.2	1.0
Structure Controlling Flow =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	ertical Orifice
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	6	2	4	3	3	3	3	3	2
Time to Drain 99% of Inflow Volume (hours) =	**14**	4	7	6	5	4	4	7	3
Maximum Ponding Depth (ft) =	2.60	10.30	2.41	2.99	3.55	5.44	7.10	6.73	14.55
Area at Maximum Ponding Depth (acres) =	0.74	1.36	0.73	0.77	0.81	0.95	1.08	1.05	1.77
Maximum Volume Stored (acre-ft) =	1.697	9.656	1.558	1.983	2.422	4.085	5.765	5.361	16.273

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: DP 134 (Basins 134+138), EURV



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	136.65	acres
Watershed Length =	3,476	ft
Watershed Length to Centroid =	1,780	ft
Watershed Slope =	0.021	ft/ft
Watershed Imperviousness =	63.30%	percent
Percentage Hydrologic Soil Group A =	38.5%	percent
Percentage Hydrologic Soil Group B =	39.0%	percent
Percentage Hydrologic Soil Groups C/D =	22.5%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	1.693 acre-feet	1.693	acre-feet
Excess Urban Runoff Volume (EURV) =	9.653 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	5.494 acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	7.678 acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	10.140 acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	15.763 acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	20.653 acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	26.847 acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	43.260 acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	5.132 acre-feet		
Approximate 5-yr Detention Volume =	7.236 acre-feet		
Approximate 10-yr Detention Volume =	9.456 acre-feet		
Approximate 25-yr Detention Volume =	12.392 acre-feet		
Approximate 50-yr Detention Volume =	14.396 acre-feet		
Approximate 100-yr Detention Volume =	17.041 acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.693	acre-feet
Zone 2 Volume (EURV - Zone 1) =	7.960	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	7.388	acre-feet
Total Detention Basin Volume =	17.041	acre-feet
Initial Surcharge Volume (ISV) =	221	ft^3
Initial Surcharge Depth (ISD) =	0.50	ft
Total Available Detention Depth (H_{total}) =	6.50	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.006	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Initial Surcharge Area (A_{ISV}) =	442	ft^2
Surcharge Volume Length (L_{ISV}) =	21.0	ft
Surcharge Volume Width (W_{ISV}) =	21.0	ft
Depth of Basin Floor (H_{FLOOR}) =	4.07	ft
Length of Basin Floor (L_{FLOOR}) =	715.6	ft
Width of Basin Floor (W_{FLOOR}) =	360.2	ft
Area of Basin Floor (A_{FLOOR}) =	257,778	ft^2
Volume of Basin Floor (V_{FLOOR}) =	364,808	ft^3
Depth of Main Basin (H_{MAIN}) =	1.43	ft
Length of Main Basin (L_{MAIN}) =	727.1	ft
Width of Main Basin (W_{MAIN}) =	371.6	ft
Area of Main Basin (A_{MAIN}) =	270,217	ft^2
Volume of Main Basin (V_{MAIN}) =	377,481	ft^3
Calculated Total Basin Volume (V_{total}) =	**17.051**	acre-feet

Depth Increment = 0.25 ft

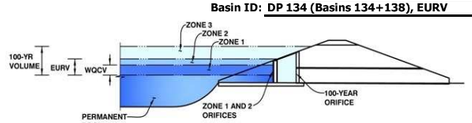
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		21.0	21.0	442		0.010		
ISV	0.50		21.0	21.0	442		0.010	221	0.005
	0.75		21.0	21.0	442		0.010	332	0.008
	1.00		21.0	21.0	442		0.010	442	0.010
	1.25		63.7	41.9	2,667		0.061	794	0.018
	1.50		106.4	62.7	6,670		0.153	1,924	0.044
	1.75		149.0	83.5	12,450		0.286	4,277	0.098
	2.00		191.7	104.4	20,008		0.459	8,297	0.190
	2.25		234.4	125.2	29,343		0.674	14,429	0.331
	2.50		277.0	146.0	40,457		0.929	23,117	0.531
	2.75		319.7	166.9	53,348		1.225	34,806	0.799
	3.00		362.4	187.7	68,017		1.561	49,939	1.146
	3.25		405.0	208.5	84,464		1.939	68,962	1.583
Zone 1 (WQCV)	3.31		415.3	213.5	88,676		2.036	74,156	1.702
	3.50		447.7	229.4	102,689		2.357	92,320	2.119
	3.75		490.4	250.2	122,691		2.817	120,455	2.765
	4.00		533.0	271.0	144,471		3.317	153,813	3.531
	4.25		575.7	291.9	168,029		3.857	192,839	4.427
	4.50		618.4	312.7	193,365		4.439	237,976	5.463
	4.75		661.0	333.5	220,479		5.061	289,669	6.650
	5.00		703.7	354.4	249,370		5.725	348,363	7.997
Floor	5.07		715.6	360.2	257,778		5.918	366,113	8.405
	5.25		717.1	361.6	259,329		5.953	412,652	9.473
Zone 2 (EURV)	5.29		717.4	362.0	259,675		5.961	423,033	9.711
	5.50		719.1	363.6	261,491		6.003	477,755	10.968
	5.75		721.1	365.6	263,660		6.053	543,398	12.475
	6.00		723.1	367.6	265,838		6.103	609,586	13.994
	6.25		725.1	369.6	268,023		6.153	676,318	15.526
Zone 3 (100-year)	6.50		727.1	371.6	270,217		6.203	743,598	17.071
	6.75		729.1	373.6	272,418		6.254	811,427	18.628
	7.00		731.1	375.6	274,628		6.305	879,808	20.198
	7.25		733.1	377.6	276,845		6.355	948,741	21.780
	7.50		735.1	379.6	279,070		6.407	1,018,231	23.375
	7.75		737.1	381.6	281,304		6.458	1,088,277	24.983
	8.00		739.1	383.6	283,545		6.509	1,158,883	26.604
	8.25		741.1	385.6	285,795		6.561	1,230,051	28.238
	8.50		743.1	387.6	288,052		6.613	1,301,781	29.885
	8.75		745.1	389.6	290,318		6.665	1,374,077	31.544
	9.00		747.1	391.6	292,591		6.717	1,446,941	33.217
	9.25		749.1	393.6	294,873		6.769	1,520,374	34.903
	9.50		751.1	395.6	297,162		6.822	1,594,378	36.602
	9.75		753.1	397.6	299,460		6.875	1,668,955	38.314
	10.00		755.1	399.6	301,765		6.928	1,744,108	40.039
	10.25		757.1	401.6	304,079		6.981	1,819,839	41.778
	10.50		759.1	403.6	306,400		7.034	1,896,148	43.530
	10.75		761.1	405.6	308,729		7.087	1,973,039	45.295
	11.00		763.1	407.6	311,067		7.141	2,050,514	47.073
	11.25		765.1	409.6	313,412		7.195	2,128,573	48.865
	11.50		767.1	411.6	315,766		7.249	2,207,221	50.671
	11.75		769.1	413.6	318,127		7.303	2,286,457	52.490
	12.00		771.1	415.6	320,497		7.358	2,366,285	54.322
	12.25		773.1	417.6	322,874		7.412	2,446,706	56.169
	12.50		775.1	419.6	325,260		7.467	2,527,723	58.029
	12.75		777.1	421.6	327,653		7.522	2,609,337	59.902
	13.00		779.1	423.6	330,055		7.577	2,691,550	61.789
	13.25		781.1	425.6	332,464		7.632	2,774,365	63.691
	13.50		783.1	427.6	334,882		7.688	2,857,783	65.606
	13.75		785.1	429.6	337,307		7.744	2,941,806	67.535
	14.00		787.1	431.6	339,740		7.799	3,026,437	69.477
	14.25		789.1	433.6	342,182		7.855	3,111,677	71.434
	14.50		791.1	435.6	344,631		7.912	3,197,528	73.405
	14.75		793.1	437.6	347,089		7.968	3,283,993	75.390
	15.00		795.1	439.6	349,554		8.025	3,371,073	77.389
	15.25		797.1	441.6	352,028		8.081	3,458,771	79.402
	15.50		799.1	443.6	354,509		8.138	3,547,088	81.430
	15.75		801.1	445.6	356,999		8.196	3,636,026	83.472
	16.00		803.1	447.6	359,496		8.253	3,725,588	85.528
	16.25		805.1	449.6	362,002		8.310	3,815,775	87.598
	16.50		807.1	451.6	364,515		8.368	3,906,589	89.683
	16.75		809.1	453.6	367,037		8.426	3,998,033	91.782
	17.00		811.1	455.6	369,566		8.484	4,090,108	93.896
	17.25		813.1	457.6	372,103		8.542	4,182,817	96.024
	17.50		815.1	459.6	374,649		8.601	4,276,161	98.167
	17.75		817.1	461.6	377,202		8.659	4,370,142	100.325
	18.00		819.1	463.6	379,764		8.718	4,464,763	102.497
	18.25		821.1	465.6	382,333		8.777	4,560,025	104.684
	18.50		823.1	467.6	384,911		8.836	4,655,930	106.885
	18.75		825.1	469.6	387,496		8.896	4,752,481	109.102
	19.00		827.1	471.6	390,090		8.955	4,849,679	111.333
	19.25		829.1	473.6	392,691		9.015	4,947,526	113.580
	19.50		831.1	475.6	395,301		9.075	5,046,025	115.841
	19.75		833.1	477.6	397,918		9.135	5,145,177	118.117
	20.00		835.1	479.6	400,544		9.195	5,244,985	120.408
	20.25		837.1	481.6	403,177		9.256	5,345,450	122.715
	20.50		839.1	483.6	405,818		9.316	5,446,574	125.036
	20.75		841.1	485.6	408,468		9.377	5,548,359	127.373
	21.00		843.1	487.6	411,125		9.438	5,650,808	129.725
	21.25		845.1	489.6	413,791		9.499	5,753,923	132.092
	21.50		847.1	491.6	416,464		9.561	5,857,704	134.474
	21.75		849.1	493.6	419,146		9.622	5,962,156	136.872
	22.00		851.1	495.6	421,835		9.684	6,067,278	139.286
	22.25		853.1	497.6	424,533		9.746	6,173,074	141.714
	22.50		855.1	499.6	427,238		9.808	6,279,545	144.159
	22.75		857.1	501.6	429,952		9.870	6,386,694	146.618
	23.00		859.1	503.6	432,673		9.933	6,494,521	149.094
	23.25		861.1	505.6	435,403		9.995	6,603,031	151.585
	23.50		863.1	507.6	438,140		10.058	6,712,223	154.091
	23.75		865.1	509.6	440,885		10.121	6,822,101	156.614
	24.00		867.1	511.6	443,639		10.185	6,932,667	159.152

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: DP 134 (Basins 134+138), EURV



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.31	1.693	Orifice Plate
Zone 2 (EURV)	5.29	7.960	Weir&Pipe (Restrict)
Zone 3 (100-year)	6.50	7.388	Not Utilized
Total (all zones)		17.041	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	3.160E-02	ft^2
Depth at top of Zone using Orifice Plate =	3.31	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	13.20	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	4.55	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.10	2.21					
Orifice Area (sq. inches)	4.55	4.55	4.55					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected		Calculated Parameters for Vertical Orifice	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected		Calculated Parameters for Overflow Weir	Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.31	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.31	N/A	feet
Overflow Weir Front Edge Length =	4.00	N/A	feet	Overflow Weir Slope Length =	4.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	29.87	N/A	
Horiz. Length of Weir Sides =	4.00	N/A	feet	Overflow Grate Open Area w/o Debris =	11.14	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	5.57	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.37	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.23	N/A	feet
Restrictor Plate Height Above Pipe Invert =	4.75		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.08	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=	5.30	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.28	feet
Spillway Crest Length =	1000.00	feet	Stage at Top of Freeboard =	6.58	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	6.22	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	17.57	acre-ft

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

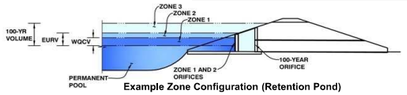
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	1.693	9.653	5.494	7.678	10.140	15.763	20.653	26.847	43.260
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	5.494	7.678	10.140	15.763	20.653	26.847	43.260
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.8	1.7	9.2	71.1	117.8	180.1	329.7
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.01	0.07	0.52	0.86	1.32	2.41
Peak Inflow Q (cfs) =	N/A	N/A	85.2	119.7	157.4	261.6	346.5	448.4	715.3
Peak Outflow Q (cfs) =	0.7	4.9	4.6	4.8	4.9	114.6	232.9	380.0	664.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	2.9	0.5	1.6	2.0	2.1	2.0
Structure Controlling Flow =	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	0.36	0.34	0.4	0.4	0.4	0.4	0.4	0.4
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	54	48	51	55	52	48	44	34
Time to Drain 99% of Inflow Volume (hours) =	**40**	60	52	57	62	61	60	58	53
Maximum Ponding Depth (ft) =	3.31	5.29	4.34	4.80	5.22	5.41	5.48	5.55	5.66
Area at Maximum Ponding Depth (acres) =	2.04	5.96	4.06	5.16	5.95	5.99	6.00	6.01	6.03
Maximum Volume Stored (acre-ft) =	1.702	9.711	4.783	6.854	9.295	10.428	10.788	11.208	11.931

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: DP 146 (Basins 146), EURV



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	36.92	acres
Watershed Length =	4,388	ft
Watershed Length to Centroid =	2,447	ft
Watershed Slope =	0.033	ft/ft
Watershed Imperviousness =	28.65%	percent
Percentage Hydrologic Soil Group A =	16.6%	percent
Percentage Hydrologic Soil Group B =	35.9%	percent
Percentage Hydrologic Soil Groups C/D =	47.5%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

Note: L / W Ratio > 8
L / W Ratio = 11.97

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.292 acre-feet	0.292	acre-feet
Excess Urban Runoff Volume (EURV) =	1.016 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	0.566 acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	0.871 acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	1.475 acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	3.036 acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	4.323 acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	6.026 acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	10.408 acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	0.553 acre-feet		
Approximate 5-yr Detention Volume =	0.897 acre-feet		
Approximate 10-yr Detention Volume =	1.227 acre-feet		
Approximate 25-yr Detention Volume =	1.663 acre-feet		
Approximate 50-yr Detention Volume =	1.935 acre-feet		
Approximate 100-yr Detention Volume =	2.546 acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.292	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.724	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.530	acre-feet
Total Detention Basin Volume =	2.546	acre-feet
Initial Surcharge Volume (ISV) =	38	ft^3
Initial Surcharge Depth (ISD) =	0.50	ft
Total Available Detention Depth (H_{total}) =	6.50	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.010	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Initial Surcharge Area (A_{ISV}) =	76	ft^2
Surcharge Volume Length (L_{ISV}) =	8.7	ft
Surcharge Volume Width (W_{ISV}) =	8.7	ft
Depth of Basin Floor (H_{FLOOR}) =	1.93	ft
Length of Basin Floor (L_{FLOOR}) =	209.5	ft
Width of Basin Floor (W_{FLOOR}) =	105.2	ft
Area of Basin Floor (A_{FLOOR}) =	22,042	ft^2
Volume of Basin Floor (V_{FLOOR}) =	15,064	ft^3
Depth of Main Basin (H_{MAIN}) =	3.57	ft
Length of Main Basin (L_{MAIN}) =	238.0	ft
Width of Main Basin (W_{MAIN}) =	133.8	ft
Area of Main Basin (A_{MAIN}) =	31,846	ft^2
Volume of Main Basin (V_{MAIN}) =	95,655	ft^3
Calculated Total Basin Volume (V_{total}) =	**2.544**	acre-feet

Depth Increment = 0.25 ft

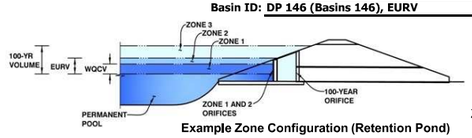
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		8.7	8.7	76		0.002		
ISV	0.50		8.7	8.7	76		0.002	38	0.001
	0.75		8.7	8.7	76		0.002	57	0.001
	1.00		8.7	8.7	76		0.002	76	0.002
	1.25		34.7	21.2	738		0.017	165	0.004
	1.50		60.7	33.7	2,049		0.047	499	0.011
	1.75		86.7	46.2	4,010		0.092	1,243	0.029
	2.00		112.7	58.7	6,622		0.152	2,559	0.059
	2.25		138.7	71.2	9,883		0.227	4,608	0.106
	2.50		164.7	83.7	13,794		0.317	7,554	0.173
	2.75		190.7	96.2	18,356		0.421	11,560	0.265
Zone 1 (WQCV)	2.82		198.0	99.7	19,749		0.453	12,893	0.296
Floor	2.93		209.5	105.2	22,042		0.506	15,190	0.349
	3.00		210.0	105.8	22,219		0.510	16,739	0.384
	3.25		212.0	107.8	22,854		0.525	22,373	0.514
	3.50		214.0	109.8	23,498		0.539	28,167	0.647
	3.75		216.0	111.8	24,150		0.554	34,123	0.783
	4.00		218.0	113.8	24,809		0.570	40,243	0.924
Zone 2 (EURV)	4.17		219.4	115.2	25,262		0.580	44,499	1.022
	4.25		220.0	115.8	25,477		0.585	46,528	1.068
	4.50		222.0	117.8	26,153		0.600	52,982	1.216
	4.75		224.0	119.8	26,836		0.616	59,605	1.368
	5.00		226.0	121.8	27,528		0.632	66,401	1.524
	5.25		228.0	123.8	28,227		0.648	73,370	1.684
	5.50		230.0	125.8	28,935		0.664	80,515	1.848
	5.75		232.0	127.8	29,651		0.681	87,838	2.016
	6.00		234.0	129.8	30,374		0.697	95,341	2.189
	6.25		236.0	131.8	31,106		0.714	103,026	2.365
Zone 3 (100-year)	6.50		238.0	133.8	31,846		0.731	110,895	2.546
	6.75		240.0	135.8	32,593		0.748	118,949	2.731
	7.00		242.0	137.8	33,349		0.766	127,192	2.920
	7.25		244.0	139.8	34,112		0.783	135,625	3.114
	7.50		246.0	141.8	34,884		0.801	144,249	3.312
	7.75		248.0	143.8	35,664		0.819	153,067	3.514
	8.00		250.0	145.8	36,451		0.837	162,081	3.721
	8.25		252.0	147.8	37,247		0.855	171,294	3.932
	8.50		254.0	149.8	38,051		0.874	180,706	4.148
	8.75		256.0	151.8	38,862		0.892	190,320	4.369
	9.00		258.0	153.8	39,682		0.911	200,137	4.595
	9.25		260.0	155.8	40,509		0.930	210,161	4.825
	9.50		262.0	157.8	41,345		0.949	220,393	5.060
	9.75		264.0	159.8	42,189		0.969	230,834	5.299
	10.00		266.0	161.8	43,040		0.988	241,488	5.544
	10.25		268.0	163.8	43,900		1.008	252,355	5.793
	10.50		270.0	165.8	44,768		1.028	263,438	6.048
	10.75		272.0	167.8	45,643		1.048	274,740	6.307
	11.00		274.0	169.8	46,527		1.068	286,261	6.572
	11.25		276.0	171.8	47,418		1.089	298,004	6.841
	11.50		278.0	173.8	48,318		1.109	309,971	7.116
	11.75		280.0	175.8	49,226		1.130	322,163	7.396
	12.00		282.0	177.8	50,141		1.151	334,584	7.681
	12.25		284.0	179.8	51,065		1.172	347,235	7.971
	12.50		286.0	181.8	51,997		1.194	360,117	8.267
	12.75		288.0	183.8	52,936		1.215	373,234	8.568
	13.00		290.0	185.8	53,884		1.237	386,586	8.875
	13.25		292.0	187.8	54,839		1.259	400,176	9.187
	13.50		294.0	189.8	55,803		1.281	414,006	9.504
	13.75		296.0	191.8	56,775		1.303	428,078	9.827
	14.00		298.0	193.8	57,754		1.326	442,394	10.156
	14.25		300.0	195.8	58,742		1.349	456,956	10.490
	14.50		302.0	197.8	59,738		1.371	471,766	10.830
	14.75		304.0	199.8	60,741		1.394	486,826	11.176
	15.00		306.0	201.8	61,753		1.418	502,137	11.527
	15.25		308.0	203.8	62,772		1.441	517,703	11.885
	15.50		310.0	205.8	63,800		1.465	533,524	12.248
	15.75		312.0	207.8	64,836		1.488	549,603	12.617
	16.00		314.0	209.8	65,879		1.512	565,943	12.992
	16.25		316.0	211.8	66,931		1.537	582,544	13.373
	16.50		318.0	213.8	67,991		1.561	599,409	13.761
	16.75		320.0	215.8	69,058		1.585	616,540	14.154
	17.00		322.0	217.8	70,134		1.610	633,938	14.553
	17.25		324.0	219.8	71,217		1.635	651,607	14.959
	17.50		326.0	221.8	72,309		1.660	669,548	15.371
	17.75		328.0	223.8	73,409		1.685	687,762	15.789
	18.00		330.0	225.8	74,516		1.711	706,253	16.213
	18.25		332.0	227.8	75,632		1.736	725,021	16.644
	18.50		334.0	229.8	76,756		1.762	744,069	17.081
	18.75		336.0	231.8	77,887		1.788	763,400	17.525
	19.00		338.0	233.8	79,027		1.814	783,014	17.976
	19.25		340.0	235.8	80,174		1.841	802,914	18.432
	19.50		342.0	237.8	81,330		1.867	823,101	18.896
	19.75		344.0	239.8	82,494		1.894	843,579	19.366
	20.00		346.0	241.8	83,665		1.921	864,349	19.843
	20.25		348.0	243.8	84,845		1.948	885,413	20.326
	20.50		350.0	245.8	86,033		1.975	906,772	20.817
	20.75		352.0	247.8	87,228		2.002	928,430	21.314
	21.00		354.0	249.8	88,432		2.030	950,387	21.818
	21.25		356.0	251.8	89,643		2.058	972,646	22.329
	21.50		358.0	253.8	90,863		2.086	995,209	22.847
	21.75		360.0	255.8	92,091		2.114	1,018,078	23.372
	22.00		362.0	257.8	93,326		2.142	1,041,255	23.904
	22.25		364.0	259.8	94,570		2.171	1,064,742	24.443
	22.50		366.0	261.8	95,822		2.200	1,088,541	24.989
	22.75		368.0	263.8	97,081		2.229	1,112,653	25.543
	23.00		370.0	265.8	98,349		2.258	1,137,082	26.104
	23.25		372.0	267.8	99,624		2.287	1,161,828	26.672
	23.50		374.0	269.8	100,908		2.317	1,186,895	27.247
	23.75		376.0	271.8	102,200		2.346	1,212,283	27.830
	24.00		378.0	273.8	103,499		2.376	1,237,995	28.420

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: DP 146 (Basins 146), EURV



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.82	0.292	Orifice Plate
Zone 2 (EURV)	4.17	0.724	Weir&Pipe (Restrict)
Zone 3 (100-year)	6.50	1.530	Not Utilized
Total (all zones)		2.546	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	N/A	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	2.82	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	11.30	inches
Orifice Plate: Orifice Area per Row =	0.82	sq. inches (diameter = 1 inch)

Calculated Parameters for Plate

WQ Orifice Area per Row =	5.694E-03	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.94	1.88					
Orifice Area (sq. inches)	0.82	0.82	0.82					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft^2
Vertical Orifice Centroid =	N/A	N/A	feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	2.82	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	4.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	4.00	N/A	feet
Overflow Grate Type =	Type C Grate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 2 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	2.82	N/A	feet
Overflow Weir Slope Length =	4.00	N/A	feet
Grate Open Area / 100-yr Orifice Area =	326.29	N/A	
Overflow Grate Open Area w/o Debris =	11.14	N/A	ft^2
Overflow Grate Open Area w/ Debris =	5.57	N/A	ft^2

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	0.92		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 2 Restrictor	Not Selected	
Outlet Orifice Area =	0.03	N/A	ft^2
Outlet Orifice Centroid =	0.05	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	0.46	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	4.18	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	1000.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth=	0.05	feet
Stage at Top of Freeboard =	5.23	feet
Basin Area at Top of Freeboard =	0.65	acres
Basin Volume at Top of Freeboard =	1.66	acre-ft

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

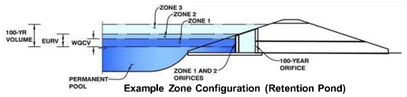
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	0.292	1.016	0.566	0.871	1.475	3.036	4.323	6.026	10.408
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.566	0.871	1.475	3.036	4.323	6.026	10.408
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.2	0.3	3.2	13.1	20.3	30.4	55.0
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.01	0.09	0.36	0.55	0.82	1.49
Peak Inflow Q (cfs) =	N/A	N/A	3.3	5.1	9.0	20.9	29.6	41.3	70.6
Peak Outflow Q (cfs) =	0.1	0.4	0.4	0.4	4.9	26.4	32.0	61.0	73.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.4	1.5	2.0	1.6	2.0	1.3
Structure Controlling Flow =	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	0.02	0.02	0.0	0.0	0.0	0.0	0.0	0.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	57	48	55	60	52	47	41	27
Time to Drain 99% of Inflow Volume (hours) =	**40**	61	51	59	65	62	60	57	51
Maximum Ponding Depth (ft) =	2.82	4.17	3.15	3.68	4.19	4.22	4.23	4.25	4.26
Area at Maximum Ponding Depth (acres) =	0.45	0.58	0.52	0.55	0.58	0.58	0.58	0.58	0.59
Maximum Volume Stored (acre-ft) =	0.296	1.022	0.461	0.745	1.033	1.051	1.051	1.068	1.074

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: DP 150 (Basins 150+154), 100-yr Flood Control Only



Example Zone Configuration (Retention Pond)

Depth Increment = 0.25 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft²)	Optional Override Area (ft²)	Area (acre)	Volume (ft³)	Volume (ac-ft)
Media Surface	0.00		175.3	87.6	15,359		0.353		
	0.25		177.3	89.6	15,888		0.365	3,906	0.090
	0.50		179.3	91.6	16,426		0.377	7,945	0.182
	0.75		181.3	93.6	16,972		0.390	12,120	0.278
	1.00		183.3	95.6	17,526		0.402	16,432	0.377
	1.25		185.3	97.6	18,088		0.415	20,883	0.479
	1.50		187.3	99.6	18,657		0.428	25,476	0.585
	1.75		189.3	101.6	19,235		0.442	30,212	0.694
	2.00		191.3	103.6	19,821		0.455	35,094	0.806
	2.25		193.3	105.6	20,415		0.469	40,124	0.921
	2.50		195.3	107.6	21,017		0.482	45,302	1.040
	2.75		197.3	109.6	21,626		0.496	50,633	1.162
	3.00		199.3	111.6	22,244		0.511	56,116	1.288
	3.25		201.3	113.6	22,870		0.525	61,755	1.418
	3.50		203.3	115.6	23,504		0.540	67,552	1.551
	3.75		205.3	117.6	24,146		0.554	73,508	1.688
	4.00		207.3	119.6	24,795		0.569	79,625	1.828
	4.25		209.3	121.6	25,453		0.584	85,906	1.972
	4.50		211.3	123.6	26,119		0.600	92,353	2.120
	4.75		213.3	125.6	26,793		0.615	98,966	2.272
	5.00		215.3	127.6	27,475		0.631	105,750	2.428
	5.25		217.3	129.6	28,164		0.647	112,704	2.587
	5.50		219.3	131.6	28,862		0.663	119,832	2.751
	5.75		221.3	133.6	29,568		0.679	127,136	2.919
	6.00		223.3	135.6	30,282		0.695	134,617	3.090
	6.25		225.3	137.6	31,003		0.712	142,278	3.266
	6.50		227.3	139.6	31,733		0.728	150,119	3.446
	6.75		229.3	141.6	32,471		0.745	158,145	3.631
	7.00		231.3	143.6	33,217		0.763	166,356	3.819
	7.25		233.3	145.6	33,971		0.780	174,754	4.012
	7.50		235.3	147.6	34,732		0.797	183,342	4.209
	7.75		237.3	149.6	35,502		0.815	192,121	4.410
	8.00		239.3	151.6	36,280		0.833	201,093	4.616
	8.25		241.3	153.6	37,066		0.851	210,261	4.827
	8.50		243.3	155.6	37,860		0.869	219,627	5.042
	8.75		245.3	157.6	38,661		0.888	229,192	5.262
	9.00		247.3	159.6	39,471		0.906	238,958	5.486
	9.25		249.3	161.6	40,289		0.925	248,928	5.715
	9.50		251.3	163.6	41,115		0.944	259,103	5.948
	9.75		253.3	165.6	41,949		0.963	269,486	6.187
	10.00		255.3	167.6	42,790		0.982	280,078	6.430
	10.25		257.3	169.6	43,640		1.002	290,882	6.678
	10.50		259.3	171.6	44,498		1.022	301,899	6.931
	10.75		261.3	173.6	45,364		1.041	313,132	7.189
	11.00		263.3	175.6	46,237		1.061	324,582	7.451
	11.25		265.3	177.6	47,119		1.082	336,251	7.719
	11.50		267.3	179.6	48,009		1.102	348,142	7.992
	11.75		269.3	181.6	48,907		1.123	360,256	8.270
	12.00		271.3	183.6	49,813		1.144	372,596	8.554
	12.25		273.3	185.6	50,726		1.165	385,163	8.842
	12.50		275.3	187.6	51,648		1.186	397,960	9.136
	12.75		277.3	189.6	52,578		1.207	410,988	9.435
	13.00		279.3	191.6	53,516		1.229	424,250	9.739
	13.25		281.3	193.6	54,462		1.250	437,747	10.049
	13.50		283.3	195.6	55,415		1.272	451,481	10.365
	13.75		285.3	197.6	56,377		1.294	465,455	10.685
	14.00		287.3	199.6	57,347		1.317	479,670	11.012
	14.25		289.3	201.6	58,325		1.339	494,129	11.344
	14.50		291.3	203.6	59,311		1.362	508,833	11.681
	14.75		293.3	205.6	60,304		1.384	523,785	12.024
Zone 1 (100-year)	14.97		295.0	207.4	61,186		1.405	537,149	12.331
	15.00		295.3	207.6	61,306		1.407	538,986	12.373
	15.25		297.3	209.6	62,316		1.431	554,439	12.728
	15.50		299.3	211.6	63,334		1.454	570,145	13.089
	15.75		301.3	213.6	64,360		1.477	586,106	13.455
	16.00		303.3	215.6	65,393		1.501	602,325	13.827
	16.25		305.3	217.6	66,435		1.525	618,804	14.206
	16.50		307.3	219.6	67,485		1.549	635,544	14.590
	16.75		309.3	221.6	68,543		1.574	652,547	14.980
	17.00		311.3	223.6	69,608		1.598	669,816	15.377
	17.25		313.3	225.6	70,682		1.623	687,352	15.779
	17.50		315.3	227.6	71,764		1.647	705,157	16.188
	17.75		317.3	229.6	72,854		1.672	723,234	16.603
	18.00		319.3	231.6	73,952		1.698	741,585	17.024
	18.25		321.3	233.6	75,057		1.723	760,211	17.452
	18.50		323.3	235.6	76,171		1.749	779,114	17.886
	18.75		325.3	237.6	77,293		1.774	798,297	18.326
	19.00		327.3	239.6	78,423		1.800	817,761	18.773
	19.25		329.3	241.6	79,561		1.826	837,509	19.227
	19.50		331.3	243.6	80,706		1.853	857,542	19.686
	19.75		333.3	245.6	81,860		1.879	877,863	20.153
	20.00		335.3	247.6	83,022		1.906	898,473	20.626
	20.25		337.3	249.6	84,192		1.933	919,375	21.106
	20.50		339.3	251.6	85,370		1.960	940,570	21.593
	20.75		341.3	253.6	86,555		1.987	962,060	22.086
	21.00		343.3	255.6	87,749		2.014	983,848	22.586
	21.25		345.3	257.6	88,951		2.042	1,005,935	23.093
	21.50		347.3	259.6	90,161		2.070	1,028,324	23.607
	21.75		349.3	261.6	91,379		2.098	1,051,016	24.128
	22.00		351.3	263.6	92,604		2.126	1,074,014	24.656
	22.25		353.3	265.6	93,838		2.154	1,097,319	25.191
	22.50		355.3	267.6	95,080		2.183	1,120,934	25.733
	22.75		357.3	269.6	96,330		2.211	1,144,860	26.282
	23.00		359.3	271.6	97,587		2.240	1,169,099	26.839
	23.25		361.3	273.6	98,853		2.269	1,193,654	27.403
	23.50		363.3	275.6	100,127		2.299	1,218,527	27.974
	23.75		365.3	277.6	101,409		2.328	1,243,718	28.552
	24.00		367.3	279.6	102,699		2.358	1,269,232	29.138
	24.25		369.3	281.6	103,996		2.387	1,295,068	29.731

Watershed Information — **Flood Control Only**

Selected BMP Type =	No BMP	
Watershed Area =	148.82	acres
Watershed Length =	3,715	ft
Watershed Length to Centroid =	2,085	ft
Watershed Slope =	0.032	ft/ft
Watershed Imperviousness =	39.79%	percent
Percentage Hydrologic Soil Group A =	69.7%	percent
Percentage Hydrologic Soil Group B =	16.6%	percent
Percentage Hydrologic Soil Groups C/D =	13.7%	percent
Target WQCV Drain Time =	N/A	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	1.334 acre-feet	1.334	acre-feet
Excess Urban Runoff Volume (EURV) =	6.250 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	3.293 acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	4.710 acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	6.261 acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	11.187 acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	15.825 acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	22.502 acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	39.531 acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	3.042 acre-feet		
Approximate 5-yr Detention Volume =	4.371 acre-feet		
Approximate 10-yr Detention Volume =	5.826 acre-feet		
Approximate 25-yr Detention Volume =	8.127 acre-feet		
Approximate 50-yr Detention Volume =	9.797 acre-feet		
Approximate 100-yr Detention Volume =	12.322 acre-feet		

Define Zones and Basin Geometry

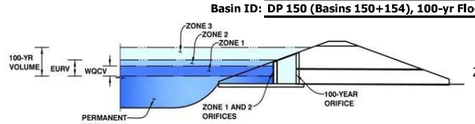
Zone 1 Volume (100-year) =	12.322	acre-feet
Select Zone 2 Storage Volume (Optional) =		acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	12.322	acre-feet
Initial Surcharge Volume (ISV) =	N/A	ft³
Initial Surcharge Depth (ISD) =	N/A	ft
Total Available Detention Depth (H_{total}) =	15.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.010	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	
Initial Surcharge Area (A_{ISV}) =	0	ft²
Surcharge Volume Length (L_{ISV}) =	0.0	ft
Surcharge Volume Width (W_{ISV}) =	0.0	ft
Depth of Basin Floor (H_{FLOOR}) =	0.00	ft
Length of Basin Floor (L_{FLOOR}) =	175.3	ft
Width of Basin Floor (W_{FLOOR}) =	87.6	ft
Area of Basin Floor (A_{FLOOR}) =	15,359	ft²
Volume of Basin Floor (V_{FLOOR}) =	0	ft³
Depth of Main Basin (H_{MAIN}) =	15.00	ft
Length of Main Basin (L_{MAIN}) =	295.3	ft
Width of Main Basin (W_{MAIN}) =	207.6	ft
Area of Main Basin (A_{MAIN}) =	61,306	ft²
Volume of Main Basin (V_{MAIN}) =	536,750	ft³
Calculated Total Basin Volume (V_{total}) =	**12.322**	acre-feet

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: DP 150 (Basins 150+154), 100-yr Flood Control Only



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (100-year)	14.97	12,322	Rectangular Orifice
Zone 2			
Zone 3			
Total (all zones)		12,322	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	N/A	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft²
Depth at top of Zone using Orifice Plate =	N/A	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft²

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (optional)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 1 Rectangular	Not Selected		Calculated Parameters for Vertical Orifice	Zone 1 Rectangular	Not Selected	
Invert of Vertical Orifice =	0.00		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	23.33		ft²
Depth at top of Zone using Vertical Orifice =	14.97		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	2.33		feet
Vertical Orifice Height =	56.00		inches				
Vertical Orifice Width =	60.00		inches				

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Not Selected	Not Selected		Calculated Parameters for Overflow Weir	Not Selected	Not Selected	
Overflow Weir Front Edge Height, Ho =			ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =			feet
Overflow Weir Front Edge Length =			feet	Overflow Weir Slope Length =			feet
Overflow Weir Grate Slope =			H:V	Grate Open Area / 100-yr Orifice Area =			
Horiz. Length of Weir Sides =			feet	Overflow Grate Open Area w/o Debris =			ft²
Overflow Grate Type =				Overflow Grate Open Area w/ Debris =			ft²
Debris Clogging % =			%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Not Selected	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =			ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =			ft²
Circular Orifice Diameter =			inches	Outlet Orifice Centroid =			feet
				Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=		ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=		feet
Spillway Crest Length =		feet	Stage at Top of Freeboard =		feet
Spillway End Slopes =		H:V	Basin Area at Top of Freeboard =		acres
Freeboard above Max Water Surface =		feet	Basin Volume at Top of Freeboard =		acre-ft

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

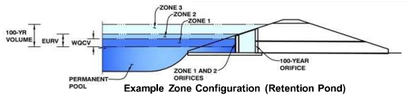
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	1.334	6.250	3.293	4.710	6.261	11.187	15.825	22.502	39.531
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	3.293	4.710	6.261	11.187	15.825	22.599	39.531
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.4	1.3	2.3	50.2	96.6	164.7	328.8
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.01	0.02	0.34	0.65	1.11	2.21
Peak Inflow Q (cfs) =	N/A	N/A	39.3	57.2	77.2	162.2	233.0	360.9	565.6
Peak Outflow Q (cfs) =	62.2	284.8	29.8	44.7	62.0	139.0	193.6	249.2	368.4
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	34.5	27.2	2.8	2.0	1.5	1.1
Structure Controlling Flow =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	3	1	3	3	3	3	2	3	2
Time to Drain 99% of Inflow Volume (hours) =	**8**	3	6	5	4	4	3	4	3
Maximum Ponding Depth (ft) =	3.09	9.82	1.78	2.22	2.66	4.15	5.30	7.25	13.09
Area at Maximum Ponding Depth (acres) =	0.52	0.97	0.44	0.47	0.49	0.58	0.65	0.78	1.24
Maximum Volume Stored (acre-ft) =	1.334	6.254	0.702	0.902	1.113	1.914	2.620	4.012	9.838

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: DP 150 (Basins 150+154), EURV



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	148.82	acres
Watershed Length =	3,715	ft
Watershed Length to Centroid =	2,085	ft
Watershed Slope =	0.032	ft/ft
Watershed Imperviousness =	39.79%	percent
Percentage Hydrologic Soil Group A =	69.7%	percent
Percentage Hydrologic Soil Group B =	16.6%	percent
Percentage Hydrologic Soil Groups C/D =	13.7%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	1.334 acre-feet	1.334	acre-feet
Excess Urban Runoff Volume (EURV) =	6.250 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	3.293 acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	4.710 acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	6.261 acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	11.187 acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	15.825 acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	22.502 acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	39.531 acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	3.042 acre-feet		
Approximate 5-yr Detention Volume =	4.371 acre-feet		
Approximate 10-yr Detention Volume =	5.826 acre-feet		
Approximate 25-yr Detention Volume =	8.127 acre-feet		
Approximate 50-yr Detention Volume =	9.797 acre-feet		
Approximate 100-yr Detention Volume =	12.322 acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.334	acre-feet
Zone 2 Volume (EURV - Zone 1) =	4.916	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	6.073	acre-feet
Total Detention Basin Volume =	12.322	acre-feet
Initial Surcharge Volume (ISV) =	174	ft^3
Initial Surcharge Depth (ISD) =	0.50	ft
Total Available Detention Depth (H_{total}) =	6.50	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.007	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Initial Surcharge Area (A_{ISV}) =	349	ft^2
Surcharge Volume Length (L_{ISV}) =	18.7	ft
Surcharge Volume Width (W_{ISV}) =	18.7	ft
Depth of Basin Floor (H_{FLOOR}) =	3.95	ft
Length of Basin Floor (L_{FLOOR}) =	598.8	ft
Width of Basin Floor (W_{FLOOR}) =	300.8	ft
Area of Basin Floor (A_{FLOOR}) =	180,115	ft^2
Volume of Basin Floor (V_{FLOOR}) =	248,045	ft^3
Depth of Main Basin (H_{MAIN}) =	1.55	ft
Length of Main Basin (L_{MAIN}) =	611.2	ft
Width of Main Basin (W_{MAIN}) =	313.2	ft
Area of Main Basin (A_{MAIN}) =	191,424	ft^2
Volume of Main Basin (V_{MAIN}) =	287,899	ft^3
Calculated Total Basin Volume (V_{total}) =	**12.312**	acre-feet

Depth Increment = 0.25 ft

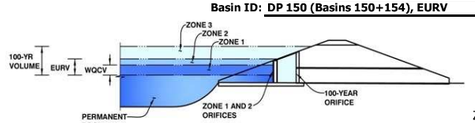
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		18.7	18.7	349		0.008		
ISV	0.50		18.7	18.7	349		0.008	174	0.004
	0.75		18.7	18.7	349		0.008	261	0.006
	1.00		18.7	18.7	349		0.008	349	0.008
	1.25		55.4	36.5	2,023		0.046	618	0.014
	1.50		92.1	54.4	5,009		0.115	1,470	0.034
	1.75		128.8	72.2	9,306		0.214	3,232	0.074
	2.00		165.5	90.1	14,914		0.342	6,232	0.143
	2.25		202.2	108.0	21,834		0.501	10,798	0.248
	2.50		239.0	125.8	30,065		0.690	17,258	0.396
	2.75		275.7	143.7	39,606		0.909	25,940	0.595
	3.00		312.4	161.5	50,460		1.158	37,171	0.853
	3.25		349.1	179.4	62,624		1.438	51,279	1.177
	3.50		385.8	197.2	76,100		1.747	68,592	1.575
	3.75		422.5	215.1	90,886		2.086	89,438	2.053
Zone 1 (WQCV)	3.95		451.9	229.4	103,660		2.380	108,878	2.500
	4.00		459.2	233.0	106,984		2.456	114,144	2.620
	4.25		496.0	250.8	124,394		2.856	143,039	3.284
	4.50		532.7	268.7	143,114		3.285	176,450	4.051
	4.75		569.4	286.5	163,146		3.745	214,706	4.929
	5.00		599.2	301.2	180,475		4.143	258,033	5.924
	5.25		601.2	303.2	182,280		4.185	303,377	6.965
	5.50		603.2	305.2	184,093		4.226	349,173	8.016
	5.75		605.2	307.2	185,914		4.268	395,424	9.078
	6.00		607.2	309.2	187,742		4.310	442,131	10.150
Zone 2 (EURV)	6.12		608.1	310.2	188,623		4.330	464,713	10.668
	6.25		609.2	311.2	189,579		4.352	489,296	11.233
Floor	6.50		611.2	313.2	191,424		4.394	536,921	12.326
	6.75		613.2	315.2	193,277		4.437	585,009	13.430
	7.00		615.2	317.2	195,137		4.480	633,560	14.545
	7.25		617.2	319.2	197,006		4.523	682,578	15.670
	7.50		619.2	321.2	198,883		4.566	732,064	16.806
Zone 3 (100-year)	7.65		620.4	322.4	200,013		4.592	761,981	17.493
	7.75		621.2	323.2	200,768		4.609	782,020	17.953
	8.00		623.2	325.2	202,660		4.652	832,448	19.110
	8.25		625.2	327.2	204,561		4.696	883,351	20.279
	8.50		627.2	329.2	206,470		4.740	934,730	21.458
	8.75		629.2	331.2	208,387		4.784	986,587	22.649
	9.00		631.2	333.2	210,311		4.828	1,038,924	23.850
	9.25		633.2	335.2	212,244		4.872	1,091,743	25.063
	9.50		635.2	337.2	214,185		4.917	1,145,046	26.287
	9.75		637.2	339.2	216,134		4.962	1,198,836	27.521
	10.00		639.2	341.2	218,090		5.007	1,253,114	28.768
	10.25		641.2	343.2	220,055		5.052	1,307,882	30.025
	10.50		643.2	345.2	222,028		5.097	1,363,142	31.293
	10.75		645.2	347.2	224,009		5.143	1,418,897	32.573
	11.00		647.2	349.2	225,997		5.188	1,475,147	33.865
	11.25		649.2	351.2	227,994		5.234	1,531,896	35.167
	11.50		651.2	353.2	229,999		5.280	1,589,145	36.482
	11.75		653.2	355.2	232,012		5.326	1,646,896	37.808
	12.00		655.2	357.2	234,032		5.373	1,705,151	39.145
	12.25		657.2	359.2	236,061		5.419	1,763,913	40.494
	12.50		659.2	361.2	238,098		5.466	1,823,183	41.855
	12.75		661.2	363.2	240,143		5.513	1,882,962	43.227
	13.00		663.2	365.2	242,195		5.560	1,943,254	44.611
	13.25		665.2	367.2	244,256		5.607	2,004,061	46.007
	13.50		667.2	369.2	246,325		5.655	2,065,383	47.415
	13.75		669.2	371.2	248,402		5.703	2,127,224	48.834
	14.00		671.2	373.2	250,486		5.750	2,189,585	50.266
	14.25		673.2	375.2	252,579		5.798	2,252,468	51.710
	14.50		675.2	377.2	254,680		5.847	2,315,875	53.165
	14.75		677.2	379.2	256,789		5.895	2,379,808	54.633
	15.00		679.2	381.2	258,905		5.944	2,444,270	56.113
	15.25		681.2	383.2	261,030		5.992	2,509,262	57.605
	15.50		683.2	385.2	263,163		6.041	2,574,786	59.109
	15.75		685.2	387.2	265,304		6.091	2,640,844	60.625
	16.00		687.2	389.2	267,452		6.140	2,707,438	62.154
	16.25		689.2	391.2	269,609		6.189	2,774,570	63.695
	16.50		691.2	393.2	271,774		6.239	2,842,243	65.249
	16.75		693.2	395.2	273,947		6.289	2,910,458	66.815
	17.00		695.2	397.2	276,127		6.339	2,979,217	68.393
	17.25		697.2	399.2	278,316		6.389	3,048,522	69.984
	17.50		699.2	401.2	280,513		6.440	3,118,376	71.588
	17.75		701.2	403.2	282,718		6.490	3,188,779	73.204
	18.00		703.2	405.2	284,930		6.541	3,259,735	74.833
	18.25		705.2	407.2	287,151		6.592	3,331,245	76.475
	18.50		707.2	409.2	289,380		6.643	3,403,311	78.129
	18.75		709.2	411.2	291,617		6.695	3,475,936	79.797
	19.00		711.2	413.2	293,861		6.746	3,549,120	81.477
	19.25		713.2	415.2	296,114		6.798	3,622,867	83.170
	19.50		715.2	417.2	298,375		6.850	3,697,178	84.876
	19.75		717.2	419.2	300,643		6.902	3,772,055	86.594
	20.00		719.2	421.2	302,920		6.954	3,847,500	88.326
	20.25		721.2	423.2	305,205		7.007	3,923,516	90.072
	20.50		723.2	425.2	307,498		7.059	4,000,104	91.830
	20.75		725.2	427.2	309,798		7.112	4,077,265	93.601
	21.00		727.2	429.2	312,107		7.165	4,155,003	95.386
	21.25		729.2	431.2	314,424		7.218	4,233,320	97.184
	21.50		731.2	433.2	316,749		7.272	4,312,216	98.995
	21.75		733.2	435.2	319,081		7.325	4,391,695	100.819
	22.00		735.2	437.2	321,422		7.379	4,471,757	102.657
	22.25		737.2	439.2	323,771		7.433	4,552,406	104.509
	22.50		739.2	441.2	326,128		7.487	4,633,644	106.374
	22.75		741.2	443.2	328,492		7.541	4,715,471	108.252
	23.00		743.2	445.2	330,865		7.596	4,797,891	110.144
	23.25		745.2	447.2	333,246		7.650	4,880,904	112.050
	23.50		747.2	449.2	335,635		7.705	4,964,514	113.970
	23.75		749.2	451.2	338,031		7.760	5,048,722	115.903
	24.00		751.2	453.2	340,436		7.815	5,133,531	117.850

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: DP 150 (Basins 150+154), EURV



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.36	1.334	Orifice Plate
Zone 2 (EURV)	5.08	4.916	Weir&Pipe (Restrict)
Zone 3 (100-year)	6.50	6.073	
Total (all zones)		12.322	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	
Underdrain Orifice Diameter =	N/A	inches	

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	
Depth at top of Zone using Orifice Plate =	3.36	ft (relative to basin bottom at Stage = 0 ft)	
Orifice Plate: Orifice Vertical Spacing =	13.40	inches	
Orifice Plate: Orifice Area per Row =	3.57	sq. inches (use rectangular openings)	

Calculated Parameters for Plate

WQ Orifice Area per Row =	2.479E-02	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.12	2.24					
Orifice Area (sq. inches)	3.57	3.57	3.57					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
Invert of Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =			inches

Calculated Parameters for Vertical Orifice

Not Selected	Not Selected	
Vertical Orifice Area =		ft^2
Vertical Orifice Centroid =		feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.36		ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	4.00		feet
Overflow Weir Grate Slope =	0.00		H:V
Horiz. Length of Weir Sides =	4.00		feet
Overflow Grate Type =	Type C Grate		
Debris Clogging % =	50%		%

Calculated Parameters for Overflow Weir

Zone 2 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	3.36	feet
Overflow Weir Slope Length =	4.00	feet
Grate Open Area / 100-yr Orifice Area =	47.64	
Overflow Grate Open Area w/o Debris =	11.14	ft^2
Overflow Grate Open Area w/ Debris =	5.57	ft^2

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50		ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00		inches
Restrictor Plate Height Above Pipe Invert =	3.42		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

Zone 2 Restrictor	Not Selected	
Outlet Orifice Area =	0.23	ft^2
Outlet Orifice Centroid =	0.17	feet
Half-Central Angle of Restrictor Plate on Pipe =	0.90	N/A radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	5.09	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	1000.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth=	0.22	feet
Stage at Top of Freeboard =	6.31	feet
Basin Area at Top of Freeboard =	4.36	acres
Basin Volume at Top of Freeboard =	11.49	acre-ft

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

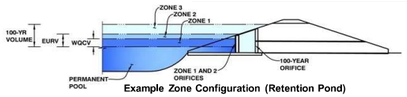
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	1.334	6.250	3.293	4.710	6.261	11.187	15.825	22.502	39.531
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	3.293	4.710	6.261	11.187	15.825	22.502	39.531
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.4	1.3	2.3	50.2	96.6	164.7	328.8
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.01	0.02	0.34	0.65	1.11	2.21
Peak Inflow Q (cfs) =	N/A	N/A	39.3	57.2	77.2	162.2	233.0	326.9	565.6
Peak Outflow Q (cfs) =	0.5	3.1	2.9	3.0	3.0	87.6	199.7	331.7	560.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	2.3	1.3	1.7	2.1	2.0	1.7
Structure Controlling Flow =	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	0.21	0.20	0.2	0.2	0.2	0.2	0.2	0.2
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	54	47	51	55	52	48	42	29
Time to Drain 99% of Inflow Volume (hours) =	**40**	60	50	55	61	61	59	56	50
Maximum Ponding Depth (ft) =	3.36	5.08	4.09	4.54	4.95	5.18	5.25	5.32	5.42
Area at Maximum Ponding Depth (acres) =	1.57	4.16	2.60	3.36	4.11	4.17	4.18	4.19	4.21
Maximum Volume Stored (acre-ft) =	1.343	6.256	2.848	4.184	5.675	6.672	6.965	7.216	7.636

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: DP 225 (Basins 226+228), EURV



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	127.21	acres
Watershed Length =	4,352	ft
Watershed Length to Centroid =	1,894	ft
Watershed Slope =	0.027	ft/ft
Watershed Imperviousness =	42.67%	percent
Percentage Hydrologic Soil Group A =	21.4%	percent
Percentage Hydrologic Soil Group B =	27.7%	percent
Percentage Hydrologic Soil Groups C/D =	50.9%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	1.189 acre-feet	1.189	acre-feet
Excess Urban Runoff Volume (EURV) =	5.449 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	3.309 acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	4.731 acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	6.987 acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	12.333 acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	16.803 acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	22.632 acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	37.926 acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	3.039 acre-feet		
Approximate 5-yr Detention Volume =	4.627 acre-feet		
Approximate 10-yr Detention Volume =	6.024 acre-feet		
Approximate 25-yr Detention Volume =	7.912 acre-feet		
Approximate 50-yr Detention Volume =	9.161 acre-feet		
Approximate 100-yr Detention Volume =	11.449 acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.189	acre-feet
Zone 2 Volume (EURV - Zone 1) =	4.260	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	6.000	acre-feet
Total Detention Basin Volume =	11.449	acre-feet
Initial Surcharge Volume (ISV) =	155	ft^3
Initial Surcharge Depth (ISD) =	0.50	ft
Total Available Detention Depth (H_{total}) =	6.50	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.008	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Initial Surcharge Area (A_{ISV}) =	311	ft^2
Surcharge Volume Length (L_{ISV}) =	17.6	ft
Surcharge Volume Width (W_{ISV}) =	17.6	ft
Depth of Basin Floor (H_{FLOOR}) =	5.39	ft
Length of Basin Floor (L_{FLOOR}) =	712.9	ft
Width of Basin Floor (W_{FLOOR}) =	354.5	ft
Area of Basin Floor (A_{FLOOR}) =	252,739	ft^2
Volume of Basin Floor (V_{FLOOR}) =	470,569	ft^3
Depth of Main Basin (H_{MAIN}) =	0.11	ft
Length of Main Basin (L_{MAIN}) =	713.8	ft
Width of Main Basin (W_{MAIN}) =	355.4	ft
Area of Main Basin (A_{MAIN}) =	253,679	ft^2
Volume of Main Basin (V_{MAIN}) =	27,853	ft^3
Calculated Total Basin Volume (V_{total}) =	**11.449**	acre-feet

Depth Increment = 0.25 ft

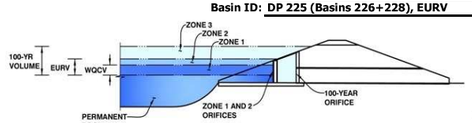
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		17.6	17.6	311		0.007		
ISV	0.50		17.6	17.6	311		0.007	155	0.004
	0.75		17.6	17.6	311		0.007	233	0.005
	1.00		17.6	17.6	311		0.007	311	0.007
	1.25		49.9	33.3	1,659		0.038	536	0.012
	1.50		82.1	48.9	4,014		0.092	1,224	0.028
	1.75		114.4	64.5	7,378		0.169	2,627	0.060
	2.00		146.6	80.1	11,749		0.270	4,997	0.115
	2.25		178.9	95.8	17,128		0.393	8,586	0.197
	2.50		211.1	111.4	23,515		0.540	13,645	0.313
	2.75		243.4	127.0	30,910		0.710	20,427	0.469
	3.00		275.6	142.6	39,312		0.902	29,184	0.670
	3.25		307.9	158.3	48,723		1.119	40,167	0.922
	3.50		340.1	173.9	59,141		1.358	53,629	1.231
	3.75		372.4	189.5	70,567		1.620	69,822	1.603
Zone 1 (WQCV)	3.84		384.0	195.1	74,927		1.720	76,368	1.753
	4.00		404.6	205.1	83,001		1.905	88,997	2.043
	4.25		436.9	220.8	96,442		2.214	111,406	2.558
	4.50		469.1	236.4	110,892		2.546	137,302	3.152
	4.75		501.4	252.0	126,349		2.901	166,936	3.832
	5.00		533.6	267.6	142,814		3.279	200,560	4.604
	5.25		565.9	283.3	160,287		3.680	238,427	5.474
	5.50		598.1	298.9	178,768		4.104	280,788	6.446
	5.75		630.4	314.5	198,256		4.551	327,895	7.527
Zone 2 (EURV)	5.90		649.7	323.9	210,433		4.831	358,542	8.231
	6.00		662.6	330.1	218,752		5.022	380,000	8.724
	6.25		694.9	345.8	240,256		5.516	437,355	10.040
Floor	6.50		713.8	355.4	253,679		5.824	499,714	11.472
	6.75		715.8	357.4	255,822		5.873	563,401	12.934
	7.00		717.8	359.4	257,972		5.922	627,625	14.408
	7.25		719.8	361.4	260,130		5.972	692,388	15.895
Zone 3 (100-year)	7.46		721.5	363.1	261,950		6.014	747,206	17.153
	7.50		721.8	363.4	262,297		6.022	757,691	17.394
	7.75		723.8	365.4	264,471		6.071	823,537	18.906
	8.00		725.8	367.4	266,654		6.122	889,927	20.430
	8.25		727.8	369.4	268,844		6.172	956,864	21.967
	8.50		729.8	371.4	271,042		6.222	1,024,350	23.516
	8.75		731.8	373.4	273,249		6.273	1,092,386	25.078
	9.00		733.8	375.4	275,463		6.324	1,160,975	26.652
	9.25		735.8	377.4	277,686		6.375	1,230,118	28.240
	9.50		737.8	379.4	279,916		6.426	1,299,818	29.840
	9.75		739.8	381.4	282,154		6.477	1,370,077	31.453
	10.00		741.8	383.4	284,401		6.529	1,440,896	33.078
	10.25		743.8	385.4	286,655		6.581	1,512,278	34.717
	10.50		745.8	387.4	288,918		6.633	1,584,225	36.369
	10.75		747.8	389.4	291,188		6.685	1,656,738	38.033
	11.00		749.8	391.4	293,466		6.737	1,729,819	39.711
	11.25		751.8	393.4	295,753		6.790	1,803,471	41.402
	11.50		753.8	395.4	298,047		6.842	1,877,696	43.106
	11.75		755.8	397.4	300,350		6.895	1,952,496	44.823
	12.00		757.8	399.4	302,660		6.948	2,027,872	46.554
	12.25		759.8	401.4	304,978		7.001	2,103,826	48.297
	12.50		761.8	403.4	307,305		7.055	2,180,362	50.054
	12.75		763.8	405.4	309,639		7.108	2,257,479	51.825
	13.00		765.8	407.4	311,982		7.162	2,335,182	53.608
	13.25		767.8	409.4	314,332		7.216	2,413,471	55.406
	13.50		769.8	411.4	316,690		7.270	2,492,348	57.216
	13.75		771.8	413.4	319,057		7.325	2,571,817	59.041
	14.00		773.8	415.4	321,431		7.379	2,651,878	60.879
	14.25		775.8	417.4	323,814		7.434	2,732,533	62.730
	14.50		777.8	419.4	326,204		7.489	2,813,785	64.596
	14.75		779.8	421.4	328,602		7.544	2,895,636	66.475
	15.00		781.8	423.4	331,009		7.599	2,978,087	68.367
	15.25		783.8	425.4	333,423		7.654	3,061,141	70.274
	15.50		785.8	427.4	335,846		7.710	3,144,799	72.195
	15.75		787.8	429.4	338,276		7.766	3,229,064	74.129
	16.00		789.8	431.4	340,714		7.822	3,313,938	76.078
	16.25		791.8	433.4	343,161		7.878	3,399,422	78.040
	16.50		793.8	435.4	345,615		7.934	3,485,519	80.017
	16.75		795.8	437.4	348,078		7.991	3,572,230	82.007
	17.00		797.8	439.4	350,548		8.047	3,659,558	84.012
	17.25		799.8	441.4	353,026		8.104	3,747,505	86.031
	17.50		801.8	443.4	355,513		8.161	3,836,072	88.064
	17.75		803.8	445.4	358,007		8.219	3,925,262	90.112
	18.00		805.8	447.4	360,510		8.276	4,015,077	92.173
	18.25		807.8	449.4	363,020		8.334	4,105,518	94.250
	18.50		809.8	451.4	365,538		8.392	4,196,587	96.340
	18.75		811.8	453.4	368,065		8.450	4,288,288	98.446
	19.00		813.8	455.4	370,599		8.508	4,380,620	100.565
	19.25		815.8	457.4	373,142		8.566	4,473,588	102.699
	19.50		817.8	459.4	375,692		8.625	4,567,192	104.848
	19.75		819.8	461.4	378,250		8.683	4,661,435	107.012
	20.00		821.8	463.4	380,817		8.742	4,756,318	109.190
	20.25		823.8	465.4	383,391		8.801	4,851,844	111.383
	20.50		825.8	467.4	385,974		8.861	4,948,014	113.591
	20.75		827.8	469.4	388,564		8.920	5,044,831	115.813
	21.00		829.8	471.4	391,162		8.980	5,142,297	118.051
	21.25		831.8	473.4	393,769		9.040	5,240,413	120.303
	21.50		833.8	475.4	396,383		9.100	5,339,182	122.571
	21.75		835.8	477.4	399,006		9.160	5,438,605	124.853
	22.00		837.8	479.4	401,636		9.220	5,538,685	127.151
	22.25		839.8	481.4	404,275		9.281	5,639,424	129.463
	22.50		841.8	483.4	406,921		9.342	5,740,823	131.791
	22.75		843.8	485.4	409,575		9.403	5,842,885	134.134
	23.00		845.8	487.4	412,238		9.464	5,945,612	136.492
	23.25		847.8	489.4	414,908		9.525	6,049,005	138.866
	23.50		849.8	491.4	417,587		9.586	6,153,066	141.255
	23.75		851.8	493.4	420,273		9.648	6,257,799	143.659
	24.00		853.8	495.4	422,967		9.710	6,363,204	146.079

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: DP 225 (Basins 226+228), EURV



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.47	1.189	Orifice Plate
Zone 2 (EURV)	5.25	4.260	Weir&Pipe (Restrict)
Zone 3 (100-year)	6.50	6.000	Not Utilized
Total (all zones)		11.449	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	2.188E-02 ft^2
Depth at top of Zone using Orifice Plate =	3.47	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A feet
Orifice Plate: Orifice Vertical Spacing =	13.90	inches	Elliptical Slot Centroid =	N/A feet
Orifice Plate: Orifice Area per Row =	3.15	sq. inches (diameter = 2 inches)	Elliptical Slot Area =	N/A ft^2

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.16	2.31					
Orifice Area (sq. inches)	3.15	3.15	3.15					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

Calculated Parameters for Vertical Orifice

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected			Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.47	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.47	N/A	feet
Overflow Weir Front Edge Length =	4.00	N/A	feet	Overflow Weir Slope Length =	4.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	57.52	N/A	
Horiz. Length of Weir Sides =	4.00	N/A	feet	Overflow Grate Open Area w/o Debris =	11.14	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	5.57	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Restrictor	Not Selected			Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.19	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.15	N/A	feet
Restrictor Plate Height Above Pipe Invert =	3.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	0.84	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	5.26	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.21 feet
Spillway Crest Length =	1000.00	feet	Stage at Top of Freeboard =	6.47 feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	5.82 acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	11.30 acre-ft

Calculated Parameters for Spillway

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

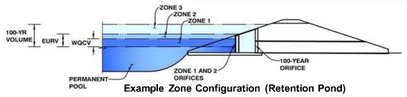
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	1.189	5.449	3.309	4.731	6.987	12.333	16.803	22.632	37.926
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	3.309	4.731	6.987	12.333	16.803	22.632	37.926
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.9	1.7	18.5	75.6	116.2	169.0	302.8
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.01	0.15	0.59	0.91	1.33	2.38
Peak Inflow Q (cfs) =	N/A	N/A	40.0	57.7	89.2	171.2	233.6	309.5	508.4
Peak Outflow Q (cfs) =	0.5	2.6	2.4	2.5	23.6	136.6	197.0	305.5	516.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.5	1.3	1.8	1.7	1.8	1.7
Structure Controlling Flow =	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	0.17	0.17	0.2	0.2	0.2	0.2	0.2	0.2
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	55	48	53	56	50	45	40	28
Time to Drain 99% of Inflow Volume (hours) =	**40**	60	52	58	63	60	58	55	50
Maximum Ponding Depth (ft) =	3.47	5.25	4.40	4.90	5.30	5.39	5.42	5.48	5.57
Area at Maximum Ponding Depth (acres) =	1.33	3.68	2.40	3.11	3.75	3.90	3.97	4.05	4.21
Maximum Volume Stored (acre-ft) =	1.191	5.474	2.880	4.253	5.622	5.966	6.123	6.324	6.695

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: DP 236 (Basins 236), EURV



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	59.95	acres
Watershed Length =	3,976	ft
Watershed Length to Centroid =	1,873	ft
Watershed Slope =	0.036	ft/ft
Watershed Imperviousness =	31.47%	percent
Percentage Hydrologic Soil Group A =	34.2%	percent
Percentage Hydrologic Soil Group B =	64.6%	percent
Percentage Hydrologic Soil Groups C/D =	1.2%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.468 acre-feet	0.468	acre-feet
Excess Urban Runoff Volume (EURV) =	1.930 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	0.973 acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	1.450 acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	2.147 acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	4.493 acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	6.494 acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	9.250 acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	16.225 acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	0.952 acre-feet		
Approximate 5-yr Detention Volume =	1.392 acre-feet		
Approximate 10-yr Detention Volume =	2.060 acre-feet		
Approximate 25-yr Detention Volume =	2.842 acre-feet		
Approximate 50-yr Detention Volume =	3.358 acre-feet		
Approximate 100-yr Detention Volume =	4.314 acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.468	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.462	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	2.385	acre-feet
Total Detention Basin Volume =	4.314	acre-feet
Initial Surcharge Volume (ISV) =	61	ft^3
Initial Surcharge Depth (ISD) =	0.50	ft
Total Available Detention Depth (H_{MAX}) =	6.50	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.010	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	
Initial Surcharge Area (A_{ISV}) =	122	ft^2
Surcharge Volume Length (L_{ISV}) =	11.1	ft
Surcharge Volume Width (W_{ISV}) =	11.1	ft
Depth of Basin Floor (H_{FLOOR}) =	2.88	ft
Length of Basin Floor (L_{FLOOR}) =	310.6	ft
Width of Basin Floor (W_{FLOOR}) =	155.1	ft
Area of Basin Floor (A_{FLOOR}) =	48,158	ft^2
Volume of Basin Floor (V_{FLOOR}) =	48,679	ft^3
Depth of Main Basin (H_{MAIN}) =	2.62	ft
Length of Main Basin (L_{MAIN}) =	331.5	ft
Width of Main Basin (W_{MAIN}) =	176.0	ft
Area of Main Basin (A_{MAIN}) =	58,358	ft^2
Volume of Main Basin (V_{MAIN}) =	139,322	ft^3
Calculated Total Basin Volume (V_{total}) =	**4.319**	acre-feet

Depth Increment = 0.25 ft

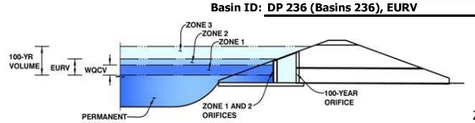
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		11.1	11.1	122		0.003		
ISV	0.50		11.1	11.1	122		0.003	61	0.001
	0.75		11.1	11.1	122		0.003	92	0.002
	1.00		11.1	11.1	122		0.003	122	0.003
	1.25		37.1	23.6	873		0.020	233	0.005
	1.50		63.1	36.1	2,274		0.052	613	0.014
	1.75		89.1	48.6	4,325		0.099	1,424	0.033
	2.00		115.1	61.1	7,026		0.161	2,830	0.065
	2.25		141.1	73.6	10,376		0.238	4,991	0.115
	2.50		167.1	86.1	14,377		0.330	8,072	0.185
	2.75		193.1	98.6	19,028		0.437	12,234	0.281
	3.00		219.1	111.1	24,329		0.559	17,640	0.405
Zone 1 (WQCV)	3.11		230.5	116.6	26,867		0.617	20,455	0.470
	3.25		245.1	123.6	30,279		0.695	24,452	0.561
	3.50		271.1	136.1	36,880		0.847	32,834	0.754
	3.75		297.1	148.6	44,131		1.013	42,947	0.986
Floor	3.88		310.6	155.1	48,158		1.106	48,944	1.124
	4.00		311.5	156.0	48,606		1.116	54,750	1.257
	4.25		313.5	158.0	49,545		1.137	67,018	1.539
	4.50		315.5	160.0	50,493		1.159	79,523	1.826
Zone 2 (EURV)	4.59		316.3	160.7	50,835		1.167	84,083	1.930
	4.75		317.5	162.0	51,448		1.181	92,265	2.118
	5.00		319.5	164.0	52,411		1.203	105,247	2.416
	5.25		321.5	166.0	53,382		1.225	118,471	2.720
	5.50		323.5	168.0	54,361		1.248	131,939	3.029
	5.75		325.5	170.0	55,348		1.271	145,653	3.344
	6.00		327.5	172.0	56,343		1.293	159,614	3.664
	6.25		329.5	174.0	57,346		1.316	173,825	3.990
Zone 3 (100-year)	6.50		331.5	176.0	58,358		1.340	188,288	4.322
	6.75		333.5	178.0	59,377		1.363	203,004	4.660
	7.00		335.5	180.0	60,404		1.387	217,977	5.004
	7.25		337.5	182.0	61,439		1.410	233,207	5.354
	7.50		339.5	184.0	62,482		1.434	248,697	5.709
	7.75		341.5	186.0	63,533		1.459	264,448	6.071
	8.00		343.5	188.0	64,592		1.483	280,464	6.439
	8.25		345.5	190.0	65,659		1.507	296,745	6.812
	8.50		347.5	192.0	66,734		1.532	313,294	7.192
	8.75		349.5	194.0	67,818		1.557	330,113	7.578
	9.00		351.5	196.0	68,909		1.582	347,204	7.971
	9.25		353.5	198.0	70,008		1.607	364,568	8.369
	9.50		355.5	200.0	71,115		1.633	382,208	8.774
	9.75		357.5	202.0	72,230		1.658	400,126	9.186
	10.00		359.5	204.0	73,353		1.684	418,324	9.603
	10.25		361.5	206.0	74,484		1.710	436,804	10.028
	10.50		363.5	208.0	75,623		1.736	455,567	10.458
	10.75		365.5	210.0	76,771		1.762	474,616	10.896
	11.00		367.5	212.0	77,926		1.789	493,953	11.340
	11.25		369.5	214.0	79,089		1.816	513,579	11.790
	11.50		371.5	216.0	80,260		1.843	533,498	12.247
	11.75		373.5	218.0	81,439		1.870	553,710	12.711
	12.00		375.5	220.0	82,626		1.897	574,218	13.182
	12.25		377.5	222.0	83,821		1.924	595,024	13.660
	12.50		379.5	224.0	85,024		1.952	616,129	14.144
	12.75		381.5	226.0	86,235		1.980	637,537	14.636
	13.00		383.5	228.0	87,455		2.008	659,248	15.134
	13.25		385.5	230.0	88,682		2.036	681,265	15.640
	13.50		387.5	232.0	89,917		2.064	703,589	16.152
	13.75		389.5	234.0	91,160		2.093	726,224	16.672
	14.00		391.5	236.0	92,411		2.121	749,170	17.199
	14.25		393.5	238.0	93,670		2.150	772,430	17.733
	14.50		395.5	240.0	94,937		2.179	796,006	18.274
	14.75		397.5	242.0	96,212		2.209	819,899	18.822
	15.00		399.5	244.0	97,496		2.238	844,112	19.378
	15.25		401.5	246.0	98,787		2.268	868,648	19.941
	15.50		403.5	248.0	100,086		2.298	893,506	20.512
	15.75		405.5	250.0	101,393		2.328	918,691	21.090
	16.00		407.5	252.0	102,708		2.358	944,204	21.676
	16.25		409.5	254.0	104,031		2.388	970,046	22.269
	16.50		411.5	256.0	105,362		2.419	996,220	22.870
	16.75		413.5	258.0	106,701		2.450	1,022,728	23.479
	17.00		415.5	260.0	108,048		2.480	1,049,571	24.095
	17.25		417.5	262.0	109,404		2.512	1,076,753	24.719
	17.50		419.5	264.0	110,767		2.543	1,104,274	25.351
	17.75		421.5	266.0	112,138		2.574	1,132,137	25.990
	18.00		423.5	268.0	113,517		2.606	1,160,343	26.638
	18.25		425.5	270.0	114,904		2.638	1,188,896	27.293
	18.50		427.5	272.0	116,299		2.670	1,217,796	27.957
	18.75		429.5	274.0	117,702		2.702	1,247,046	28.628
	19.00		431.5	276.0	119,113		2.734	1,276,648	29.308
	19.25		433.5	278.0	120,533		2.767	1,306,603	29.995
	19.50		435.5	280.0	121,960		2.800	1,336,915	30.691
	19.75		437.5	282.0	123,395		2.833	1,367,584	31.395
	20.00		439.5	284.0	124,838		2.866	1,398,613	32.108
	20.25		441.5	286.0	126,289		2.899	1,430,004	32.828
	20.50		443.5	288.0	127,748		2.933	1,461,758	33.557
	20.75		445.5	290.0	129,215		2.966	1,493,878	34.295
	21.00		447.5	292.0	130,690		3.000	1,526,366	35.041
	21.25		449.5	294.0	132,174		3.034	1,559,224	35.795
	21.50		451.5	296.0	133,665		3.069	1,592,454	36.558
	21.75		453.5	298.0	135,164		3.103	1,626,057	37.329
	22.00		455.5	300.0	136,671		3.138	1,660,036	38.109
	22.25		457.5	302.0	138,186		3.172	1,694,393	38.898
	22.50		459.5	304.0	139,709		3.207	1,729,130	39.695
	22.75		461.5	306.0	141,240		3.242	1,764,248	40.502
	23.00		463.5	308.0	142,779		3.278	1,799,751	41.317
	23.25		465.5	310.0	144,326		3.313	1,835,639	42.140
	23.50		467.5	312.0	145,882		3.349	1,871,915	42.973
	23.75		469.5	314.0	147,445		3.385	1,908,580	43.815
	24.00		471.5	316.0	149,016		3.421	1,945,638	44.666

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: DP 236 (Basins 236), EURV



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.11	0.468	Orifice Plate
Zone 2 (EURV)	4.59	1.462	Weir&Pipe (Restrict)
Zone 3 (100-year)	6.50	2.385	Not Utilized
Total (all zones)		4.314	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	8.889E-03	ft^2
Depth at top of Zone using Orifice Plate =	3.11	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	12.40	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	1.28	sq. inches (diameter = 1-1/4 inches)	Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.04	2.07					
Orifice Area (sq. inches)	1.28	1.28	1.28					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected		Calculated Parameters for Vertical Orifice	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected		Calculated Parameters for Overflow Weir	Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.11	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.11	N/A	feet
Overflow Weir Front Edge Length =	4.00	N/A	feet	Overflow Weir Slope Length =	4.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	164.76	N/A	
Horiz. Length of Weir Sides =	4.00	N/A	feet	Overflow Grate Open Area w/o Debris =	11.14	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	5.57	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.07	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.07	N/A	feet
Restrictor Plate Height Above Pipe Invert =	1.46		inches	Half-Central Angle of Restrictor Plate on Pipe =	0.58	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=	4.60	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.09	feet
Spillway Crest Length =	1000.00	feet	Stage at Top of Freeboard =	6.69	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	1.36	acres
Freeboard above Max Water Surface =	2.00	feet	Basin Volume at Top of Freeboard =	4.57	acre-ft

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

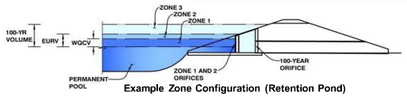
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	0.468	1.930	0.973	1.450	2.147	4.493	6.494	9.250	16.225
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.973	1.450	2.147	4.493	6.494	9.250	16.225
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.3	0.5	2.8	24.0	40.1	61.6	113.9
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.01	0.05	0.40	0.67	1.03	1.90
Peak Inflow Q (cfs) =	N/A	N/A	8.2	12.4	18.6	45.5	66.1	92.8	159.5
Peak Outflow Q (cfs) =	0.2	0.9	0.8	0.8	1.2	41.3	62.5	125.4	201.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.5	0.4	1.7	1.6	2.0	1.8
Structure Controlling Flow =	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	0.06	0.05	0.1	0.1	0.1	0.1	0.1	0.1
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	55	46	51	58	51	46	40	26
Time to Drain 99% of Inflow Volume (hours) =	**40**	60	49	55	64	61	58	55	49
Maximum Ponding Depth (ft) =	3.11	4.59	3.58	4.01	4.60	4.66	4.67	4.72	4.76
Area at Maximum Ponding Depth (acres) =	0.62	1.17	0.90	1.12	1.17	1.17	1.17	1.18	1.18
Maximum Volume Stored (acre-ft) =	0.470	1.930	0.824	1.268	1.942	2.000	2.024	2.071	2.130

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: DP 244 (Basins 244), EURV



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	90.37	acres
Watershed Length =	4,383	ft
Watershed Length to Centroid =	2,537	ft
Watershed Slope =	0.038	ft/ft
Watershed Imperviousness =	53.85%	percent
Percentage Hydrologic Soil Group A =	22.5%	percent
Percentage Hydrologic Soil Group B =	62.5%	percent
Percentage Hydrologic Soil Groups C/D =	15.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.981	acre-feet	0.981	acre-feet
Excess Urban Runoff Volume (EURV) =	5.255	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	3.052	acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	4.302	acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	5.927	acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	9.688	acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	12.917	acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	17.032	acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	27.921	acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	2.810	acre-feet		
Approximate 5-yr Detention Volume =	4.020	acre-feet		
Approximate 10-yr Detention Volume =	5.436	acre-feet		
Approximate 25-yr Detention Volume =	7.066	acre-feet		
Approximate 50-yr Detention Volume =	8.166	acre-feet		
Approximate 100-yr Detention Volume =	9.830	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.981	acre-feet
Zone 2 Volume (EURV - Zone 1) =	4.274	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	4.575	acre-feet
Total Detention Basin Volume =	9.830	acre-feet
Initial Surcharge Volume (ISV) =	128	ft^3
Initial Surcharge Depth (ISD) =	0.50	ft
Total Available Detention Depth (H_{MAX}) =	6.50	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.008	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Initial Surcharge Area (A_{ISV}) =	256	ft^2
Surcharge Volume Length (L_{ISV}) =	16.0	ft
Surcharge Volume Width (W_{ISV}) =	16.0	ft
Depth of Basin Floor (H_{FLOOR}) =	4.13	ft
Length of Basin Floor (L_{FLOOR}) =	548.8	ft
Width of Basin Floor (W_{FLOOR}) =	274.1	ft
Area of Basin Floor (A_{FLOOR}) =	150,442	ft^2
Volume of Basin Floor (V_{FLOOR}) =	216,011	ft^3
Depth of Main Basin (H_{MAIN}) =	1.37	ft
Length of Main Basin (L_{MAIN}) =	559.7	ft
Width of Main Basin (W_{MAIN}) =	285.1	ft
Area of Main Basin (A_{MAIN}) =	159,581	ft^2
Volume of Main Basin (V_{MAIN}) =	212,335	ft^3
Calculated Total Basin Volume (V_{total}) =	**9.839**	acre-feet

Depth Increment = 0.25 ft

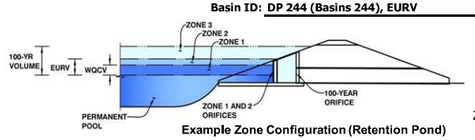
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		16.0	16.0	256		0.006		
ISV	0.50		16.0	16.0	256		0.006	128	0.003
	0.75		16.0	16.0	256		0.006	192	0.004
	1.00		16.0	16.0	256		0.006	256	0.006
	1.25		48.3	31.6	1,527		0.035	458	0.011
	1.50		80.5	47.3	3,805		0.087	1,104	0.025
	1.75		112.8	62.9	7,091		0.163	2,445	0.056
	2.00		145.0	78.5	11,385		0.261	4,733	0.109
	2.25		177.3	94.1	16,687		0.383	8,221	0.189
	2.50		209.5	109.8	22,997		0.528	13,161	0.302
	2.75		241.8	125.4	30,314		0.696	19,804	0.455
	3.00		274.0	141.0	38,639		0.887	28,402	0.652
	3.25		306.3	156.6	47,972		1.101	39,207	0.900
	3.50		338.5	172.3	58,313		1.339	52,472	1.205
Zone 1 (WQCV)	3.68		361.7	183.5	66,382		1.524	63,687	1.462
	3.75		370.8	187.9	69,662		1.599	68,448	1.571
	4.00		403.0	203.5	82,018		1.883	87,387	2.006
	4.25		435.3	219.1	95,382		2.190	109,541	2.515
	4.50		467.5	234.8	109,754		2.520	135,162	3.103
	4.75		499.8	250.4	125,134		2.873	164,502	3.776
	5.00		532.0	266.0	141,522		3.249	197,813	4.541
	5.25		549.7	275.1	151,233		3.472	234,888	5.392
	5.50		551.7	277.1	152,886		3.510	272,903	6.265
	5.75		553.7	279.1	154,548		3.548	311,332	7.147
Zone 2 (EURV)	5.86		554.6	280.0	155,282		3.565	328,372	7.538
	6.00		555.7	281.1	156,218		3.586	350,177	8.039
	6.25		557.7	283.1	157,895		3.625	389,441	8.940
Floor	6.50		559.7	285.1	159,581		3.663	429,126	9.851
	6.75		561.7	287.1	161,275		3.702	469,232	10.772
	7.00		563.7	289.1	162,976		3.741	509,764	11.703
Zone 3 (100-year)	7.09		564.5	289.8	163,591		3.756	524,459	12.040
	7.25		565.7	291.1	164,686		3.781	550,721	12.643
	7.50		567.7	293.1	166,404		3.820	592,107	13.593
	7.75		569.7	295.1	168,129		3.860	633,924	14.553
	8.00		571.7	297.1	169,863		3.900	676,173	15.523
	8.25		573.7	299.1	171,605		3.940	718,856	16.503
	8.50		575.7	301.1	173,354		3.980	761,976	17.493
	8.75		577.7	303.1	175,112		4.020	805,534	18.493
	9.00		579.7	305.1	176,878		4.061	849,533	19.503
	9.25		581.7	307.1	178,652		4.101	893,974	20.523
	9.50		583.7	309.1	180,433		4.142	938,859	21.553
	9.75		585.7	311.1	182,223		4.183	984,191	22.594
	10.00		587.7	313.1	184,021		4.225	1,029,971	23.645
	10.25		589.7	315.1	185,826		4.266	1,076,202	24.706
	10.50		591.7	317.1	187,640		4.308	1,122,885	25.778
	10.75		593.7	319.1	189,462		4.349	1,170,022	26.860
	11.00		595.7	321.1	191,291		4.391	1,217,616	27.953
	11.25		597.7	323.1	193,129		4.434	1,265,669	29.056
	11.50		599.7	325.1	194,975		4.476	1,314,181	30.169
	11.75		601.7	327.1	196,828		4.519	1,363,157	31.294
	12.00		603.7	329.1	198,690		4.561	1,412,596	32.429
	12.25		605.7	331.1	200,560		4.604	1,462,502	33.574
	12.50		607.7	333.1	202,437		4.647	1,512,877	34.731
	12.75		609.7	335.1	204,323		4.691	1,563,722	35.898
	13.00		611.7	337.1	206,217		4.734	1,615,039	37.076
	13.25		613.7	339.1	208,118		4.778	1,666,831	38.265
	13.50		615.7	341.1	210,028		4.822	1,719,099	39.465
	13.75		617.7	343.1	211,946		4.866	1,771,845	40.676
	14.00		619.7	345.1	213,871		4.910	1,825,072	41.898
	14.25		621.7	347.1	215,805		4.954	1,878,782	43.131
	14.50		623.7	349.1	217,747		4.999	1,932,975	44.375
	14.75		625.7	351.1	219,696		5.044	1,987,656	45.630
	15.00		627.7	353.1	221,654		5.088	2,042,824	46.897
	15.25		629.7	355.1	223,620		5.134	2,098,483	48.175
	15.50		631.7	357.1	225,593		5.179	2,154,635	49.464
	15.75		633.7	359.1	227,575		5.224	2,211,281	50.764
	16.00		635.7	361.1	229,565		5.270	2,268,423	52.076
	16.25		637.7	363.1	231,563		5.316	2,326,064	53.399
	16.50		639.7	365.1	233,568		5.362	2,384,205	54.734
	16.75		641.7	367.1	235,582		5.408	2,442,849	56.080
	17.00		643.7	369.1	237,604		5.455	2,501,997	57.438
	17.25		645.7	371.1	239,633		5.501	2,561,651	58.807
	17.50		647.7	373.1	241,671		5.548	2,621,814	60.189
	17.75		649.7	375.1	243,717		5.595	2,682,487	61.581
	18.00		651.7	377.1	245,770		5.642	2,743,673	62.986
	18.25		653.7	379.1	247,832		5.689	2,805,373	64.403
	18.50		655.7	381.1	249,902		5.737	2,867,590	65.831
	18.75		657.7	383.1	251,979		5.785	2,930,325	67.271
	19.00		659.7	385.1	254,065		5.833	2,993,580	68.723
	19.25		661.7	387.1	256,159		5.881	3,057,358	70.187
	19.50		663.7	389.1	258,260		5.929	3,121,660	71.663
	19.75		665.7	391.1	260,370		5.977	3,186,489	73.152
	20.00		667.7	393.1	262,488		6.026	3,251,846	74.652
	20.25		669.7	395.1	264,613		6.075	3,317,733	76.165
	20.50		671.7	397.1	266,747		6.124	3,384,153	77.689
	20.75		673.7	399.1	268,889		6.173	3,451,107	79.227
	21.00		675.7	401.1	271,038		6.222	3,518,598	80.776
	21.25		677.7	403.1	273,196		6.272	3,586,627	82.338
	21.50		679.7	405.1	275,362		6.321	3,655,197	83.912
	21.75		681.7	407.1	277,535		6.371	3,724,309	85.498
	22.00		683.7	409.1	279,717		6.421	3,793,965	87.097
	22.25		685.7	411.1	281,907		6.472	3,864,168	88.709
	22.50		687.7	413.1	284,105		6.522	3,934,919	90.333
	22.75		689.7	415.1	286,310		6.573	4,006,221	91.970
	23.00		691.7	417.1	288,524		6.624	4,078,075	93.620
	23.25		693.7	419.1	290,746		6.675	4,150,483	95.282
	23.50		695.7	421.1	292,975		6.726	4,223,448	96.957
	23.75		697.7	423.1	295,213		6.777	4,296,972	98.645
	24.00		699.7	425.1	297,459		6.829	4,371,056	100.346

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: DP 244 (Basins 244), EURV



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.33	0.981	Orifice Plate
Zone 2 (EURV)	5.22	4.274	Weir&Pipe (Restrict)
Zone 3 (100-year)	6.50	4.575	Not Utilized
Total (all zones)		9.830	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	1.833E-02	ft^2
Depth at top of Zone using Orifice Plate =	3.33	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	13.30	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	2.64	sq. inches (diameter = 1-13/16 inches)	Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.11	2.22					
Orifice Area (sq. inches)	2.64	2.64	2.64					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected		Calculated Parameters for Vertical Orifice	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected		Calculated Parameters for Overflow Weir	Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.33	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.33	N/A	feet
Overflow Weir Front Edge Length =	4.00	N/A	feet	Overflow Weir Slope Length =	4.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	57.52	N/A	
Horiz. Length of Weir Sides =	4.00	N/A	feet	Overflow Grate Open Area w/o Debris =	11.14	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	5.57	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.19	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.15	N/A	feet
Restrictor Plate Height Above Pipe Invert =	3.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	0.84	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=	5.23	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.17	feet
Spillway Crest Length =	1000.00	feet	Stage at Top of Freeboard =	6.40	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	3.65	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	9.49	acre-ft

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

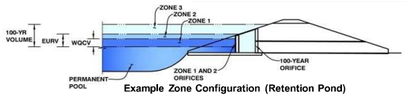
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	0.981	5.255	3.052	4.302	5.927	9.688	12.917	17.032	27.921
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	3.052	4.302	5.927	9.688	12.917	17.032	27.921
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.5	0.9	8.3	41.9	66.4	99.6	180.7
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.01	0.09	0.46	0.73	1.10	2.00
Peak Inflow Q (cfs) =	N/A	N/A	36.1	51.0	71.4	128.4	171.7	224.9	363.0
Peak Outflow Q (cfs) =	0.4	2.6	2.4	2.5	5.9	80.1	134.8	206.1	427.4
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	2.7	0.7	1.9	2.0	2.1	2.4
Structure Controlling Flow =	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	0.18	0.17	0.2	0.2	0.2	0.2	0.2	0.2
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	54	48	52	56	51	47	43	31
Time to Drain 99% of Inflow Volume (hours) =	**40**	60	52	57	63	61	59	57	52
Maximum Ponding Depth (ft) =	3.33	5.22	4.31	4.77	5.24	5.32	5.35	5.40	5.50
Area at Maximum Ponding Depth (acres) =	1.17	3.47	2.25	2.90	3.47	3.48	3.49	3.49	3.51
Maximum Volume Stored (acre-ft) =	0.991	5.288	2.626	3.834	5.358	5.601	5.740	5.880	6.265

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: DP 245 (Basins 248, 250, 252), 100-yr Flood Control only



Example Zone Configuration (Retention Pond)

Depth Increment = 0.25 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft²)	Optional Override Area (ft²)	Area (acre)	Volume (ft³)	Volume (ac-ft)
Media Surface	0.00		305.6	152.8	46,690		1.072		
	0.25		307.6	154.8	47,611		1.093	11,787	0.271
	0.50		309.6	156.8	48,539		1.114	23,806	0.547
	0.75		311.6	158.8	49,476		1.136	36,058	0.828
	1.00		313.6	160.8	50,421		1.158	48,545	1.114
	1.25		315.6	162.8	51,374		1.179	61,269	1.407
	1.50		317.6	164.8	52,334		1.201	74,232	1.704
	1.75		319.6	166.8	53,303		1.224	87,437	2.007
	2.00		321.6	168.8	54,280		1.246	100,884	2.316
	2.25		323.6	170.8	55,264		1.269	114,577	2.630
	2.50		325.6	172.8	56,257		1.291	128,517	2.950
	2.75		327.6	174.8	57,258		1.314	142,706	3.276
	3.00		329.6	176.8	58,267		1.338	157,147	3.608
	3.25		331.6	178.8	59,283		1.361	171,840	3.945
	3.50		333.6	180.8	60,308		1.384	186,789	4.288
	3.75		335.6	182.8	61,341		1.408	201,995	4.637
	4.00		337.6	184.8	62,382		1.432	217,460	4.992
	4.25		339.6	186.8	63,430		1.456	233,187	5.353
	4.50		341.6	188.8	64,487		1.480	249,176	5.720
	4.75		343.6	190.8	65,552		1.505	265,431	6.093
	5.00		345.6	192.8	66,625		1.529	281,953	6.473
	5.25		347.6	194.8	67,705		1.554	298,744	6.858
	5.50		349.6	196.8	68,794		1.579	315,806	7.250
	5.75		351.6	198.8	69,891		1.604	333,142	7.648
	6.00		353.6	200.8	70,996		1.630	350,752	8.052
	6.25		355.6	202.8	72,108		1.655	368,640	8.463
	6.50		357.6	204.8	73,229		1.681	386,807	8.880
	6.75		359.6	206.8	74,358		1.707	405,255	9.303
	7.00		361.6	208.8	75,495		1.733	423,987	9.733
	7.25		363.6	210.8	76,639		1.759	443,003	10.170
	7.50		365.6	212.8	77,792		1.786	462,307	10.613
	7.75		367.6	214.8	78,953		1.813	481,900	11.063
	8.00		369.6	216.8	80,122		1.839	501,784	11.519
	8.25		371.6	218.8	81,298		1.866	521,962	11.983
	8.50		373.6	220.8	82,483		1.894	542,434	12.453
	8.75		375.6	222.8	83,676		1.921	563,204	12.929
	9.00		377.6	224.8	84,877		1.948	584,273	13.413
	9.25		379.6	226.8	86,085		1.976	605,643	13.904
	9.50		381.6	228.8	87,302		2.004	627,316	14.401
	9.75		383.6	230.8	88,527		2.032	649,294	14.906
	10.00		385.6	232.8	89,760		2.061	671,580	15.417
	10.25		387.6	234.8	91,000		2.089	694,175	15.936
	10.50		389.6	236.8	92,249		2.118	717,081	16.462
	10.75		391.6	238.8	93,506		2.147	740,300	16.995
	11.00		393.6	240.8	94,770		2.176	763,834	17.535
	11.25		395.6	242.8	96,043		2.205	787,686	18.083
	11.50		397.6	244.8	97,324		2.234	811,857	18.638
	11.75		399.6	246.8	98,613		2.264	836,348	19.200
	12.00		401.6	248.8	99,909		2.294	861,164	19.770
	12.25		403.6	250.8	101,214		2.324	886,304	20.347
	12.50		405.6	252.8	102,527		2.354	911,771	20.931
	12.75		407.6	254.8	103,848		2.384	937,568	21.524
	13.00		409.6	256.8	105,176		2.415	963,696	22.123
	13.25		411.6	258.8	106,513		2.445	990,157	22.731
	13.50		413.6	260.8	107,858		2.476	1,016,953	23.346
	13.75		415.6	262.8	109,211		2.507	1,044,086	23.969
	14.00		417.6	264.8	110,571		2.538	1,071,559	24.600
	14.25		419.6	266.8	111,940		2.570	1,099,373	25.238
	14.50		421.6	268.8	113,317		2.601	1,127,530	25.885
	14.75		423.6	270.8	114,702		2.633	1,156,032	26.539
Zone 1 (100-year)	14.98		425.4	272.6	115,983		2.663	1,182,560	27.148
	15.00		425.6	272.8	116,094		2.665	1,184,881	27.201
	15.25		427.6	274.8	117,495		2.697	1,214,080	27.871
	15.50		429.6	276.8	118,904		2.730	1,243,629	28.550
	15.75		431.6	278.8	120,321		2.762	1,273,532	29.236
	16.00		433.6	280.8	121,745		2.795	1,303,790	29.931
	16.25		435.6	282.8	123,178		2.828	1,334,406	30.634
	16.50		437.6	284.8	124,619		2.861	1,365,380	31.345
	16.75		439.6	286.8	126,068		2.894	1,396,716	32.064
	17.00		441.6	288.8	127,524		2.928	1,428,415	32.792
	17.25		443.6	290.8	128,989		2.961	1,460,479	33.528
	17.50		445.6	292.8	130,462		2.995	1,492,910	34.272
	17.75		447.6	294.8	131,943		3.029	1,525,710	35.025
	18.00		449.6	296.8	133,431		3.063	1,558,882	35.787
	18.25		451.6	298.8	134,928		3.098	1,592,426	36.557
	18.50		453.6	300.8	136,433		3.132	1,626,346	37.336
	18.75		455.6	302.8	137,945		3.167	1,660,643	38.123
	19.00		457.6	304.8	139,466		3.202	1,695,320	38.919
	19.25		459.6	306.8	140,995		3.237	1,730,377	39.724
	19.50		461.6	308.8	142,532		3.272	1,765,818	40.538
	19.75		463.6	310.8	144,076		3.308	1,801,644	41.360
	20.00		465.6	312.8	145,629		3.343	1,837,857	42.191
	20.25		467.6	314.8	147,190		3.379	1,874,459	43.032
	20.50		469.6	316.8	148,759		3.415	1,911,452	43.881
	20.75		471.6	318.8	150,335		3.451	1,948,839	44.739
	21.00		473.6	320.8	151,920		3.488	1,986,621	45.607
	21.25		475.6	322.8	153,513		3.524	2,024,800	46.483
	21.50		477.6	324.8	155,114		3.561	2,063,378	47.369
	21.75		479.6	326.8	156,722		3.598	2,102,357	48.263
	22.00		481.6	328.8	158,339		3.635	2,141,740	49.168
	22.25		483.6	330.8	159,964		3.672	2,181,528	50.081
	22.50		485.6	332.8	161,597		3.710	2,221,722	51.004
	22.75		487.6	334.8	163,237		3.747	2,262,327	51.936
	23.00		489.6	336.8	164,886		3.785	2,303,342	52.877
	23.25		491.6	338.8	166,543		3.823	2,344,770	53.829
	23.50		493.6	340.8	168,208		3.862	2,386,614	54.789
	23.75		495.6	342.8	169,880		3.900	2,428,875	55.759
	24.00		497.6	344.8	171,561		3.939	2,471,555	56.739
	24.25		499.6	346.8	173,250		3.977	2,514,656	57.729

Watershed Information

	Flood Control Only	
Selected BMP Type =	No BMP	
Watershed Area =	203.27	acres
Watershed Length =	3,613	ft
Watershed Length to Centroid =	1,652	ft
Watershed Slope =	0.019	ft/ft
Watershed Imperviousness =	71.33%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	61.0%	percent
Percentage Hydrologic Soil Groups C/D =	39.0%	percent
Target WQCV Drain Time =	N/A	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	2.857 acre-feet	2.857	acre-feet
Excess Urban Runoff Volume (EURV) =	15.232 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	9.666 acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	13.530 acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	18.103 acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	26.856 acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	34.525 acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	43.759 acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	68.877 acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	8.977 acre-feet		
Approximate 5-yr Detention Volume =	12.707 acre-feet		
Approximate 10-yr Detention Volume =	16.524 acre-feet		
Approximate 25-yr Detention Volume =	20.661 acre-feet		
Approximate 50-yr Detention Volume =	23.379 acre-feet		
Approximate 100-yr Detention Volume =	27.136 acre-feet		

Define Zones and Basin Geometry

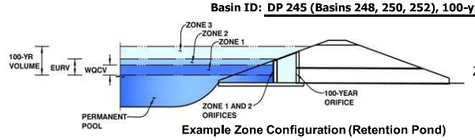
Zone 1 Volume (100-year) =	27.136	acre-feet
Select Zone 2 Storage Volume (Optional) =		acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	27.136	acre-feet
Initial Surcharge Volume (ISV) =	N/A	ft³
Initial Surcharge Depth (ISD) =	N/A	ft
Total Available Detention Depth (H_{total}) =	15.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.010	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	
Initial Surcharge Area (A_{ISV}) =	0	ft²
Surcharge Volume Length (L_{ISV}) =	0.0	ft
Surcharge Volume Width (W_{ISV}) =	0.0	ft
Depth of Basin Floor (H_{FLOOR}) =	0.00	ft
Length of Basin Floor (L_{FLOOR}) =	305.6	ft
Width of Basin Floor (W_{FLOOR}) =	152.8	ft
Area of Basin Floor (A_{FLOOR}) =	46,690	ft²
Volume of Basin Floor (V_{FLOOR}) =	0	ft³
Depth of Main Basin (H_{MAIN}) =	15.00	ft
Length of Main Basin (L_{MAIN}) =	425.6	ft
Width of Main Basin (W_{MAIN}) =	272.8	ft
Area of Main Basin (A_{MAIN}) =	116,094	ft²
Volume of Main Basin (V_{MAIN}) =	1,182,038	ft³
Calculated Total Basin Volume (V_{total}) =	**27.136**	acre-feet

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: DP 245 (Basins 248, 250, 252), 100-yr Flood Control only



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (100-year)	14.98	27.136	Rectangular Orifice
Zone 2			
Zone 3			
Total (all zones)		27.136	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	N/A	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft²
Depth at top of Zone using Orifice Plate =	N/A	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft²

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (optional)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 1 Rectangular	Not Selected		Calculated Parameters for Vertical Orifice	Zone 1 Rectangular	Not Selected	
Invert of Vertical Orifice =	0.00		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	25.00		ft²
Depth at top of Zone using Vertical Orifice =	14.98		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	2.50		feet
Vertical Orifice Height =	60.00		inches				
Vertical Orifice Width =	60.00		inches				

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Not Selected	Not Selected		Calculated Parameters for Overflow Weir	Not Selected	Not Selected	
Overflow Weir Front Edge Height, Ho =	0.00		ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =			feet
Overflow Weir Front Edge Length =			feet	Overflow Weir Slope Length =			feet
Overflow Weir Grate Slope =			H:V	Grate Open Area / 100-yr Orifice Area =			
Horiz. Length of Weir Sides =			feet	Overflow Grate Open Area w/o Debris =			ft²
Overflow Grate Type =				Overflow Grate Open Area w/ Debris =			ft²
Debris Clogging % =			%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Not Selected	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =			ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =			ft²
Circular Orifice Diameter =			inches	Outlet Orifice Centroid =			feet
				Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=		ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=		feet
Spillway Crest Length =		feet	Stage at Top of Freeboard =		feet
Spillway End Slopes =		H:V	Basin Area at Top of Freeboard =		acres
Freeboard above Max Water Surface =		feet	Basin Volume at Top of Freeboard =		acre-ft

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

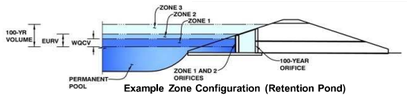
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	2.857	15.232	9.666	13.530	18.103	26.856	34.525	43.759	68.877
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	9.666	13.530	18.103	26.856	34.525	31.974	68.877
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	2.1	11.6	50.4	158.6	234.8	332.2	584.8
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.06	0.25	0.78	1.16	1.63	2.88
Peak Inflow Q (cfs) =	N/A	N/A	173.4	241.1	322.4	498.4	641.1	508.0	1259.2
Peak Outflow Q (cfs) =	46.7	315.6	81.8	122.9	172.7	258.6	305.1	264.8	457.4
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	10.6	3.4	1.6	1.3	0.8	0.8
Structure Controlling Flow =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	12	4	6	5	4	4	3	6	3
Time to Drain 99% of Inflow Volume (hours) =	**30**	8	12	10	8	7	6	9	5
Maximum Ponding Depth (ft) =	2.43	9.91	3.14	3.93	4.74	7.12	8.93	7.34	16.94
Area at Maximum Ponding Depth (acres) =	1.29	2.05	1.35	1.42	1.50	1.74	1.94	1.77	2.92
Maximum Volume Stored (acre-ft) =	2.860	15.232	3.782	4.878	6.063	9.925	13.258	10.311	32.616

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: DP 245 (Basins 248, 250, 252), EURV



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	203.27	acres
Watershed Length =	3,613	ft
Watershed Length to Centroid =	1,652	ft
Watershed Slope =	0.019	ft/ft
Watershed Imperviousness =	71.33%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	61.0%	percent
Percentage Hydrologic Soil Groups C/D =	39.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	2.857 acre-feet	2.857	acre-feet
Excess Urban Runoff Volume (EURV) =	15.232 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	9.666 acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	13.530 acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	18.103 acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	26.856 acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	34.525 acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	43.759 acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	68.877 acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	8.977 acre-feet		
Approximate 5-yr Detention Volume =	12.707 acre-feet		
Approximate 10-yr Detention Volume =	16.524 acre-feet		
Approximate 25-yr Detention Volume =	20.661 acre-feet		
Approximate 50-yr Detention Volume =	23.379 acre-feet		
Approximate 100-yr Detention Volume =	27.136 acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	2.857	acre-feet
Zone 2 Volume (EURV - Zone 1) =	12.375	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	11.904	acre-feet
Total Detention Basin Volume =	27.136	acre-feet
Initial Surcharge Volume (ISV) =	373	ft^3
Initial Surcharge Depth (ISD) =	0.50	ft
Total Available Detention Depth (H_{total}) =	6.50	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.005	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Initial Surcharge Area (A_{ISV}) =	747	ft^2
Surcharge Volume Length (L_{ISV}) =	27.3	ft
Surcharge Volume Width (W_{ISV}) =	27.3	ft
Depth of Basin Floor (H_{FLOOR}) =	4.61	ft
Length of Basin Floor (L_{FLOOR}) =	967.8	ft
Width of Basin Floor (W_{FLOOR}) =	488.3	ft
Area of Basin Floor (A_{FLOOR}) =	472,585	ft^2
Volume of Basin Floor (V_{FLOOR}) =	756,220	ft^3
Depth of Main Basin (H_{MAIN}) =	0.89	ft
Length of Main Basin (L_{MAIN}) =	974.9	ft
Width of Main Basin (W_{MAIN}) =	495.4	ft
Area of Main Basin (A_{MAIN}) =	483,003	ft^2
Volume of Main Basin (V_{MAIN}) =	425,228	ft^3
Calculated Total Basin Volume (V_{total}) =	**27.139**	acre-feet

Depth Increment = 0.25 ft

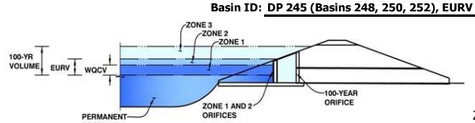
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		27.3	27.3	747		0.017		
ISV	0.50		27.3	27.3	747		0.017	373	0.009
	0.75		27.3	27.3	747		0.017	560	0.013
	1.00		27.3	27.3	747		0.017	747	0.017
	1.25		78.3	52.3	4,098		0.094	1,299	0.030
	1.50		129.3	77.3	10,000		0.230	3,008	0.069
	1.75		180.3	102.3	18,452		0.424	6,512	0.149
	2.00		231.3	127.3	29,454		0.676	12,447	0.286
	2.25		282.3	152.3	43,006		0.987	21,451	0.492
	2.50		333.3	177.3	59,107		1.357	34,162	0.784
	2.75		384.3	202.3	77,759		1.785	51,217	1.176
	3.00		435.3	227.3	98,961		2.272	73,254	1.682
	3.25		486.3	252.3	122,713		2.817	100,910	2.317
	3.50		537.3	277.3	149,014		3.421	134,823	3.095
	3.75		588.3	302.3	177,866		4.083	175,630	4.032
	4.00		639.3	327.3	209,268		4.804	223,969	5.142
	4.25		690.3	352.3	243,220		5.584	280,476	6.439
	4.50		741.3	377.3	279,721		6.422	345,791	7.938
Zone 1 (WQCV)	4.75		792.3	402.3	318,773		7.318	420,550	9.654
	5.00		843.3	427.3	360,375		8.273	505,390	11.602
	5.25		894.3	452.3	404,527		9.287	600,950	13.796
	5.50		945.3	477.3	451,229		10.359	707,866	16.250
	5.75		968.9	489.4	474,217		10.887	824,947	18.938
	6.00		970.9	491.4	477,138		10.954	943,867	21.668
	6.25		972.9	493.4	480,067		11.021	1,063,517	24.415
Floor	6.50		974.9	495.4	483,003		11.088	1,183,901	27.179
	6.75		976.9	497.4	485,948		11.156	1,305,019	29.959
	7.00		978.9	499.4	488,901		11.224	1,426,875	32.757
	7.25		980.9	501.4	491,861		11.292	1,549,470	35.571
	7.50		982.9	503.4	494,830		11.360	1,672,806	38.402
	7.75		984.9	505.4	497,807		11.428	1,796,886	41.251
	8.00		986.9	507.4	500,791		11.497	1,921,710	44.116
Zone 2 (EURV)	8.14		988.0	508.6	502,466		11.535	1,991,938	45.729
	8.25		988.9	509.4	503,784		11.565	2,047,282	46.999
	8.50		990.9	511.4	506,785		11.634	2,173,603	49.899
	8.75		992.9	513.4	509,793		11.703	2,300,675	52.816
	9.00		994.9	515.4	512,810		11.772	2,428,500	55.751
	9.25		996.9	517.4	515,835		11.842	2,557,081	58.702
	9.50		998.9	519.4	518,867		11.912	2,686,418	61.672
	9.75		1,000.9	521.4	521,908		11.981	2,816,515	64.658
	10.00		1,002.9	523.4	524,957		12.051	2,947,373	67.662
	10.25		1,004.9	525.4	528,013		12.122	3,078,994	70.684
	10.50		1,006.9	527.4	531,078		12.192	3,211,380	73.723
Zone 3 (100-year)	10.70		1,008.5	529.0	533,535		12.248	3,317,841	76.167
	10.75		1,008.9	529.4	534,151		12.262	3,344,534	76.780
	11.00		1,010.9	531.4	537,231		12.333	3,478,456	79.854
	11.25		1,012.9	533.4	540,320		12.404	3,613,150	82.947
	11.50		1,014.9	535.4	543,417		12.475	3,748,617	86.056
	11.75		1,016.9	537.4	546,521		12.546	3,884,859	89.184
	12.00		1,018.9	539.4	549,634		12.618	4,021,878	92.330
	12.25		1,020.9	541.4	552,755		12.689	4,159,676	95.493
	12.50		1,022.9	543.4	555,883		12.761	4,298,256	98.674
	12.75		1,024.9	545.4	559,020		12.833	4,437,619	101.874
	13.00		1,026.9	547.4	562,164		12.906	4,577,766	105.091
	13.25		1,028.9	549.4	565,317		12.978	4,718,701	108.326
	13.50		1,030.9	551.4	568,478		13.050	4,860,426	111.580
	13.75		1,032.9	553.4	571,646		13.123	5,002,941	114.852
	14.00		1,034.9	555.4	574,823		13.196	5,146,250	118.142
	14.25		1,036.9	557.4	578,008		13.269	5,290,353	121.450
	14.50		1,038.9	559.4	581,200		13.343	5,435,254	124.776
	14.75		1,040.9	561.4	584,401		13.416	5,580,954	128.121
	15.00		1,042.9	563.4	587,610		13.490	5,727,455	131.484
	15.25		1,044.9	565.4	590,826		13.564	5,874,760	134.866
	15.50		1,046.9	567.4	594,051		13.638	6,022,869	138.266
	15.75		1,048.9	569.4	597,284		13.712	6,171,786	141.685
	16.00		1,050.9	571.4	600,524		13.786	6,321,512	145.122
	16.25		1,052.9	573.4	603,773		13.861	6,472,049	148.578
	16.50		1,054.9	575.4	607,030		13.935	6,623,399	152.052
	16.75		1,056.9	577.4	610,294		14.010	6,775,564	155.546
	17.00		1,058.9	579.4	613,567		14.086	6,928,547	159.058
	17.25		1,060.9	581.4	616,848		14.161	7,082,349	162.588
	17.50		1,062.9	583.4	620,136		14.236	7,236,972	166.138
	17.75		1,064.9	585.4	623,433		14.312	7,392,418	169.707
	18.00		1,066.9	587.4	626,738		14.388	7,548,689	173.294
	18.25		1,068.9	589.4	630,050		14.464	7,705,787	176.901
	18.50		1,070.9	591.4	633,371		14.540	7,863,715	180.526
	18.75		1,072.9	593.4	636,700		14.617	8,022,473	184.171
	19.00		1,074.9	595.4	640,036		14.693	8,182,065	187.834
	19.25		1,076.9	597.4	643,381		14.770	8,342,492	191.517
	19.50		1,078.9	599.4	646,734		14.847	8,503,756	195.219
	19.75		1,080.9	601.4	650,094		14.924	8,665,860	198.941
	20.00		1,082.9	603.4	653,463		15.001	8,828,804	202.681
	20.25		1,084.9	605.4	656,840		15.079	8,992,592	206.442
	20.50		1,086.9	607.4	660,224		15.157	9,157,225	210.221
	20.75		1,088.9	609.4	663,617		15.235	9,322,705	214.020
	21.00		1,090.9	611.4	667,018		15.313	9,489,034	217.838
	21.25		1,092.9	613.4	670,426		15.391	9,656,214	221.676
	21.50		1,094.9	615.4	673,843		15.469	9,824,248	225.534
	21.75		1,096.9	617.4	677,268		15.548	9,993,137	229.411
	22.00		1,098.9	619.4	680,700		15.627	10,162,882	233.308
	22.25		1,100.9	621.4	684,141		15.706	10,333,487	237.224
	22.50		1,102.9	623.4	687,590		15.785	10,504,954	241.161
	22.75		1,104.9	625.4	691,046		15.864	10,677,283	245.117
	23.00		1,106.9	627.4	694,511		15.944	10,850,477	249.093
	23.25		1,108.9	629.4	697,984		16.024	11,024,539	253.089
	23.50		1,110.9	631.4	701,464		16.103	11,199,470	257.104
	23.75		1,112.9	633.4	704,953		16.183	11,375,272	261.140
	24.00		1,114.9	635.4	708,450		16.264	11,551,947	265.196
	24.25		1,116.9	637.4	711,954		16.344	11,729,497	269.272

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: DP 245 (Basins 248, 250, 252), EURV



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.43	2.857	Orifice Plate
Zone 2 (EURV)	5.40	12.375	Weir&Pipe (Restrict)
Zone 3 (100-year)	6.50	11.904	Not Utilized
Total (all zones)		27.136	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	5.264E-02 ft^2
Depth at top of Zone using Orifice Plate =	3.43	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A feet
Orifice Plate: Orifice Vertical Spacing =	13.70	inches	Elliptical Slot Centroid =	N/A feet
Orifice Plate: Orifice Area per Row =	7.58	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A ft^2

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.14	2.29					
Orifice Area (sq. inches)	7.58	7.58	7.58					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

Calculated Parameters for Vertical Orifice

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected			Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.43	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.43	N/A	feet
Overflow Weir Front Edge Length =	4.00	N/A	feet	Overflow Weir Slope Length =	4.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	17.52	N/A	
Horiz. Length of Weir Sides =	4.00	N/A	feet	Overflow Grate Open Area w/o Debris =	11.14	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	5.57	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Restrictor	Not Selected			Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.64	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.34	N/A	feet
Restrictor Plate Height Above Pipe Invert =	7.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.35	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	5.41	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.41 feet
Spillway Crest Length =	1000.00	feet	Stage at Top of Freeboard =	6.82 feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	11.17 acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	30.74 acre-ft

Calculated Parameters for Spillway

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

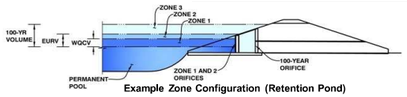
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	2.857	15.232	9.666	13.530	18.103	26.856	34.525	43.759	68.877
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	9.666	13.530	18.103	26.856	34.525	43.759	68.877
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	2.1	11.6	50.4	158.6	234.8	332.2	584.8
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.06	0.25	0.78	1.16	1.63	2.88
Peak Inflow Q (cfs) =	N/A	N/A	173.4	241.1	322.4	498.4	641.1	810.7	1259.2
Peak Outflow Q (cfs) =	1.1	8.4	8.0	8.2	38.3	209.6	374.8	593.1	1087.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.7	0.8	1.3	1.6	1.8	1.9
Structure Controlling Flow =	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	0.62	0.59	0.6	0.6	0.6	0.6	0.6	0.6
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	54	49	53	55	51	47	44	35
Time to Drain 99% of Inflow Volume (hours) =	**40**	60	53	58	62	60	59	57	52
Maximum Ponding Depth (ft) =	3.43	5.40	4.59	5.08	5.46	5.57	5.66	5.75	5.92
Area at Maximum Ponding Depth (acres) =	3.25	9.92	6.70	8.55	10.14	10.67	10.86	10.88	10.93
Maximum Volume Stored (acre-ft) =	2.862	15.236	8.463	12.191	15.738	16.986	17.851	18.829	20.683

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: DP 256 (Basins 256), EURV



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	93.66	acres
Watershed Length =	5,038	ft
Watershed Length to Centroid =	2,923	ft
Watershed Slope =	0.032	ft/ft
Watershed Imperviousness =	43.82%	percent
Percentage Hydrologic Soil Group A =	20.0%	percent
Percentage Hydrologic Soil Group B =	80.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.889 acre-feet	0.889	acre-feet
Excess Urban Runoff Volume (EURV) =	4.385 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	2.474 acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	3.534 acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	5.037 acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	8.893 acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	12.163 acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	16.441 acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	27.609 acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	2.263 acre-feet		
Approximate 5-yr Detention Volume =	3.250 acre-feet		
Approximate 10-yr Detention Volume =	4.637 acre-feet		
Approximate 25-yr Detention Volume =	6.114 acre-feet		
Approximate 50-yr Detention Volume =	7.095 acre-feet		
Approximate 100-yr Detention Volume =	8.730 acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.889	acre-feet
Zone 2 Volume (EURV - Zone 1) =	3.496	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	4.345	acre-feet
Total Detention Basin Volume =	8.730	acre-feet
Initial Surcharge Volume (ISV) =	116	ft^3
Initial Surcharge Depth (ISD) =	0.50	ft
Total Available Detention Depth (H_{total}) =	6.50	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.009	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Initial Surcharge Area (A_{ISV}) =	232	ft^2
Surcharge Volume Length (L_{ISV}) =	15.2	ft
Surcharge Volume Width (W_{ISV}) =	15.2	ft
Depth of Basin Floor (H_{FLOOR}) =	4.80	ft
Length of Basin Floor (L_{FLOOR}) =	567.8	ft
Width of Basin Floor (W_{FLOOR}) =	281.9	ft
Area of Basin Floor (A_{FLOOR}) =	160,062	ft^2
Volume of Basin Floor (V_{FLOOR}) =	266,228	ft^3
Depth of Main Basin (H_{MAIN}) =	0.70	ft
Length of Main Basin (L_{MAIN}) =	573.4	ft
Width of Main Basin (W_{MAIN}) =	287.5	ft
Area of Main Basin (A_{MAIN}) =	164,851	ft^2
Volume of Main Basin (V_{MAIN}) =	113,715	ft^3
Calculated Total Basin Volume (V_{total}) =	**8.728**	acre-feet

Depth Increment = 0.25 ft

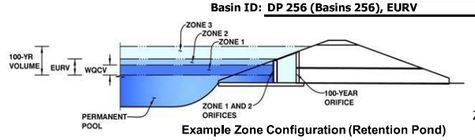
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		15.2	15.2	232		0.005		
ISV	0.50		15.2	15.2	232		0.005	116	0.003
	0.75		15.2	15.2	232		0.005	174	0.004
	1.00		15.2	15.2	232		0.005	232	0.005
	1.25		44.0	29.1	1,282		0.029	405	0.009
	1.50		72.8	43.0	3,132		0.072	940	0.022
	1.75		101.6	56.9	5,781		0.133	2,038	0.047
	2.00		130.4	70.8	9,229		0.212	3,897	0.089
	2.25		159.1	84.7	13,476		0.309	6,719	0.154
	2.50		187.9	98.6	18,523		0.425	10,702	0.246
	2.75		216.7	112.5	24,370		0.559	16,047	0.368
	3.00		245.5	126.4	31,016		0.712	22,953	0.527
	3.25		274.2	140.2	38,461		0.883	31,621	0.726
Zone 1 (WQCV)	3.43		295.0	150.2	44,316		1.017	39,065	0.897
	3.50		303.0	154.1	46,705		1.072	42,250	0.970
	3.75		331.8	168.0	55,749		1.280	55,041	1.264
	4.00		360.6	181.9	65,592		1.506	70,192	1.611
	4.25		389.4	195.8	76,235		1.750	87,903	2.018
	4.50		418.1	209.7	87,677		2.013	108,376	2.488
	4.75		446.9	223.6	99,918		2.294	131,808	3.026
	5.00		475.7	237.5	112,959		2.593	158,402	3.636
	5.25		504.5	251.4	126,799		2.911	188,355	4.324
Zone 2 (EURV)	5.28		507.9	253.0	128,514		2.950	192,184	4.412
	5.50		533.2	265.2	141,439		3.247	221,868	5.093
	5.75		562.0	279.1	156,878		3.601	259,141	5.949
Floor	5.80		567.8	281.9	160,062		3.675	267,064	6.131
	6.00		569.4	283.5	161,424		3.706	299,213	6.869
	6.25		571.4	285.5	163,133		3.745	339,782	7.800
Zone 3 (100-year)	6.50		573.4	287.5	164,851		3.784	380,780	8.742
	6.75		575.4	289.5	166,577		3.824	422,208	9.693
	7.00		577.4	291.5	168,311		3.864	464,069	10.654
	7.25		579.4	293.5	170,053		3.904	506,364	11.625
	7.50		581.4	295.5	171,802		3.944	549,096	12.606
	7.75		583.4	297.5	173,560		3.984	592,266	13.597
	8.00		585.4	299.5	175,326		4.025	635,877	14.598
	8.25		587.4	301.5	177,100		4.066	679,930	15.609
	8.50		589.4	303.5	178,881		4.107	724,427	16.631
	8.75		591.4	305.5	180,671		4.148	769,371	17.662
	9.00		593.4	307.5	182,469		4.189	814,764	18.704
	9.25		595.4	309.5	184,275		4.230	860,606	19.757
	9.50		597.4	311.5	186,089		4.272	906,902	20.820
	9.75		599.4	313.5	187,910		4.314	953,651	21.893
	10.00		601.4	315.5	189,740		4.356	1,000,857	22.977
	10.25		603.4	317.5	191,578		4.398	1,048,522	24.071
	10.50		605.4	319.5	193,424		4.440	1,096,647	25.176
	10.75		607.4	321.5	195,277		4.483	1,145,234	26.291
	11.00		609.4	323.5	197,139		4.526	1,194,286	27.417
	11.25		611.4	325.5	199,009		4.569	1,243,805	28.554
	11.50		613.4	327.5	200,887		4.612	1,293,791	29.701
	11.75		615.4	329.5	202,772		4.655	1,344,249	30.860
	12.00		617.4	331.5	204,666		4.698	1,395,178	32.029
	12.25		619.4	333.5	206,568		4.742	1,446,582	33.209
	12.50		621.4	335.5	208,478		4.786	1,498,463	34.400
	12.75		623.4	337.5	210,396		4.830	1,550,822	35.602
	13.00		625.4	339.5	212,321		4.874	1,603,661	36.815
	13.25		627.4	341.5	214,255		4.919	1,656,983	38.039
	13.50		629.4	343.5	216,197		4.963	1,710,790	39.274
	13.75		631.4	345.5	218,147		5.008	1,765,082	40.521
	14.00		633.4	347.5	220,104		5.053	1,819,864	41.778
	14.25		635.4	349.5	222,070		5.098	1,875,135	43.047
	14.50		637.4	351.5	224,044		5.143	1,930,899	44.327
	14.75		639.4	353.5	226,026		5.189	1,987,158	45.619
	15.00		641.4	355.5	228,015		5.235	2,043,913	46.922
	15.25		643.4	357.5	230,013		5.280	2,101,166	48.236
	15.50		645.4	359.5	232,019		5.326	2,158,920	49.562
	15.75		647.4	361.5	234,033		5.373	2,217,177	50.899
	16.00		649.4	363.5	236,055		5.419	2,275,937	52.248
	16.25		651.4	365.5	238,084		5.466	2,335,204	53.609
	16.50		653.4	367.5	240,122		5.512	2,394,980	54.981
	16.75		655.4	369.5	242,168		5.559	2,455,266	56.365
	17.00		657.4	371.5	244,222		5.607	2,516,065	57.761
	17.25		659.4	373.5	246,283		5.654	2,577,378	59.168
	17.50		661.4	375.5	248,353		5.701	2,639,207	60.588
	17.75		663.4	377.5	250,431		5.749	2,701,555	62.019
	18.00		665.4	379.5	252,517		5.797	2,764,423	63.462
	18.25		667.4	381.5	254,611		5.845	2,827,814	64.918
	18.50		669.4	383.5	256,712		5.893	2,891,729	66.385
	18.75		671.4	385.5	258,822		5.942	2,956,171	67.864
	19.00		673.4	387.5	260,940		5.990	3,021,141	69.356
	19.25		675.4	389.5	263,066		6.039	3,086,641	70.860
	19.50		677.4	391.5	265,199		6.088	3,152,674	72.375
	19.75		679.4	393.5	267,341		6.137	3,219,242	73.904
	20.00		681.4	395.5	269,491		6.187	3,286,346	75.444
	20.25		683.4	397.5	271,649		6.236	3,353,988	76.997
	20.50		685.4	399.5	273,814		6.286	3,422,171	78.562
	20.75		687.4	401.5	275,988		6.336	3,490,896	80.140
	21.00		689.4	403.5	278,170		6.386	3,560,165	81.730
	21.25		691.4	405.5	280,360		6.436	3,629,981	83.333
	21.50		693.4	407.5	282,558		6.487	3,700,346	84.948
	21.75		695.4	409.5	284,763		6.537	3,771,261	86.576
	22.00		697.4	411.5	286,977		6.588	3,842,728	88.217
	22.25		699.4	413.5	289,199		6.639	3,914,750	89.870
	22.50		701.4	415.5	291,429		6.690	3,987,328	91.536
	22.75		703.4	417.5	293,666		6.742	4,060,465	93.215
	23.00		705.4	419.5	295,912		6.793	4,134,162	94.907
	23.25		707.4	421.5	298,166		6.845	4,208,422	96.612
	23.50		709.4	423.5	300,428		6.897	4,283,246	98.330
	23.75		711.4	425.5	302,698		6.949	4,358,636	100.061
	24.00		713.4	427.5	304,975		7.001	4,434,595	101.804

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: DP 256 (Basins 256), EURV



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.43	0.889	Orifice Plate
Zone 2 (EURV)	5.28	3.496	Weir&Pipe (Restrict)
Zone 3 (100-year)	6.50	4.345	Not Utilized
Total (all zones)		8.730	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	1.646E-02 ft^2
Depth at top of Zone using Orifice Plate =	3.43	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A feet
Orifice Plate: Orifice Vertical Spacing =	13.70	inches	Elliptical Slot Centroid =	N/A feet
Orifice Plate: Orifice Area per Row =	2.37	sq. inches (diameter = 1-3/4 inches)	Elliptical Slot Area =	N/A ft^2

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.14	2.29					
Orifice Area (sq. inches)	2.37	2.37	2.37					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

Calculated Parameters for Vertical Orifice

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected			Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.43	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.43	N/A	feet
Overflow Weir Front Edge Length =	4.00	N/A	feet	Overflow Weir Slope Length =	4.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	71.57	N/A	
Horiz. Length of Weir Sides =	4.00	N/A	feet	Overflow Grate Open Area w/o Debris =	11.14	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	5.57	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Restrictor	Not Selected			Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.16	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.13	N/A	feet
Restrictor Plate Height Above Pipe Invert =	2.58		inches	Half-Central Angle of Restrictor Plate on Pipe =	0.78	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	5.30	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.15 feet
Spillway Crest Length =	1000.00	feet	Stage at Top of Freeboard =	6.45 feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	3.78 acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	8.55 acre-ft

Calculated Parameters for Spillway

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

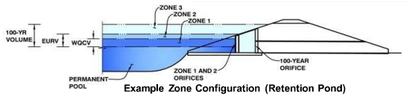
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	0.889	4.385	2.474	3.534	5.037	8.893	12.163	16.441	27.609
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	2.474	3.534	5.037	8.893	12.163	16.441	27.609
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.4	0.8	7.0	37.6	60.0	90.6	165.3
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.01	0.08	0.40	0.64	0.97	1.76
Peak Inflow Q (cfs) =	N/A	N/A	22.9	33.0	48.1	96.4	131.9	177.5	292.6
Peak Outflow Q (cfs) =	0.4	2.1	1.9	2.0	5.5	68.8	121.8	197.8	316.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	2.4	0.8	1.8	2.0	2.2	1.9
Structure Controlling Flow =	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	0.14	0.14	0.1	0.1	0.1	0.1	0.1	0.1
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	55	48	52	57	51	47	42	30
Time to Drain 99% of Inflow Volume (hours) =	**40**	60	51	57	64	61	59	56	51
Maximum Ponding Depth (ft) =	3.43	5.28	4.31	4.79	5.31	5.38	5.42	5.46	5.52
Area at Maximum Ponding Depth (acres) =	1.02	2.95	1.80	2.34	2.99	3.07	3.12	3.19	3.27
Maximum Volume Stored (acre-ft) =	0.897	4.412	2.107	3.119	4.501	4.683	4.807	4.965	5.159

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: DP 263 (Basins 264+268), 100-yr Flood Control Only



Example Zone Configuration (Retention Pond)

Depth Increment = 0.25 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft²)	Optional Override Area (ft²)	Area (acre)	Volume (ft³)	Volume (ac-ft)
Media Surface	0.00		207.9	103.9	21,608		0.496		
	0.25		209.9	105.9	22,236		0.510	5,480	0.126
	0.50		211.9	107.9	22,871		0.525	11,118	0.255
	0.75		213.9	109.9	23,515		0.540	16,917	0.388
	1.00		215.9	111.9	24,166		0.555	22,876	0.525
	1.25		217.9	113.9	24,826		0.570	29,000	0.666
	1.50		219.9	115.9	25,494		0.585	35,290	0.810
	1.75		221.9	117.9	26,169		0.601	41,748	0.958
	2.00		223.9	119.9	26,853		0.616	48,376	1.111
	2.25		225.9	121.9	27,545		0.632	55,175	1.267
	2.50		227.9	123.9	28,244		0.648	62,149	1.427
	2.75		229.9	125.9	28,952		0.665	69,298	1.591
	3.00		231.9	127.9	29,668		0.681	76,625	1.759
	3.25		233.9	129.9	30,391		0.698	84,133	1.931
	3.50		235.9	131.9	31,123		0.714	91,822	2.108
	3.75		237.9	133.9	31,863		0.731	99,695	2.289
	4.00		239.9	135.9	32,610		0.749	107,754	2.474
	4.25		241.9	137.9	33,366		0.766	116,000	2.663
	4.50		243.9	139.9	34,130		0.784	124,437	2.857
	4.75		245.9	141.9	34,901		0.801	133,066	3.055
	5.00		247.9	143.9	35,681		0.819	141,889	3.257
	5.25		249.9	145.9	36,469		0.837	150,907	3.464
	5.50		251.9	147.9	37,264		0.855	160,123	3.676
	5.75		253.9	149.9	38,068		0.874	169,540	3.892
	6.00		255.9	151.9	38,879		0.893	179,158	4.113
	6.25		257.9	153.9	39,699		0.911	188,980	4.338
	6.50		259.9	155.9	40,527		0.930	199,008	4.569
	6.75		261.9	157.9	41,362		0.950	209,244	4.804
	7.00		263.9	159.9	42,206		0.969	219,690	5.043
	7.25		265.9	161.9	43,058		0.988	230,348	5.288
	7.50		267.9	163.9	43,917		1.008	241,220	5.538
	7.75		269.9	165.9	44,785		1.028	252,307	5.792
	8.00		271.9	167.9	45,661		1.048	263,613	6.052
	8.25		273.9	169.9	46,544		1.069	275,138	6.316
	8.50		275.9	171.9	47,436		1.089	286,886	6.586
	8.75		277.9	173.9	48,336		1.110	298,857	6.861
	9.00		279.9	175.9	49,243		1.130	311,054	7.141
	9.25		281.9	177.9	50,159		1.151	323,479	7.426
	9.50		283.9	179.9	51,083		1.173	336,134	7.717
	9.75		285.9	181.9	52,014		1.194	349,021	8.012
	10.00		287.9	183.9	52,954		1.216	362,142	8.314
	10.25		289.9	185.9	53,902		1.237	375,499	8.620
	10.50		291.9	187.9	54,857		1.259	389,094	8.932
	10.75		293.9	189.9	55,821		1.281	402,928	9.250
	11.00		295.9	191.9	56,793		1.304	417,005	9.573
	11.25		297.9	193.9	57,772		1.326	431,325	9.902
	11.50		299.9	195.9	58,760		1.349	445,892	10.236
	11.75		301.9	197.9	59,755		1.372	460,706	10.576
	12.00		303.9	199.9	60,759		1.395	475,770	10.922
	12.25		305.9	201.9	61,771		1.418	491,086	11.274
	12.50		307.9	203.9	62,790		1.441	506,656	11.631
	12.75		309.9	205.9	63,818		1.465	522,482	11.995
	13.00		311.9	207.9	64,854		1.489	538,566	12.364
	13.25		313.9	209.9	65,897		1.513	554,909	12.739
	13.50		315.9	211.9	66,949		1.537	571,515	13.120
	13.75		317.9	213.9	68,009		1.561	588,385	13.507
	14.00		319.9	215.9	69,076		1.586	605,520	13.901
	14.25		321.9	217.9	70,152		1.610	622,924	14.300
	14.50		323.9	219.9	71,236		1.635	640,597	14.706
	14.75		325.9	221.9	72,327		1.660	658,542	15.118
Zone 1 (100-year)	14.97		327.6	223.7	73,295		1.683	674,560	15.486
	15.00		327.9	223.9	73,427		1.686	676,761	15.536
	15.25		329.9	225.9	74,535		1.711	695,256	15.961
	15.50		331.9	227.9	75,650		1.737	714,029	16.392
	15.75		333.9	229.9	76,774		1.762	733,082	16.829
	16.00		335.9	231.9	77,906		1.788	752,417	17.273
	16.25		337.9	233.9	79,045		1.815	772,035	17.723
	16.50		339.9	235.9	80,193		1.841	791,940	18.180
	16.75		341.9	237.9	81,349		1.868	812,133	18.644
	17.00		343.9	239.9	82,512		1.894	832,615	19.114
	17.25		345.9	241.9	83,684		1.921	853,389	19.591
	17.50		347.9	243.9	84,863		1.948	874,458	20.075
	17.75		349.9	245.9	86,051		1.975	895,822	20.565
	18.00		351.9	247.9	87,247		2.003	917,484	21.063
	18.25		353.9	249.9	88,450		2.031	939,446	21.567
	18.50		355.9	251.9	89,662		2.058	961,710	22.078
	18.75		357.9	253.9	90,882		2.086	984,277	22.596
	19.00		359.9	255.9	92,109		2.115	1,007,151	23.121
	19.25		361.9	257.9	93,345		2.143	1,030,333	23.653
	19.50		363.9	259.9	94,589		2.171	1,053,824	24.192
	19.75		365.9	261.9	95,840		2.200	1,077,628	24.739
	20.00		367.9	263.9	97,100		2.229	1,101,745	25.293
	20.25		369.9	265.9	98,368		2.258	1,126,178	25.854
	20.50		371.9	267.9	99,643		2.287	1,150,930	26.422
	20.75		373.9	269.9	100,927		2.317	1,176,001	26.997
	21.00		375.9	271.9	102,219		2.347	1,201,394	27.580
	21.25		377.9	273.9	103,518		2.376	1,227,111	28.171
	21.50		379.9	275.9	104,826		2.406	1,253,154	28.768
	21.75		381.9	277.9	106,142		2.437	1,279,524	29.374
	22.00		383.9	279.9	107,465		2.467	1,306,225	29.987
	22.25		385.9	281.9	108,797		2.498	1,333,258	30.607
	22.50		387.9	283.9	110,137		2.528	1,360,624	31.236
	22.75		389.9	285.9	111,484		2.559	1,388,327	31.872
	23.00		391.9	287.9	112,840		2.590	1,416,367	32.515
	23.25		393.9	289.9	114,203		2.622	1,444,747	33.167
	23.50		395.9	291.9	115,575		2.653	1,473,469	33.826
	23.75		397.9	293.9	116,955		2.685	1,502,535	34.493
	24.00		399.9	295.9	118,342		2.717	1,531,947	35.169
	24.25		401.9	297.9	119,738		2.749	1,561,707	35.852

Watershed Information — **Flood Control Only**

Selected BMP Type =	No BMP	
Watershed Area =	127.34	acres
Watershed Length =	3,476	ft
Watershed Length to Centroid =	1,780	ft
Watershed Slope =	0.021	ft/ft
Watershed Imperviousness =	62.03%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	96.7%	percent
Percentage Hydrologic Soil Groups C/D =	3.3%	percent
Target WQCV Drain Time =	N/A	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	1.548 acre-feet	1.548	acre-feet
Excess Urban Runoff Volume (EURV) =	8.559 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	0.000 acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	0.000 acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	0.000 acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	0.000 acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	0.000 acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	0.000 acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	0.000 acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	4.739 acre-feet		
Approximate 5-yr Detention Volume =	6.682 acre-feet		
Approximate 10-yr Detention Volume =	9.148 acre-feet		
Approximate 25-yr Detention Volume =	11.540 acre-feet		
Approximate 50-yr Detention Volume =	13.141 acre-feet		
Approximate 100-yr Detention Volume =	15.481 acre-feet		

Define Zones and Basin Geometry

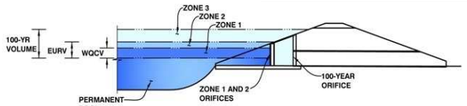
Zone 1 Volume (100-year) =	15.481	acre-feet
Select Zone 2 Storage Volume (Optional) =		acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	15.481	acre-feet
Initial Surcharge Volume (ISV) =	N/A	ft³
Initial Surcharge Depth (ISD) =	N/A	ft
Total Available Detention Depth (H_{total}) =	15.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.010	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	
Initial Surcharge Area (A_{ISV}) =	0	ft²
Surcharge Volume Length (L_{ISV}) =	0.0	ft
Surcharge Volume Width (W_{ISV}) =	0.0	ft
Depth of Basin Floor (H_{FLOOR}) =	0.00	ft
Length of Basin Floor (L_{FLOOR}) =	207.9	ft
Width of Basin Floor (W_{FLOOR}) =	103.9	ft
Area of Basin Floor (A_{FLOOR}) =	21,608	ft²
Volume of Basin Floor (V_{FLOOR}) =	0	ft³
Depth of Main Basin (H_{MAIN}) =	15.00	ft
Length of Main Basin (L_{MAIN}) =	327.9	ft
Width of Main Basin (W_{MAIN}) =	223.9	ft
Area of Main Basin (A_{MAIN}) =	73,427	ft²
Volume of Main Basin (V_{MAIN}) =	674,335	ft³
Calculated Total Basin Volume (V_{total}) =	**15.481**	acre-feet

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: DP 263 (Basins 264+268), 100-yr Flood Control Only



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (100-year)	14.97	15.481	Rectangular Orifice
Zone 2			
Zone 3			
Total (all zones)		15.481	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A ft²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	N/A	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A ft²
Depth at top of Zone using Orifice Plate =	N/A	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A ft²

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (optional)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 1 Rectangular	Not Selected		Calculated Parameters for Vertical Orifice: Zone 1 Rectangular	Not Selected
Invert of Vertical Orifice =	0.00		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	10.42 ft²
Depth at top of Zone using Vertical Orifice =	14.97		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	1.04 feet
Vertical Orifice Height =	25.00		inches		
Vertical Orifice Width =	60.00		inches		

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Not Selected	Not Selected		Calculated Parameters for Overflow Weir: Not Selected	Not Selected
Overflow Weir Front Edge Height, Ho =			ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	feet
Overflow Weir Front Edge Length =			feet	Overflow Weir Slope Length =	feet
Overflow Weir Grate Slope =			H:V	Grate Open Area / 100-yr Orifice Area =	
Horiz. Length of Weir Sides =			feet	Overflow Grate Open Area w/o Debris =	ft²
Overflow Grate Type =				Overflow Grate Open Area w/ Debris =	ft²
Debris Clogging % =			%		

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Not Selected	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate: Not Selected	Not Selected
Depth to Invert of Outlet Pipe =			ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	ft²
Circular Orifice Diameter =			inches	Outlet Orifice Centroid =	feet
				Half-Central Angle of Restrictor Plate on Pipe =	N/A N/A radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway	
Spillway Invert Stage=		ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	feet
Spillway Crest Length =		feet	Stage at Top of Freeboard =	feet
Spillway End Slopes =		H:V	Basin Area at Top of Freeboard =	acres
Freeboard above Max Water Surface =		feet	Basin Volume at Top of Freeboard =	acre-ft

Routed Hydrograph Results — *The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).*

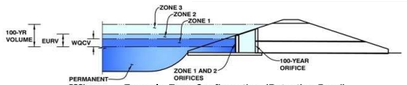
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	1.548	8.559	0.000	0.000	0.000	0.000	0.000	0.000	0.000
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	5.137	7.186	9.863	15.284	19.941	19.230	41.170
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Peak Inflow Q (cfs) =	N/A	N/A	78.0	109.6	152.1	249.4	327.8	299.3	664.4
Peak Outflow Q (cfs) =	58.0	148.3	54.8	70.5	88.7	125.8	146.4	137.2	208.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	N/A	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Structure Controlling Flow =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	4	2	3	3	3	3	3	3	3
Time to Drain 99% of Inflow Volume (hours) =	**10**	3	5	5	4	4	3	6	4
Maximum Ponding Depth (ft) =	2.69	10.21	2.23	3.02	4.17	7.33	9.56	8.52	18.33
Area at Maximum Ponding Depth (acres) =	0.66	1.23	0.63	0.68	0.76	0.99	1.18	1.09	2.04
Maximum Volume Stored (acre-ft) =	1.551	8.571	1.254	1.766	2.602	5.367	7.775	6.597	21.730

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: DP 263 (Basins 264+268), EURV



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	127.34	acres
Watershed Length =	3,476	ft
Watershed Length to Centroid =	1,780	ft
Watershed Slope =	0.021	ft/ft
Watershed Imperviousness =	62.03%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	96.7%	percent
Percentage Hydrologic Soil Groups C/D =	3.3%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	1.548 acre-feet	1.548	acre-feet
Excess Urban Runoff Volume (EURV) =	8.559 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	5.137 acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	7.186 acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	9.863 acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	15.284 acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	19.941 acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	25.699 acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	41.170 acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	4.739 acre-feet		
Approximate 5-yr Detention Volume =	6.682 acre-feet		
Approximate 10-yr Detention Volume =	9.148 acre-feet		
Approximate 25-yr Detention Volume =	11.540 acre-feet		
Approximate 50-yr Detention Volume =	13.141 acre-feet		
Approximate 100-yr Detention Volume =	15.481 acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.548	acre-feet
Zone 2 Volume (EURV - Zone 1) =	7.011	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	6.922	acre-feet
Total Detention Basin Volume =	15.481	acre-feet
Initial Surcharge Volume (ISV) =	202	ft^3
Initial Surcharge Depth (ISD) =	0.50	ft
Total Available Detention Depth (H_{total}) =	6.50	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.006	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Initial Surcharge Area (A_{ISV}) =	405	ft^2
Surcharge Volume Length (L_{ISV}) =	20.1	ft
Surcharge Volume Width (W_{ISV}) =	20.1	ft
Depth of Basin Floor (H_{FLOOR}) =	3.70	ft
Length of Basin Floor (L_{FLOOR}) =	651.6	ft
Width of Basin Floor (W_{FLOOR}) =	328.4	ft
Area of Basin Floor (A_{FLOOR}) =	214,010	ft^2
Volume of Basin Floor (V_{FLOOR}) =	275,921	ft^3
Depth of Main Basin (H_{MAIN}) =	1.80	ft
Length of Main Basin (L_{MAIN}) =	666.0	ft
Width of Main Basin (W_{MAIN}) =	342.8	ft
Area of Main Basin (A_{MAIN}) =	228,330	ft^2
Volume of Main Basin (V_{MAIN}) =	398,037	ft^3
Calculated Total Basin Volume (V_{total}) =	**15.481**	acre-feet

Depth Increment = 0.25 ft

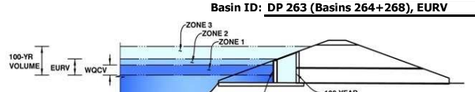
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		20.1	20.1	405		0.009		
ISV	0.50		20.1	20.1	405		0.009	202	0.005
	0.75		20.1	20.1	405		0.009	303	0.007
	1.00		20.1	20.1	405		0.009	405	0.009
	1.25		62.8	40.9	2,571		0.059	739	0.017
	1.50		105.4	61.8	6,515		0.150	1,838	0.042
	1.75		148.1	82.6	12,236		0.281	4,145	0.095
	2.00		190.8	103.4	19,736		0.453	8,104	0.186
	2.25		233.4	124.3	29,013		0.666	14,161	0.325
	2.50		276.1	145.1	40,068		0.920	22,759	0.522
	2.75		318.8	165.9	52,901		1.214	34,343	0.788
	3.00		361.4	186.8	67,512		1.550	49,358	1.133
Zone 1 (WQCV)	3.25		404.1	207.6	83,900		1.926	68,247	1.567
	3.50		446.8	228.4	102,066		2.343	91,456	2.100
	3.75		489.4	249.3	122,010		2.801	119,428	2.742
	4.00		532.1	270.1	143,732		3.300	152,609	3.503
	4.25		574.8	290.9	167,231		3.839	191,442	4.395
	4.50		617.4	311.8	192,508		4.419	236,373	5.426
Floor	4.70		651.6	328.4	214,010		4.913	277,006	6.359
	4.75		652.0	328.8	214,402		4.922	287,716	6.605
	5.00		654.0	330.8	216,368		4.967	341,562	7.841
Zone 2 (EURV)	5.15		655.2	332.0	217,551		4.994	374,106	8.588
	5.25		656.0	332.8	218,342		5.012	395,901	9.089
	5.50		658.0	334.8	220,323		5.058	450,734	10.347
	5.75		660.0	336.8	222,313		5.104	506,063	11.618
	6.00		662.0	338.8	224,311		5.149	561,891	12.899
	6.25		664.0	340.8	226,316		5.196	618,219	14.192
Zone 3 (100-year)	6.50		666.0	342.8	228,330		5.242	675,050	15.497
	6.75		668.0	344.8	230,352		5.288	732,385	16.813
	7.00		670.0	346.8	232,381		5.335	790,226	18.141
	7.25		672.0	348.8	234,419		5.382	848,576	19.481
	7.50		674.0	350.8	236,465		5.428	907,436	20.832
	7.75		676.0	352.8	238,518		5.476	966,809	22.195
	8.00		678.0	354.8	240,580		5.523	1,026,696	23.570
	8.25		680.0	356.8	242,650		5.570	1,087,100	24.956
	8.50		682.0	358.8	244,727		5.618	1,148,022	26.355
	8.75		684.0	360.8	246,813		5.666	1,209,464	27.765
	9.00		686.0	362.8	248,907		5.714	1,271,429	29.188
	9.25		688.0	364.8	251,008		5.762	1,333,918	30.623
	9.50		690.0	366.8	253,118		5.811	1,396,933	32.069
	9.75		692.0	368.8	255,236		5.859	1,460,477	33.528
	10.00		694.0	370.8	257,361		5.908	1,524,552	34.999
	10.25		696.0	372.8	259,495		5.957	1,589,159	36.482
	10.50		698.0	374.8	261,637		6.006	1,654,300	37.978
	10.75		700.0	376.8	263,786		6.056	1,719,978	39.485
	11.00		702.0	378.8	265,944		6.105	1,786,194	41.005
	11.25		704.0	380.8	268,109		6.155	1,852,950	42.538
	11.50		706.0	382.8	270,283		6.205	1,920,249	44.083
	11.75		708.0	384.8	272,465		6.255	1,988,092	45.640
	12.00		710.0	386.8	274,654		6.305	2,056,482	47.210
	12.25		712.0	388.8	276,852		6.356	2,125,420	48.793
	12.50		714.0	390.8	279,058		6.406	2,194,909	50.388
	12.75		716.0	392.8	281,271		6.457	2,264,950	51.996
	13.00		718.0	394.8	283,493		6.508	2,335,545	53.617
	13.25		720.0	396.8	285,723		6.559	2,406,697	55.250
	13.50		722.0	398.8	287,960		6.611	2,478,407	56.896
	13.75		724.0	400.8	290,206		6.662	2,550,678	58.556
	14.00		726.0	402.8	292,460		6.714	2,623,511	60.228
	14.25		728.0	404.8	294,721		6.766	2,696,909	61.913
	14.50		730.0	406.8	296,991		6.818	2,770,872	63.610
	14.75		732.0	408.8	299,269		6.870	2,845,405	65.322
	15.00		734.0	410.8	301,554		6.923	2,920,507	67.046
	15.25		736.0	412.8	303,848		6.975	2,996,183	68.783
	15.50		738.0	414.8	306,150		7.028	3,072,432	70.533
	15.75		740.0	416.8	308,459		7.081	3,149,258	72.297
	16.00		742.0	418.8	310,777		7.134	3,226,662	74.074
	16.25		744.0	420.8	313,103		7.188	3,304,647	75.864
	16.50		746.0	422.8	315,436		7.241	3,383,214	77.668
	16.75		748.0	424.8	317,778		7.295	3,462,366	79.485
	17.00		750.0	426.8	320,128		7.349	3,542,104	81.316
	17.25		752.0	428.8	322,485		7.403	3,622,431	83.160
	17.50		754.0	430.8	324,851		7.458	3,703,347	85.017
	17.75		756.0	432.8	327,225		7.512	3,784,857	86.888
	18.00		758.0	434.8	329,606		7.567	3,866,960	88.773
	18.25		760.0	436.8	331,996		7.622	3,949,660	90.672
	18.50		762.0	438.8	334,394		7.677	4,032,959	92.584
	18.75		764.0	440.8	336,799		7.732	4,116,858	94.510
	19.00		766.0	442.8	339,213		7.787	4,201,359	96.450
	19.25		768.0	444.8	341,635		7.843	4,286,465	98.404
	19.50		770.0	446.8	344,064		7.899	4,372,177	100.371
	19.75		772.0	448.8	346,502		7.955	4,458,498	102.353
	20.00		774.0	450.8	348,947		8.011	4,545,429	104.349
	20.25		776.0	452.8	351,401		8.067	4,632,972	106.358
	20.50		778.0	454.8	353,863		8.124	4,721,130	108.382
	20.75		780.0	456.8	356,332		8.180	4,809,904	110.420
	21.00		782.0	458.8	358,810		8.237	4,899,297	112.472
	21.25		784.0	460.8	361,296		8.294	4,989,310	114.539
	21.50		786.0	462.8	363,789		8.351	5,079,945	116.620
	21.75		788.0	464.8	366,291		8.409	5,171,205	118.715
	22.00		790.0	466.8	368,801		8.467	5,263,092	120.824
	22.25		792.0	468.8	371,318		8.524	5,355,606	122.948
	22.50		794.0	470.8	373,844		8.582	5,448,752	125.086
	22.75		796.0	472.8	376,378		8.640	5,542,529	127.239
	23.00		798.0	474.8	378,919		8.699	5,636,941	129.406
	23.25		800.0	476.8	381,469		8.757	5,731,989	131.588
	23.50		802.0	478.8	384,027		8.816	5,827,676	133.785
	23.75		804.0	480.8	386,592		8.875	5,924,003	135.996
	24.00		806.0	482.8	389,166		8.934	6,020,973	138.223
	24.25		808.0	484.8	391,748		8.993	6,118,587	140.463

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: DP 263 (Basins 264+268), EURV



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.25	1.548	Orifice Plate
Zone 2 (EURV)	5.15	7.011	Weir&Pipe (Restrict)
Zone 3 (100-year)	6.50	6.922	Not Utilized
Total (all zones)		15.481	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	2.910E-02	ft^2
Depth at top of Zone using Orifice Plate =	3.25	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	13.00	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	4.19	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.08	2.17					
Orifice Area (sq. inches)	4.19	4.19	4.19					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected		Calculated Parameters for Vertical Orifice	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected		Calculated Parameters for Overflow Weir	Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.25	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.25	N/A	feet
Overflow Weir Front Edge Length =	4.00	N/A	feet	Overflow Weir Slope Length =	4.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	32.23	N/A	
Horiz. Length of Weir Sides =	4.00	N/A	feet	Overflow Grate Open Area w/o Debris =	11.14	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	5.57	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.35	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.22	N/A	feet
Restrictor Plate Height Above Pipe Invert =	4.50		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.05	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=	5.16	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.26	feet
Spillway Crest Length =	1000.00	feet	Stage at Top of Freeboard =	6.42	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	5.23	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	15.08	acre-ft

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

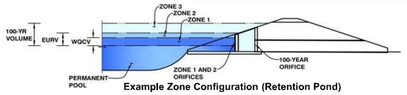
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	1.548	8.559	5.137	7.186	9.863	15.284	19.941	25.699	41.170
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	5.137	7.186	9.863	15.284	19.941	25.699	41.170
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	1.1	2.8	24.0	85.4	128.3	184.2	325.2
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.02	0.19	0.67	1.01	1.45	2.55
Peak Inflow Q (cfs) =	N/A	N/A	78.0	109.6	152.1	249.4	327.8	418.8	664.4
Peak Outflow Q (cfs) =	0.6	4.5	4.3	4.4	18.4	138.1	236.1	366.8	686.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.6	0.8	1.6	1.8	2.0	2.1
Structure Controlling Flow =	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	0.33	0.32	0.3	0.3	0.3	0.3	0.3	0.3
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	53	48	52	55	50	47	43	32
Time to Drain 99% of Inflow Volume (hours) =	**40**	60	53	57	62	60	58	56	52
Maximum Ponding Depth (ft) =	3.25	5.15	4.27	4.72	5.19	5.29	5.34	5.40	5.53
Area at Maximum Ponding Depth (acres) =	1.93	4.99	3.88	4.92	5.00	5.02	5.03	5.04	5.06
Maximum Volume Stored (acre-ft) =	1.567	8.588	4.472	6.457	8.738	9.239	9.540	9.843	10.499

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: Basin 514+518 (DP 510) 100-yr Flood Control Only



Example Zone Configuration (Retention Pond)

Depth Increment = 0.25 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft²)	Optional Override Area (ft²)	Area (acre)	Volume (ft³)	Volume (ac-ft)
Media Surface	0.00		240.6	120.3	28,943		0.664		
	0.25		242.6	122.3	29,669		0.681	7,326	0.168
	0.50		244.6	124.3	30,402		0.698	14,835	0.341
	0.75		246.6	126.3	31,144		0.715	22,528	0.517
	1.00		248.6	128.3	31,894		0.732	30,408	0.698
	1.25		250.6	130.3	32,652		0.750	38,476	0.883
	1.50		252.6	132.3	33,417		0.767	46,734	1.073
	1.75		254.6	134.3	34,191		0.785	55,185	1.267
	2.00		256.6	136.3	34,973		0.803	63,830	1.465
	2.25		258.6	138.3	35,763		0.821	72,672	1.668
	2.50		260.6	140.3	36,561		0.839	81,713	1.876
	2.75		262.6	142.3	37,366		0.858	90,953	2.088
	3.00		264.6	144.3	38,180		0.876	100,396	2.305
	3.25		266.6	146.3	39,002		0.895	110,044	2.526
	3.50		268.6	148.3	39,832		0.914	119,898	2.752
	3.75		270.6	150.3	40,670		0.934	129,961	2.983
	4.00		272.6	152.3	41,515		0.953	140,234	3.219
	4.25		274.6	154.3	42,369		0.973	150,719	3.460
	4.50		276.6	156.3	43,231		0.992	161,419	3.706
	4.75		278.6	158.3	44,101		1.012	172,335	3.956
	5.00		280.6	160.3	44,978		1.033	183,470	4.212
	5.25		282.6	162.3	45,864		1.053	194,825	4.473
	5.50		284.6	164.3	46,758		1.073	206,402	4.738
	5.75		286.6	166.3	47,660		1.094	218,205	5.009
	6.00		288.6	168.3	48,570		1.115	230,233	5.285
	6.25		290.6	170.3	49,487		1.136	242,490	5.567
	6.50		292.6	172.3	50,413		1.157	254,977	5.853
	6.75		294.6	174.3	51,347		1.179	267,697	6.145
	7.00		296.6	176.3	52,289		1.200	280,652	6.443
	7.25		298.6	178.3	53,238		1.222	293,842	6.746
	7.50		300.6	180.3	54,196		1.244	307,271	7.054
	7.75		302.6	182.3	55,162		1.266	320,941	7.368
	8.00		304.6	184.3	56,136		1.289	334,853	7.687
	8.25		306.6	186.3	57,118		1.311	349,010	8.012
	8.50		308.6	188.3	58,107		1.334	363,413	8.343
	8.75		310.6	190.3	59,105		1.357	378,064	8.679
	9.00		312.6	192.3	60,111		1.380	392,966	9.021
	9.25		314.6	194.3	61,125		1.403	408,120	9.369
	9.50		316.6	196.3	62,147		1.427	423,529	9.723
	9.75		318.6	198.3	63,176		1.450	439,194	10.083
	10.00		320.6	200.3	64,214		1.474	455,118	10.448
	10.25		322.6	202.3	65,260		1.498	471,302	10.820
	10.50		324.6	204.3	66,314		1.522	487,748	11.197
	10.75		326.6	206.3	67,375		1.547	504,459	11.581
	11.00		328.6	208.3	68,445		1.571	521,437	11.971
	11.25		330.6	210.3	69,523		1.596	538,683	12.366
	11.50		332.6	212.3	70,609		1.621	556,199	12.769
	11.75		334.6	214.3	71,703		1.646	573,988	13.177
	12.00		336.6	216.3	72,804		1.671	592,051	13.592
	12.25		338.6	218.3	73,914		1.697	610,390	14.013
	12.50		340.6	220.3	75,032		1.722	629,009	14.440
	12.75		342.6	222.3	76,158		1.748	647,907	14.874
	13.00		344.6	224.3	77,291		1.774	667,088	15.314
	13.25		346.6	226.3	78,433		1.801	686,553	15.761
	13.50		348.6	228.3	79,583		1.827	706,305	16.215
	13.75		350.6	230.3	80,741		1.854	726,346	16.675
	14.00		352.6	232.3	81,907		1.880	746,676	17.141
	14.25		354.6	234.3	83,080		1.907	767,300	17.615
	14.50		356.6	236.3	84,262		1.934	788,217	18.095
	14.75		358.6	238.3	85,452		1.962	809,431	18.582
Zone 1 (100-year)	14.98		360.4	240.1	86,554		1.987	829,212	19.036
	15.00		360.6	240.3	86,650		1.989	830,944	19.076
	15.25		362.6	242.3	87,856		2.017	852,757	19.577
	15.50		364.6	244.3	89,069		2.045	874,872	20.084
	15.75		366.6	246.3	90,291		2.073	897,292	20.599
	16.00		368.6	248.3	91,521		2.101	920,019	21.121
	16.25		370.6	250.3	92,759		2.129	943,053	21.650
	16.50		372.6	252.3	94,004		2.158	966,399	22.185
	16.75		374.6	254.3	95,258		2.187	990,056	22.729
	17.00		376.6	256.3	96,520		2.216	1,014,028	23.279
	17.25		378.6	258.3	97,790		2.245	1,038,317	23.836
	17.50		380.6	260.3	99,068		2.274	1,062,924	24.401
	17.75		382.6	262.3	100,353		2.304	1,087,851	24.974
	18.00		384.6	264.3	101,647		2.333	1,113,101	25.553
	18.25		386.6	266.3	102,949		2.363	1,138,676	26.140
	18.50		388.6	268.3	104,259		2.393	1,164,576	26.735
	18.75		390.6	270.3	105,576		2.424	1,190,806	27.337
	19.00		392.6	272.3	106,902		2.454	1,217,365	27.947
	19.25		394.6	274.3	108,236		2.485	1,244,257	28.564
	19.50		396.6	276.3	109,578		2.516	1,271,484	29.189
	19.75		398.6	278.3	110,928		2.547	1,299,047	29.822
	20.00		400.6	280.3	112,285		2.578	1,326,948	30.463
	20.25		402.6	282.3	113,651		2.609	1,355,190	31.111
	20.50		404.6	284.3	115,025		2.641	1,383,775	31.767
	20.75		406.6	286.3	116,407		2.672	1,412,703	32.431
	21.00		408.6	288.3	117,797		2.704	1,441,979	33.103
	21.25		410.6	290.3	119,194		2.736	1,471,602	33.783
	21.50		412.6	292.3	120,600		2.769	1,501,577	34.471
	21.75		414.6	294.3	122,014		2.801	1,531,903	35.168
	22.00		416.6	296.3	123,436		2.834	1,562,584	35.872
	22.25		418.6	298.3	124,865		2.867	1,593,622	36.585
	22.50		420.6	300.3	126,303		2.900	1,625,018	37.305
	22.75		422.6	302.3	127,749		2.933	1,656,774	38.034
	23.00		424.6	304.3	129,203		2.966	1,688,893	38.772
	23.25		426.6	306.3	130,665		3.000	1,721,376	39.517
	23.50		428.6	308.3	132,134		3.033	1,754,226	40.271
	23.75		430.6	310.3	133,612		3.067	1,787,444	41.034
	24.00		432.6	312.3	135,098		3.101	1,821,032	41.805
	24.25		434.6	314.3	136,592		3.136	1,854,993	42.585

Watershed Information

Flood Control Only

Selected BMP Type =	No BMP	
Watershed Area =	168.27	acres
Watershed Length =	4,897	ft
Watershed Length to Centroid =	2,411	ft
Watershed Slope =	0.025	ft/ft
Watershed Imperviousness =	56.60%	percent
Percentage Hydrologic Soil Group A =	16.7%	percent
Percentage Hydrologic Soil Group B =	65.4%	percent
Percentage Hydrologic Soil Groups C/D =	17.9%	percent
Target WQCV Drain Time =	N/A	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	1.895	acre-feet	1.895	acre-feet
Excess Urban Runoff Volume (EURV) =	10.253	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	6.081	acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	8.538	acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	11.775	acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	18.872	acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	24.947	acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	32.613	acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	53.041	acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	5.582	acre-feet		
Approximate 5-yr Detention Volume =	7.980	acre-feet		
Approximate 10-yr Detention Volume =	10.733	acre-feet		
Approximate 25-yr Detention Volume =	13.822	acre-feet		
Approximate 50-yr Detention Volume =	15.898	acre-feet		
Approximate 100-yr Detention Volume =	19.016	acre-feet		

Define Zones and Basin Geometry

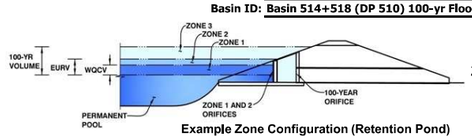
Zone 1 Volume (100-year) =	19.016	acre-feet
Select Zone 2 Storage Volume (Optional) =		acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	19.016	acre-feet
Initial Surcharge Volume (ISV) =	N/A	ft^3
Initial Surcharge Depth (ISD) =	N/A	ft
Total Available Detention Depth (H_{total}) =	15.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.010	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	
Initial Surcharge Area (A_{ISV}) =	0	ft^2
Surcharge Volume Length (L_{ISV}) =	0.0	ft
Surcharge Volume Width (W_{ISV}) =	0.0	ft
Depth of Basin Floor (H_{FLOOR}) =	0.00	ft
Length of Basin Floor (L_{FLOOR}) =	240.6	ft
Width of Basin Floor (W_{FLOOR}) =	120.3	ft
Area of Basin Floor (A_{FLOOR}) =	28,943	ft^2
Volume of Basin Floor (V_{FLOOR}) =	0	ft^3
Depth of Main Basin (H_{MAIN}) =	15.00	ft
Length of Main Basin (L_{MAIN}) =	360.6	ft
Width of Main Basin (W_{MAIN}) =	240.3	ft
Area of Main Basin (A_{MAIN}) =	86,650	ft^2
Volume of Main Basin (V_{MAIN}) =	828,357	ft^3
Calculated Total Basin Volume (V_{total}) =	**19.016**	acre-feet

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: Basin 514+518 (DP 510) 100-yr Flood Control Only



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (100-year)	14.98	19.016	Rectangular Orifice
Zone 2			
Zone 3			
Total (all zones)		19.016	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	N/A	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	N/A	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (optional)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 1 Rectangular	Not Selected		Zone 1 Rectangular	Not Selected	
Invert of Vertical Orifice =	0.00		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	17.50		ft^2
Depth at top of Zone using Vertical Orifice =	14.98		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	1.75		feet
Vertical Orifice Height =	42.00		inches				
Vertical Orifice Width =	60.00		inches				

Calculated Parameters for Vertical Orifice

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Not Selected	Not Selected			Not Selected	Not Selected	
Overflow Weir Front Edge Height, Ho =			ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =			feet
Overflow Weir Front Edge Length =			feet	Overflow Weir Slope Length =			feet
Overflow Weir Grate Slope =			H:V	Grate Open Area / 100-yr Orifice Area =			
Horiz. Length of Weir Sides =			feet	Overflow Grate Open Area w/o Debris =			ft^2
Overflow Grate Type =				Overflow Grate Open Area w/ Debris =			ft^2
Debris Clogging % =			%				

Calculated Parameters for Overflow Weir

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Not Selected	Not Selected			Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =			ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =			ft^2
Circular Orifice Diameter =			inches	Outlet Orifice Centroid =			feet
				Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=		ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	feet
Spillway Crest Length =		feet	Stage at Top of Freeboard =	feet
Spillway End Slopes =		H:V	Basin Area at Top of Freeboard =	acres
Freeboard above Max Water Surface =		feet	Basin Volume at Top of Freeboard =	acre-ft

Calculated Parameters for Spillway

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

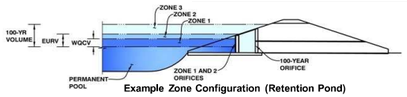
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	1.895	10.253	6.081	8.538	11.775	18.872	24.947	32.613	53.041
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	6.081	8.538	11.775	18.872	24.947	24.913	53.041
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	1.1	2.0	20.3	89.3	138.8	205.2	368.1
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.01	0.12	0.53	0.82	1.22	2.19
Peak Inflow Q (cfs) =	N/A	N/A	79.6	111.7	156.4	272.8	361.7	380.9	752.9
Peak Outflow Q (cfs) =	52.4	231.7	52.1	76.9	111.7	173.6	210.1	208.4	325.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	38.3	5.5	1.9	1.5	1.0	0.9
Structure Controlling Flow =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	ertical Orifice
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	7	2	4	4	3	3	3	3	3
Time to Drain 99% of Inflow Volume (hours) =	**16**	5	8	7	6	4	4	7	4
Maximum Ponding Depth (ft) =	2.53	9.87	2.30	2.85	3.51	6.00	7.97	7.87	16.68
Area at Maximum Ponding Depth (acres) =	0.84	1.46	0.82	0.87	0.91	1.11	1.29	1.28	2.18
Maximum Volume Stored (acre-ft) =	1.901	10.257	1.709	2.174	2.752	5.274	7.636	7.508	22.554

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: Basin 514+518 (DP 513) EURV-LID



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	168.27	acres
Watershed Length =	4,897	ft
Watershed Length to Centroid =	2,411	ft
Watershed Slope =	0.025	ft/ft
Watershed Imperviousness =	56.60%	percent
Percentage Hydrologic Soil Group A =	16.7%	percent
Percentage Hydrologic Soil Group B =	65.4%	percent
Percentage Hydrologic Soil Groups C/D =	17.9%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	1.895 acre-feet	1.895	acre-feet
Excess Urban Runoff Volume (EURV) =	10.253 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	6.081 acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	8.538 acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	11.775 acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	18.872 acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	24.947 acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	32.613 acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	53.041 acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	5.582 acre-feet		
Approximate 5-yr Detention Volume =	7.980 acre-feet		
Approximate 10-yr Detention Volume =	10.733 acre-feet		
Approximate 25-yr Detention Volume =	13.822 acre-feet		
Approximate 50-yr Detention Volume =	15.898 acre-feet		
Approximate 100-yr Detention Volume =	19.016 acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.895	acre-feet
Zone 2 Volume (EURV - Zone 1) =	8.358	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	8.764	acre-feet
Total Detention Basin Volume =	19.016	acre-feet
Initial Surcharge Volume (ISV) =	248	ft^3
Initial Surcharge Depth (ISD) =	0.50	ft
Total Available Detention Depth (H_{total}) =	6.50	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.006	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	
Initial Surcharge Area (A_{ISV}) =	495	ft^2
Surcharge Volume Length (L_{ISV}) =	22.3	ft
Surcharge Volume Width (W_{ISV}) =	22.3	ft
Depth of Basin Floor (H_{FLOOR}) =	4.66	ft
Length of Basin Floor (L_{FLOOR}) =	817.6	ft
Width of Basin Floor (W_{FLOOR}) =	410.6	ft
Area of Basin Floor (A_{FLOOR}) =	335,681	ft^2
Volume of Basin Floor (V_{FLOOR}) =	542,223	ft^3
Depth of Main Basin (H_{MAIN}) =	0.84	ft
Length of Main Basin (L_{MAIN}) =	824.3	ft
Width of Main Basin (W_{MAIN}) =	417.3	ft
Area of Main Basin (A_{MAIN}) =	343,979	ft^2
Volume of Main Basin (V_{MAIN}) =	285,450	ft^3
Calculated Total Basin Volume (V_{total}) =	**19.012**	acre-feet

Depth Increment = 0.25 ft

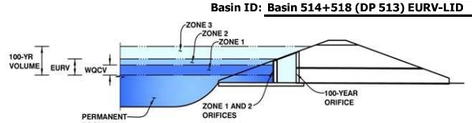
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		22.3	22.3	495		0.011		
ISV	0.50		22.3	22.3	495		0.011	248	0.006
	0.75		22.3	22.3	495		0.011	371	0.009
	1.00		22.3	22.3	495		0.011	495	0.011
	1.25		64.9	43.1	2,797		0.064	870	0.020
	1.50		107.6	63.9	6,877		0.158	2,042	0.047
	1.75		150.3	84.8	12,735		0.292	4,457	0.102
	2.00		192.9	105.6	20,370		0.468	8,558	0.196
	2.25		235.6	126.4	29,783		0.684	14,790	0.340
	2.50		278.3	147.3	40,974		0.941	23,598	0.542
	2.75		320.9	168.1	53,943		1.238	35,425	0.813
	3.00		363.6	188.9	68,690		1.577	50,717	1.164
	3.25		406.3	209.8	85,214		1.956	69,918	1.605
Zone 1 (WQCV)	3.40		431.9	222.3	95,982		2.203	83,500	1.917
	3.50		448.9	230.6	103,516		2.376	93,472	2.146
	3.75		491.6	251.4	123,596		2.837	121,824	2.797
	4.00		534.3	272.3	145,453		3.339	155,418	3.568
	4.25		576.9	293.1	169,089		3.882	194,699	4.470
	4.50		619.6	313.9	194,502		4.465	240,111	5.512
	4.75		662.3	334.8	221,693		5.089	292,098	6.706
	5.00		704.9	355.6	250,662		5.754	351,106	8.060
	5.25		747.6	376.4	281,408		6.460	417,577	9.586
Zone 2 (EURV)	5.36		766.4	385.6	295,500		6.784	449,304	10.315
	5.50		790.3	397.3	313,933		7.207	491,958	11.294
Floor	5.66		817.6	410.6	335,681		7.706	543,917	12.487
	5.75		818.3	411.3	336,566		7.726	574,168	13.181
	6.00		820.3	413.3	339,029		7.783	658,618	15.120
	6.25		822.3	415.3	341,500		7.840	743,684	17.073
Zone 3 (100-year)	6.50		824.3	417.3	343,979		7.897	829,368	19.040
	6.75		826.3	419.3	346,467		7.954	915,674	21.021
	7.00		828.3	421.3	348,962		8.011	1,002,602	23.017
	7.25		830.3	423.3	351,465		8.069	1,090,155	25.027
	7.50		832.3	425.3	353,976		8.126	1,178,335	27.051
	7.75		834.3	427.3	356,495		8.184	1,267,144	29.090
	8.00		836.3	429.3	359,022		8.242	1,356,584	31.143
	8.25		838.3	431.3	361,558		8.300	1,446,656	33.211
	8.50		840.3	433.3	364,101		8.359	1,537,363	35.293
	8.75		842.3	435.3	366,652		8.417	1,628,707	37.390
	9.00		844.3	437.3	369,211		8.476	1,720,690	39.502
	9.25		846.3	439.3	371,778		8.535	1,813,313	41.628
	9.50		848.3	441.3	374,354		8.594	1,906,580	43.769
	9.75		850.3	443.3	376,937		8.653	2,000,491	45.925
	10.00		852.3	445.3	379,528		8.713	2,095,049	48.096
	10.25		854.3	447.3	382,127		8.772	2,190,255	50.281
	10.50		856.3	449.3	384,734		8.832	2,286,113	52.482
	10.75		858.3	451.3	387,349		8.892	2,382,623	54.698
	11.00		860.3	453.3	389,973		8.953	2,479,788	56.928
	11.25		862.3	455.3	392,604		9.013	2,577,610	59.174
	11.50		864.3	457.3	395,243		9.074	2,676,091	61.435
	11.75		866.3	459.3	397,890		9.134	2,775,232	63.711
	12.00		868.3	461.3	400,545		9.195	2,875,037	66.002
	12.25		870.3	463.3	403,209		9.256	2,975,506	68.308
	12.50		872.3	465.3	405,880		9.318	3,076,642	70.630
	12.75		874.3	467.3	408,559		9.379	3,178,446	72.967
	13.00		876.3	469.3	411,246		9.441	3,280,922	75.320
	13.25		878.3	471.3	413,941		9.503	3,384,070	77.688
	13.50		880.3	473.3	416,644		9.565	3,487,893	80.071
	13.75		882.3	475.3	419,356		9.627	3,592,393	82.470
	14.00		884.3	477.3	422,075		9.690	3,697,571	84.885
	14.25		886.3	479.3	424,802		9.752	3,803,431	87.315
	14.50		888.3	481.3	427,537		9.815	3,909,973	89.761
	14.75		890.3	483.3	430,280		9.878	4,017,200	92.222
	15.00		892.3	485.3	433,031		9.941	4,125,114	94.700
	15.25		894.3	487.3	435,791		10.004	4,233,716	97.193
	15.50		896.3	489.3	438,558		10.068	4,343,010	99.702
	15.75		898.3	491.3	441,333		10.132	4,452,996	102.227
	16.00		900.3	493.3	444,116		10.196	4,563,677	104.768
	16.25		902.3	495.3	446,907		10.260	4,675,055	107.324
	16.50		904.3	497.3	449,707		10.324	4,787,131	109.897
	16.75		906.3	499.3	452,514		10.388	4,899,909	112.486
	17.00		908.3	501.3	455,329		10.453	5,013,389	115.092
	17.25		910.3	503.3	458,152		10.518	5,127,574	117.713
	17.50		912.3	505.3	460,983		10.583	5,242,466	120.350
	17.75		914.3	507.3	463,822		10.648	5,358,066	123.004
	18.00		916.3	509.3	466,670		10.713	5,474,378	125.674
	18.25		918.3	511.3	469,525		10.779	5,591,402	128.361
	18.50		920.3	513.3	472,388		10.845	5,709,141	131.064
	18.75		922.3	515.3	475,259		10.910	5,827,596	133.783
	19.00		924.3	517.3	478,138		10.977	5,946,771	136.519
	19.25		926.3	519.3	481,026		11.043	6,066,666	139.271
	19.50		928.3	521.3	483,921		11.109	6,187,284	142.041
	19.75		930.3	523.3	486,824		11.176	6,308,627	144.826
	20.00		932.3	525.3	489,735		11.243	6,430,697	147.628
	20.25		934.3	527.3	492,654		11.310	6,553,495	150.448
	20.50		936.3	529.3	495,581		11.377	6,677,025	153.283
	20.75		938.3	531.3	498,517		11.444	6,801,287	156.136
	21.00		940.3	533.3	501,460		11.512	6,926,284	159.006
	21.25		942.3	535.3	504,411		11.580	7,052,017	161.892
	21.50		944.3	537.3	507,370		11.648	7,178,490	164.795
	21.75		946.3	539.3	510,337		11.716	7,305,703	167.716
	22.00		948.3	541.3	513,313		11.784	7,433,659	170.653
	22.25		950.3	543.3	516,296		11.853	7,562,360	173.608
	22.50		952.3	545.3	519,287		11.921	7,691,808	176.580
	22.75		954.3	547.3	522,286		11.990	7,822,004	179.569
	23.00		956.3	549.3	525,293		12.059	7,952,951	182.575
	23.25		958.3	551.3	528,308		12.128	8,084,651	185.598
	23.50		960.3	553.3	531,332		12.198	8,217,106	188.639
	23.75		962.3	555.3	534,363		12.267	8,350,318	191.697
	24.00		964.3	557.3	537,402		12.337	8,484,288	194.772

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: Basin 514+518 (DP 513) EURV-LID



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.40	1.895	Orifice Plate
Zone 2 (EURV)	5.36	8.358	Weir&Pipe (Restrict)
Zone 3 (100-year)	6.50	8.764	Not Utilized
Total (all zones)		19.016	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	3.514E-02 ft^2
Depth at top of Zone using Orifice Plate =	3.40	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A feet
Orifice Plate: Orifice Vertical Spacing =	12.40	inches	Elliptical Slot Centroid =	N/A feet
Orifice Plate: Orifice Area per Row =	5.06	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A ft^2

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.13	2.27					
Orifice Area (sq. inches)	5.06	5.06	5.06					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected			Calculated Parameters for Vertical Orifice	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =		N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =		N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches					

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected			Calculated Parameters for Overflow Weir	Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.40	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =		3.40	N/A	feet
Overflow Weir Front Edge Length =	4.00	N/A	feet	Overflow Weir Slope Length =		4.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =		27.80	N/A	
Horiz. Length of Weir Sides =	4.00	N/A	feet	Overflow Grate Open Area w/o Debris =		11.14	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =		5.57	N/A	ft^2
Debris Clogging % =	50%	N/A	%					

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Restrictor	Not Selected			Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =		0.40	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =		0.25	N/A	feet
Restrictor Plate Height Above Pipe Invert =	5.00		inches	Half-Central Angle of Restrictor Plate on Pipe =		1.11	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	5.37	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.29 feet
Spillway Crest Length =	1000.00	feet	Stage at Top of Freeboard =	6.66 feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	7.93 acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	20.31 acre-ft

Calculated Parameters for Spillway

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

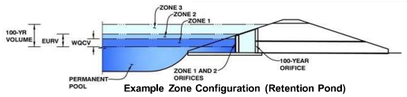
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	1.895	10.253	6.081	8.538	11.775	18.872	24.947	32.613	53.041
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	6.081	8.538	11.775	18.872	24.947	32.613	53.041
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	1.1	2.0	20.3	89.3	138.8	205.2	368.1
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.01	0.12	0.53	0.82	1.22	2.19
Peak Inflow Q (cfs) =	N/A	N/A	79.6	111.7	156.4	272.8	361.7	470.6	752.9
Peak Outflow Q (cfs) =	0.7	5.3	5.0	5.2	16.3	146.0	256.2	388.5	755.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	2.6	0.8	1.6	1.8	1.9	2.1
Structure Controlling Flow =	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	0.38	0.37	0.4	0.4	0.4	0.4	0.4	0.4
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	54	49	52	56	51	47	43	32
Time to Drain 99% of Inflow Volume (hours) =	**40**	60	53	57	63	61	59	57	52
Maximum Ponding Depth (ft) =	3.40	5.36	4.45	4.93	5.39	5.50	5.56	5.62	5.77
Area at Maximum Ponding Depth (acres) =	2.20	6.78	4.32	5.54	6.87	7.18	7.39	7.58	7.73
Maximum Volume Stored (acre-ft) =	1.917	10.315	5.249	7.609	10.519	11.222	11.732	12.181	13.258

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: DP 614 (Basins 614), EURV



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	100.31	acres
Watershed Length =	3,204	ft
Watershed Length to Centroid =	1,742	ft
Watershed Slope =	0.036	ft/ft
Watershed Imperviousness =	52.38%	percent
Percentage Hydrologic Soil Group A =	43.8%	percent
Percentage Hydrologic Soil Group B =	54.4%	percent
Percentage Hydrologic Soil Groups C/D =	1.8%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	1.068 acre-feet	1.068	acre-feet
Excess Urban Runoff Volume (EURV) =	5.845 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	3.178 acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	4.503 acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	5.945 acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	9.935 acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	13.374 acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	17.935 acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	29.726 acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	2.955 acre-feet		
Approximate 5-yr Detention Volume =	4.159 acre-feet		
Approximate 10-yr Detention Volume =	5.666 acre-feet		
Approximate 25-yr Detention Volume =	7.556 acre-feet		
Approximate 50-yr Detention Volume =	8.865 acre-feet		
Approximate 100-yr Detention Volume =	10.706 acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.068	acre-feet
Zone 2 Volume (EURV - Zone 1) =	4.777	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	4.861	acre-feet
Total Detention Basin Volume =	10.706	acre-feet
Initial Surcharge Volume (ISV) =	140	ft^3
Initial Surcharge Depth (ISD) =	0.50	ft
Total Available Detention Depth (H_{total}) =	6.50	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.008	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Initial Surcharge Area (A_{ISV}) =	279	ft^2
Surcharge Volume Length (L_{ISV}) =	16.7	ft
Surcharge Volume Width (W_{ISV}) =	16.7	ft
Depth of Basin Floor (H_{FLOOR}) =	4.60	ft
Length of Basin Floor (L_{FLOOR}) =	610.1	ft
Width of Basin Floor (W_{FLOOR}) =	304.2	ft
Area of Basin Floor (A_{FLOOR}) =	185,599	ft^2
Volume of Basin Floor (V_{FLOOR}) =	296,050	ft^3
Depth of Main Basin (H_{MAIN}) =	0.90	ft
Length of Main Basin (L_{MAIN}) =	617.3	ft
Width of Main Basin (W_{MAIN}) =	311.4	ft
Area of Main Basin (A_{MAIN}) =	192,234	ft^2
Volume of Main Basin (V_{MAIN}) =	170,016	ft^3
Calculated Total Basin Volume (V_{total}) =	**10.706**	acre-feet

Depth Increment = 0.25 ft

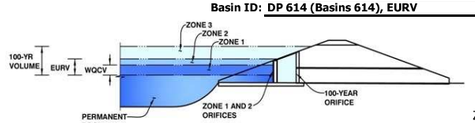
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		16.7	16.7	279		0.006		
ISV	0.50		16.7	16.7	279		0.006	140	0.003
	0.75		16.7	16.7	279		0.006	209	0.005
	1.00		16.7	16.7	279		0.006	279	0.006
	1.25		49.0	32.3	1,583		0.036	491	0.011
	1.50		81.2	48.0	3,894		0.089	1,155	0.027
	1.75		113.5	63.6	7,214		0.166	2,522	0.058
	2.00		145.7	79.2	11,541		0.265	4,845	0.111
	2.25		178.0	94.8	16,876		0.387	8,377	0.192
	2.50		210.2	110.5	23,219		0.533	13,368	0.307
	2.75		242.5	126.1	30,570		0.702	20,070	0.461
	3.00		274.7	141.7	38,928		0.894	28,736	0.660
	3.25		307.0	157.3	48,294		1.109	39,618	0.910
	3.50		339.2	173.0	58,668		1.347	52,967	1.216
Zone 1 (WQCV)	3.75		371.5	188.6	70,050		1.608	69,036	1.585
	4.00		403.7	204.2	82,440		1.893	88,077	2.022
	4.25		436.0	219.8	95,837		2.200	110,340	2.533
	4.50		468.2	235.5	110,243		2.531	136,079	3.124
	4.75		500.5	251.1	125,656		2.885	165,546	3.800
	5.00		532.7	266.7	142,077		3.262	198,991	4.568
	5.25		565.0	282.3	159,506		3.662	236,668	5.433
	5.50		597.2	298.0	177,942		4.085	278,828	6.401
	5.75		611.3	305.4	186,698		4.286	324,926	7.459
	6.00		613.3	307.4	188,535		4.328	371,830	8.536
Zone 2 (EURV)	6.03		613.5	307.6	188,756		4.333	377,489	8.666
	6.25		615.3	309.4	190,381		4.371	419,194	9.623
Floor	6.50		617.3	311.4	192,234		4.413	467,021	10.721
	6.75		619.3	313.4	194,095		4.456	515,312	11.830
	7.00		621.3	315.4	195,965		4.499	564,069	12.949
	7.25		623.3	317.4	197,842		4.542	613,295	14.079
Zone 3 (100-year)	7.29		623.6	317.7	198,143		4.549	621,215	14.261
	7.50		625.3	319.4	199,728		4.585	662,991	15.220
	7.75		627.3	321.4	201,621		4.629	713,159	16.372
	8.00		629.3	323.4	203,523		4.672	763,802	17.534
	8.25		631.3	325.4	205,432		4.716	814,921	18.708
	8.50		633.3	327.4	207,349		4.760	866,519	19.893
	8.75		635.3	329.4	209,275		4.804	918,597	21.088
	9.00		637.3	331.4	211,208		4.849	971,157	22.295
	9.25		639.3	333.4	213,150		4.893	1,024,201	23.512
	9.50		641.3	335.4	215,099		4.938	1,077,732	24.741
	9.75		643.3	337.4	217,057		4.983	1,131,752	25.981
	10.00		645.3	339.4	219,022		5.028	1,186,261	27.233
	10.25		647.3	341.4	220,995		5.073	1,241,263	28.495
	10.50		649.3	343.4	222,977		5.119	1,296,760	29.770
	10.75		651.3	345.4	224,966		5.165	1,352,752	31.055
	11.00		653.3	347.4	226,964		5.210	1,409,243	32.352
	11.25		655.3	349.4	228,969		5.256	1,466,235	33.660
	11.50		657.3	351.4	230,983		5.303	1,523,729	34.980
	11.75		659.3	353.4	233,004		5.349	1,581,727	36.311
	12.00		661.3	355.4	235,033		5.396	1,640,231	37.655
	12.25		663.3	357.4	237,071		5.442	1,699,244	39.009
	12.50		665.3	359.4	239,116		5.489	1,758,767	40.376
	12.75		667.3	361.4	241,170		5.536	1,818,803	41.754
	13.00		669.3	363.4	243,231		5.584	1,879,353	43.144
	13.25		671.3	365.4	245,301		5.631	1,940,419	44.546
	13.50		673.3	367.4	247,378		5.679	2,002,004	45.960
	13.75		675.3	369.4	249,463		5.727	2,064,109	47.385
	14.00		677.3	371.4	251,557		5.775	2,126,736	48.823
	14.25		679.3	373.4	253,658		5.823	2,189,888	50.273
	14.50		681.3	375.4	255,768		5.872	2,253,566	51.735
	14.75		683.3	377.4	257,885		5.920	2,317,772	53.209
	15.00		685.3	379.4	260,011		5.969	2,382,509	54.695
	15.25		687.3	381.4	262,144		6.018	2,447,778	56.193
	15.50		689.3	383.4	264,285		6.067	2,513,582	57.704
	15.75		691.3	385.4	266,435		6.117	2,579,922	59.227
	16.00		693.3	387.4	268,592		6.166	2,646,800	60.762
	16.25		695.3	389.4	270,758		6.216	2,714,219	62.310
	16.50		697.3	391.4	272,931		6.266	2,782,180	63.870
	16.75		699.3	393.4	275,113		6.316	2,850,685	65.443
	17.00		701.3	395.4	277,302		6.366	2,919,736	67.028
	17.25		703.3	397.4	279,499		6.416	2,989,336	68.626
	17.50		705.3	399.4	281,705		6.467	3,059,487	70.236
	17.75		707.3	401.4	283,918		6.518	3,130,190	71.859
	18.00		709.3	403.4	286,140		6.569	3,201,447	73.495
	18.25		711.3	405.4	288,369		6.620	3,273,260	75.144
	18.50		713.3	407.4	290,607		6.671	3,345,632	76.805
	18.75		715.3	409.4	292,852		6.723	3,418,564	78.479
	19.00		717.3	411.4	295,105		6.775	3,492,059	80.167
	19.25		719.3	413.4	297,367		6.827	3,566,117	81.867
	19.50		721.3	415.4	299,636		6.879	3,640,743	83.580
	19.75		723.3	417.4	301,914		6.931	3,715,936	85.306
	20.00		725.3	419.4	304,199		6.983	3,791,700	87.045
	20.25		727.3	421.4	306,493		7.036	3,868,036	88.798
	20.50		729.3	423.4	308,794		7.089	3,944,947	90.564
	20.75		731.3	425.4	311,103		7.142	4,022,434	92.342
	21.00		733.3	427.4	313,421		7.195	4,100,499	94.135
	21.25		735.3	429.4	315,746		7.249	4,179,145	95.940
	21.50		737.3	431.4	318,080		7.302	4,258,373	97.759
	21.75		739.3	433.4	320,421		7.356	4,338,186	99.591
	22.00		741.3	435.4	322,771		7.410	4,418,585	101.437
	22.25		743.3	437.4	325,128		7.464	4,499,572	103.296
	22.50		745.3	439.4	327,493		7.518	4,581,149	105.169
	22.75		747.3	441.4	329,867		7.573	4,663,319	107.055
	23.00		749.3	443.4	332,248		7.627	4,746,083	108.955
	23.25		751.3	445.4	334,638		7.682	4,829,444	110.869
	23.50		753.3	447.4	337,035		7.737	4,913,403	112.796
	23.75		755.3	449.4	339,441		7.792	4,997,962	114.737
	24.00		757.3	451.4	341,854		7.848	5,083,124	116.692
	24.25		759.3	453.4	344,275		7.903	5,168,890	118.661

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: DP 614 (Basins 614), EURV



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.39	1.068	Orifice Plate
Zone 2 (EURV)	5.36	4.777	Weir&Pipe (Restrict)
Zone 3 (100-year)	6.50	4.861	Weir&Pipe (Restrict)
Total (all zones)		10.706	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	1.979E-02 ft^2
Depth at top of Zone using Orifice Plate =	3.39	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A feet
Orifice Plate: Orifice Vertical Spacing =	13.60	inches	Elliptical Slot Centroid =	N/A feet
Orifice Plate: Orifice Area per Row =	2.85	sq. inches (diameter = 1-7/8 inches)	Elliptical Slot Area =	N/A ft^2

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.13	2.26					
Orifice Area (sq. inches)	2.85	2.85	2.85					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected			Calculated Parameters for Vertical Orifice	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =		N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =		N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches					

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Zone 3 Weir			Calculated Parameters for Overflow Weir	Zone 2 Weir	Zone 3 Weir	
Overflow Weir Front Edge Height, Ho =	3.39	5.36	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =		3.39		feet
Overflow Weir Front Edge Length =	4.00		feet	Overflow Weir Slope Length =		4.00		feet
Overflow Weir Grate Slope =	0.00		H:V	Grate Open Area / 100-yr Orifice Area =		52.41		
Horiz. Length of Weir Sides =	4.00		feet	Overflow Grate Open Area w/o Debris =		11.14		ft^2
Overflow Grate Type =	Type C Grate			Overflow Grate Open Area w/ Debris =		5.57		ft^2
Debris Clogging % =	50%		%					

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Restrictor	Zone 3 Restrictor			Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 2 Restrictor	Zone 3 Restrictor	
Depth to Invert of Outlet Pipe =	2.50		ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =		0.21		ft^2
Outlet Pipe Diameter =	18.00		inches	Outlet Orifice Centroid =		0.16		feet
Restrictor Plate Height Above Pipe Invert =	3.20		inches	Half-Central Angle of Restrictor Plate on Pipe =		0.87		radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	5.37	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.21 feet
Spillway Crest Length =	1000.00	feet	Stage at Top of Freeboard =	6.58 feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	4.43 acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	11.07 acre-ft

Calculated Parameters for Spillway

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

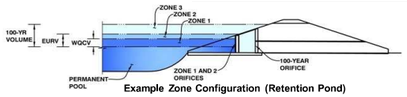
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	1.068	5.845	3.178	4.503	5.945	9.935	13.374	17.935	29.726
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	3.178	4.503	5.945	9.935	13.374	17.935	29.726
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.5	1.2	2.8	48.9	85.0	132.1	245.8
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.01	0.03	0.49	0.85	1.32	2.45
Peak Inflow Q (cfs) =	N/A	N/A	46.3	66.8	88.4	160.8	220.7	293.8	481.4
Peak Outflow Q (cfs) =	0.4	2.8	2.6	2.7	2.8	83.5	162.7	257.5	559.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	2.3	1.0	1.7	1.9	1.9	2.3
Structure Controlling Flow =	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	0.20	0.19	0.2	0.2	0.2	0.2	0.2	0.2
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	54	47	51	55	51	48	43	32
Time to Drain 99% of Inflow Volume (hours) =	**40**	60	51	56	61	61	59	57	52
Maximum Ponding Depth (ft) =	3.39	5.36	4.36	4.83	5.26	5.46	5.51	5.56	5.70
Area at Maximum Ponding Depth (acres) =	1.24	3.85	2.33	3.00	3.66	4.00	4.10	4.19	4.28
Maximum Volume Stored (acre-ft) =	1.074	5.846	2.760	4.036	5.433	6.199	6.442	6.649	7.202

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: DP 618 (Basins 618+622), 100-yr Flood Control Only



Example Zone Configuration (Retention Pond)

Depth Increment = 0.25 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft²)	Optional Override Area (ft²)	Area (acre)	Volume (ft³)	Volume (ac-ft)
Media Surface	0.00		265.0	132.5	35,105		0.806		
	0.25		267.0	134.5	35,904		0.824	8,876	0.204
	0.50		269.0	136.5	36,711		0.843	17,953	0.412
	0.75		271.0	138.5	37,526		0.861	27,232	0.625
	1.00		273.0	140.5	38,349		0.880	36,717	0.843
	1.25		275.0	142.5	39,180		0.899	46,407	1.065
	1.50		277.0	144.5	40,019		0.919	56,307	1.293
	1.75		279.0	146.5	40,866		0.938	66,418	1.525
	2.00		281.0	148.5	41,721		0.958	76,741	1.762
	2.25		283.0	150.5	42,584		0.978	87,279	2.004
	2.50		285.0	152.5	43,455		0.998	98,033	2.251
	2.75		287.0	154.5	44,333		1.018	109,007	2.502
	3.00		289.0	156.5	45,220		1.038	120,201	2.759
	3.25		291.0	158.5	46,115		1.059	131,617	3.022
	3.50		293.0	160.5	47,018		1.079	143,259	3.289
	3.75		295.0	162.5	47,929		1.100	155,127	3.561
	4.00		297.0	164.5	48,848		1.121	167,224	3.839
	4.25		299.0	166.5	49,775		1.143	179,552	4.122
	4.50		301.0	168.5	50,710		1.164	192,112	4.410
	4.75		303.0	170.5	51,653		1.186	204,907	4.704
	5.00		305.0	172.5	52,604		1.208	217,939	5.003
	5.25		307.0	174.5	53,563		1.230	231,210	5.308
	5.50		309.0	176.5	54,530		1.252	244,721	5.618
	5.75		311.0	178.5	55,504		1.274	258,475	5.934
	6.00		313.0	180.5	56,487		1.297	272,474	6.255
	6.25		315.0	182.5	57,478		1.320	286,720	6.582
	6.50		317.0	184.5	58,477		1.342	301,214	6.915
	6.75		319.0	186.5	59,484		1.366	315,959	7.253
	7.00		321.0	188.5	60,499		1.389	330,957	7.598
	7.25		323.0	190.5	61,522		1.412	346,209	7.948
	7.50		325.0	192.5	62,553		1.436	361,718	8.304
	7.75		327.0	194.5	63,592		1.460	377,486	8.666
	8.00		329.0	196.5	64,639		1.484	393,515	9.034
	8.25		331.0	198.5	65,694		1.508	409,806	9.408
	8.50		333.0	200.5	66,757		1.533	426,363	9.788
	8.75		335.0	202.5	67,828		1.557	443,185	10.174
	9.00		337.0	204.5	68,906		1.582	460,277	10.567
	9.25		339.0	206.5	69,993		1.607	477,639	10.965
	9.50		341.0	208.5	71,088		1.632	495,274	11.370
	9.75		343.0	210.5	72,191		1.657	513,184	11.781
	10.00		345.0	212.5	73,302		1.683	531,371	12.199
	10.25		347.0	214.5	74,421		1.708	549,836	12.622
	10.50		349.0	216.5	75,548		1.734	568,582	13.053
	10.75		351.0	218.5	76,683		1.760	587,610	13.490
	11.00		353.0	220.5	77,826		1.787	606,924	13.933
	11.25		355.0	222.5	78,977		1.813	626,524	14.383
	11.50		357.0	224.5	80,136		1.840	646,413	14.840
	11.75		359.0	226.5	81,303		1.866	666,592	15.303
	12.00		361.0	228.5	82,477		1.893	687,065	15.773
	12.25		363.0	230.5	83,660		1.921	707,832	16.250
	12.50		365.0	232.5	84,851		1.948	728,896	16.733
	12.75		367.0	234.5	86,050		1.975	750,258	17.224
	13.00		369.0	236.5	87,257		2.003	771,921	17.721
	13.25		371.0	238.5	88,472		2.031	793,887	18.225
	13.50		373.0	240.5	89,695		2.059	816,158	18.736
	13.75		375.0	242.5	90,926		2.087	838,736	19.255
	14.00		377.0	244.5	92,165		2.116	861,622	19.780
	14.25		379.0	246.5	93,412		2.144	884,819	20.313
	14.50		381.0	248.5	94,667		2.173	908,328	20.852
	14.75		383.0	250.5	95,930		2.202	932,153	21.399
Zone 1 (100-year)	14.98		384.8	252.3	97,099		2.229	954,351	21.909
	15.00		385.0	252.5	97,200		2.231	956,294	21.953
	15.25		387.0	254.5	98,479		2.261	980,754	22.515
	15.50		389.0	256.5	99,766		2.290	1,005,534	23.084
	15.75		391.0	258.5	101,061		2.320	1,030,637	23.660
	16.00		393.0	260.5	102,364		2.350	1,056,065	24.244
	16.25		395.0	262.5	103,675		2.380	1,081,820	24.835
	16.50		397.0	264.5	104,994		2.410	1,107,904	25.434
	16.75		399.0	266.5	106,321		2.441	1,134,318	26.040
	17.00		401.0	268.5	107,656		2.471	1,161,065	26.654
	17.25		403.0	270.5	108,999		2.502	1,188,146	27.276
	17.50		405.0	272.5	110,350		2.533	1,215,565	27.906
	17.75		407.0	274.5	111,709		2.564	1,243,322	28.543
	18.00		409.0	276.5	113,076		2.596	1,271,420	29.188
	18.25		411.0	278.5	114,450		2.627	1,299,860	29.841
	18.50		413.0	280.5	115,833		2.659	1,328,646	30.502
	18.75		415.0	282.5	117,224		2.691	1,357,778	31.170
	19.00		417.0	284.5	118,623		2.723	1,387,258	31.847
	19.25		419.0	286.5	120,030		2.756	1,417,090	32.532
	19.50		421.0	288.5	121,445		2.788	1,447,274	33.225
	19.75		423.0	290.5	122,868		2.821	1,477,813	33.926
	20.00		425.0	292.5	124,299		2.854	1,508,709	34.635
	20.25		427.0	294.5	125,738		2.887	1,539,963	35.353
	20.50		429.0	296.5	127,185		2.920	1,571,578	36.078
	20.75		431.0	298.5	128,640		2.953	1,603,556	36.813
	21.00		433.0	300.5	130,103		2.987	1,635,899	37.555
	21.25		435.0	302.5	131,573		3.021	1,668,608	38.306
	21.50		437.0	304.5	133,052		3.054	1,701,686	39.065
	21.75		439.0	306.5	134,539		3.089	1,735,135	39.833
	22.00		441.0	308.5	136,034		3.123	1,768,957	40.610
	22.25		443.0	310.5	137,537		3.157	1,803,153	41.395
	22.50		445.0	312.5	139,048		3.192	1,837,726	42.188
	22.75		447.0	314.5	140,567		3.227	1,872,677	42.991
	23.00		449.0	316.5	142,094		3.262	1,908,010	43.802
	23.25		451.0	318.5	143,629		3.297	1,943,725	44.622
	23.50		453.0	320.5	145,172		3.333	1,979,825	45.451
	23.75		455.0	322.5	146,723		3.368	2,016,312	46.288
	24.00		457.0	324.5	148,282		3.404	2,053,187	47.135
	24.25		459.0	326.5	149,848		3.440	2,090,453	47.990

Watershed Information — **Flood Control Only**

Selected BMP Type =	No BMP	
Watershed Area =	156.61	acres
Watershed Length =	5,600	ft
Watershed Length to Centroid =	3,528	ft
Watershed Slope =	0.021	ft/ft
Watershed Imperviousness =	75.29%	percent
Percentage Hydrologic Soil Group A =	15.0%	percent
Percentage Hydrologic Soil Group B =	22.8%	percent
Percentage Hydrologic Soil Groups C/D =	62.2%	percent
Target WQCV Drain Time =	N/A	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	2.358 acre-feet	2.358	acre-feet
Excess Urban Runoff Volume (EURV) =	12.426 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	7.863 acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	10.883 acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	14.442 acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	21.127 acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	27.025 acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	34.095 acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	53.368 acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	7.361 acre-feet		
Approximate 5-yr Detention Volume =	10.419 acre-feet		
Approximate 10-yr Detention Volume =	13.154 acre-feet		
Approximate 25-yr Detention Volume =	16.643 acre-feet		
Approximate 50-yr Detention Volume =	18.915 acre-feet		
Approximate 100-yr Detention Volume =	21.892 acre-feet		

Define Zones and Basin Geometry

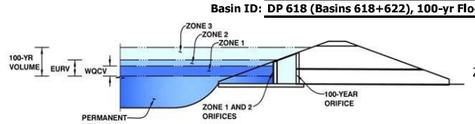
Zone 1 Volume (100-year) =	21.892	acre-feet
Select Zone 2 Storage Volume (Optional) =		acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	21.892	acre-feet
Initial Surcharge Volume (ISV) =	N/A	ft³
Initial Surcharge Depth (ISD) =	N/A	ft
Total Available Detention Depth (H_{total}) =	15.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.010	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	
Initial Surcharge Area (A_{ISV}) =	0	ft²
Surcharge Volume Length (L_{ISV}) =	0.0	ft
Surcharge Volume Width (W_{ISV}) =	0.0	ft
Depth of Basin Floor (H_{FLOOR}) =	0.00	ft
Length of Basin Floor (L_{FLOOR}) =	265.0	ft
Width of Basin Floor (W_{FLOOR}) =	132.5	ft
Area of Basin Floor (A_{FLOOR}) =	35,105	ft²
Volume of Basin Floor (V_{FLOOR}) =	0	ft³
Depth of Main Basin (H_{MAIN}) =	15.00	ft
Length of Main Basin (L_{MAIN}) =	385.0	ft
Width of Main Basin (W_{MAIN}) =	252.5	ft
Area of Main Basin (A_{MAIN}) =	97,200	ft²
Volume of Main Basin (V_{MAIN}) =	953,602	ft³
Calculated Total Basin Volume (V_{total}) =	**21.892**	acre-feet

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: DP 618 (Basins 618+622), 100-yr Flood Control Only



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (100-year)	14.98	21.892	Rectangular Orifice
Zone 2			
Zone 3			
Total (all zones)		21.892	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A ft²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	N/A	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A ft²
Depth at top of Zone using Orifice Plate =	N/A	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A ft²

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (optional)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 1 Rectangular	Not Selected		Zone 1 Rectangular	Not Selected
Invert of Vertical Orifice =	0.00		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	24.17		ft²
Depth at top of Zone using Vertical Orifice =	14.98		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	2.42		feet
Vertical Orifice Height =	58.00		inches				
Vertical Orifice Width =	60.00		inches				

Calculated Parameters for Vertical Orifice

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Not Selected	Not Selected			Not Selected	Not Selected	
Overflow Weir Front Edge Height, Ho =			ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =			feet
Overflow Weir Front Edge Length =			feet	Overflow Weir Slope Length =			feet
Overflow Weir Grate Slope =			H:V	Grate Open Area / 100-yr Orifice Area =			
Horiz. Length of Weir Sides =			feet	Overflow Grate Open Area w/o Debris =			ft²
Overflow Grate Type =				Overflow Grate Open Area w/ Debris =			ft²
Debris Clogging % =			%				

Calculated Parameters for Overflow Weir

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Not Selected	Not Selected			Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =			ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =			ft²
Circular Orifice Diameter =			inches	Outlet Orifice Centroid =			feet
				Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=		ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	feet
Spillway Crest Length =		feet	Stage at Top of Freeboard =	feet
Spillway End Slopes =		H:V	Basin Area at Top of Freeboard =	acres
Freeboard above Max Water Surface =		feet	Basin Volume at Top of Freeboard =	acre-ft

Calculated Parameters for Spillway

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

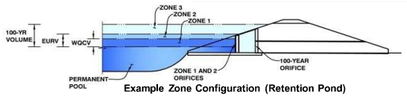
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	2.358	12.426	7.863	10.883	14.442	21.127	27.025	34.095	53.368
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	7.863	10.883	14.442	21.127	27.025	24.530	53.368
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.8	2.5	18.8	70.0	106.3	156.3	279.7
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.02	0.12	0.45	0.68	1.00	1.79
Peak Inflow Q (cfs) =	N/A	N/A	94.5	129.2	170.5	266.8	341.7	409.8	670.2
Peak Outflow Q (cfs) =	52.0	309.6	59.6	86.2	117.2	195.3	235.4	233.9	377.9
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	34.8	6.2	2.8	2.2	1.5	1.4
Structure Controlling Flow =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	9	3	5	4	4	3	3	4	3
Time to Drain 99% of Inflow Volume (hours) =	**21**	6	10	8	7	6	5	8	4
Maximum Ponding Depth (ft) =	2.61	10.14	2.62	3.21	3.80	5.23	6.51	6.46	12.96
Area at Maximum Ponding Depth (acres) =	1.01	1.70	1.01	1.05	1.10	1.23	1.34	1.34	2.00
Maximum Volume Stored (acre-ft) =	2.361	12.435	2.361	2.969	3.616	5.283	6.915	6.848	17.641

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: DP 618 (Basins 618+622), EURV



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	156.61	acres
Watershed Length =	5,600	ft
Watershed Length to Centroid =	3,528	ft
Watershed Slope =	0.021	ft/ft
Watershed Imperviousness =	75.29%	percent
Percentage Hydrologic Soil Group A =	15.0%	percent
Percentage Hydrologic Soil Group B =	22.8%	percent
Percentage Hydrologic Soil Groups C/D =	62.2%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	2.358 acre-feet	2.358	acre-feet
Excess Urban Runoff Volume (EURV) =	12.426 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	7.863 acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	10.883 acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	14.442 acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	21.127 acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	27.025 acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	34.095 acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	53.368 acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	7.361 acre-feet		
Approximate 5-yr Detention Volume =	10.419 acre-feet		
Approximate 10-yr Detention Volume =	13.154 acre-feet		
Approximate 25-yr Detention Volume =	16.643 acre-feet		
Approximate 50-yr Detention Volume =	18.915 acre-feet		
Approximate 100-yr Detention Volume =	21.892 acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	2.358	acre-feet
Zone 2 Volume (EURV - Zone 1) =	10.068	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	9.466	acre-feet
Total Detention Basin Volume =	21.892	acre-feet
Initial Surcharge Volume (ISV) =	308	ft^3
Initial Surcharge Depth (ISD) =	0.50	ft
Total Available Detention Depth (H_{total}) =	6.50	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.005	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Initial Surcharge Area (A_{ISV}) =	616	ft^2
Surcharge Volume Length (L_{ISV}) =	24.8	ft
Surcharge Volume Width (W_{ISV}) =	24.8	ft
Depth of Basin Floor (H_{FLOOR}) =	3.65	ft
Length of Basin Floor (L_{FLOOR}) =	769.4	ft
Width of Basin Floor (W_{FLOOR}) =	389.8	ft
Area of Basin Floor (A_{FLOOR}) =	299,941	ft^2
Volume of Basin Floor (V_{FLOOR}) =	382,220	ft^3
Depth of Main Basin (H_{MAIN}) =	1.85	ft
Length of Main Basin (L_{MAIN}) =	784.2	ft
Width of Main Basin (W_{MAIN}) =	404.6	ft
Area of Main Basin (A_{MAIN}) =	317,317	ft^2
Volume of Main Basin (V_{MAIN}) =	570,889	ft^3
Calculated Total Basin Volume (V_{total}) =	**21.895**	acre-feet

Depth Increment = 0.25 ft

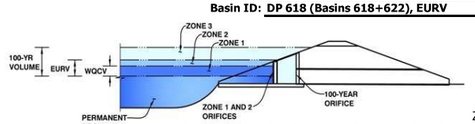
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		24.8	24.8	616		0.014		
ISV	0.50		24.8	24.8	616		0.014	308	0.007
	0.75		24.8	24.8	616		0.014	462	0.011
	1.00		24.8	24.8	616		0.014	616	0.014
	1.25		75.8	49.8	3,778		0.087	1,112	0.026
	1.50		126.8	74.8	9,490		0.218	2,718	0.062
	1.75		177.8	99.8	17,751		0.408	6,070	0.139
	2.00		228.8	124.8	28,563		0.656	11,806	0.271
	2.25		279.8	149.8	41,925		0.962	20,564	0.472
	2.50		330.8	174.8	57,837		1.328	32,981	0.757
	2.75		381.8	199.8	76,298		1.752	49,695	1.141
	3.00		432.8	224.8	97,310		2.234	71,343	1.638
	3.25		483.8	249.8	120,872		2.775	98,562	2.263
	3.50		534.8	274.8	146,983		3.374	131,991	3.030
	3.75		585.8	299.8	175,645		4.032	172,266	3.955
	4.00		636.8	324.8	206,857		4.749	220,026	5.051
	4.25		687.8	349.8	240,619		5.524	275,907	6.334
	4.50		738.8	374.8	276,930		6.357	340,548	7.818
Zone 1 (WQCV)	4.53		744.9	377.8	281,459		6.461	348,923	8.010
	4.75		770.2	390.6	300,869		6.907	413,842	9.501
	5.00		772.2	392.6	303,195		6.960	489,350	11.234
	5.25		774.2	394.6	305,529		7.014	565,440	12.981
	5.50		776.2	396.6	307,870		7.068	642,115	14.741
	5.75		778.2	398.6	310,220		7.122	719,376	16.515
	6.00		780.2	400.6	312,578		7.176	797,226	18.302
	6.25		782.2	402.6	314,943		7.230	875,666	20.103
Floor	6.50		784.2	404.6	317,317		7.285	954,698	21.917
	6.75		786.2	406.6	319,699		7.339	1,034,325	23.745
	7.00		788.2	408.6	322,089		7.394	1,114,548	25.587
	7.25		790.2	410.6	324,486		7.449	1,195,370	27.442
	7.50		792.2	412.6	326,892		7.504	1,276,792	29.311
Zone 2 (EURV)	7.55		792.6	413.0	327,374		7.515	1,293,149	29.687
	7.75		794.2	414.6	329,306		7.560	1,358,817	31.194
	8.00		796.2	416.6	331,727		7.615	1,441,446	33.091
	8.25		798.2	418.6	334,157		7.671	1,524,681	35.002
	8.50		800.2	420.6	336,595		7.727	1,608,525	36.927
	8.75		802.2	422.6	339,040		7.783	1,692,979	38.865
	9.00		804.2	424.6	341,494		7.840	1,778,046	40.818
	9.25		806.2	426.6	343,956		7.896	1,863,727	42.785
	9.50		808.2	428.6	346,426		7.953	1,950,024	44.766
Zone 3 (100-year)	9.67		809.6	430.0	348,110		7.991	2,009,060	46.122
	9.75		810.2	430.6	348,903		8.010	2,036,940	46.762
	10.00		812.2	432.6	351,389		8.067	2,124,477	48.771
	10.25		814.2	434.6	353,883		8.124	2,212,635	50.795
	10.50		816.2	436.6	356,384		8.181	2,301,419	52.833
	10.75		818.2	438.6	358,894		8.239	2,390,828	54.886
	11.00		820.2	440.6	361,412		8.297	2,480,866	56.953
	11.25		822.2	442.6	363,937		8.355	2,571,535	59.034
	11.50		824.2	444.6	366,471		8.413	2,662,836	61.130
	11.75		826.2	446.6	369,013		8.471	2,754,771	63.241
	12.00		828.2	448.6	371,563		8.530	2,847,343	65.366
	12.25		830.2	450.6	374,120		8.589	2,940,553	67.506
	12.50		832.2	452.6	376,686		8.648	3,034,404	69.660
	12.75		834.2	454.6	379,260		8.707	3,128,897	71.830
	13.00		836.2	456.6	381,841		8.766	3,224,034	74.014
	13.25		838.2	458.6	384,431		8.825	3,319,818	76.213
	13.50		840.2	460.6	387,029		8.885	3,416,250	78.426
	13.75		842.2	462.6	389,635		8.945	3,513,333	80.655
	14.00		844.2	464.6	392,248		9.005	3,611,068	82.899
	14.25		846.2	466.6	394,870		9.065	3,709,458	85.157
	14.50		848.2	468.6	397,500		9.125	3,808,504	87.431
	14.75		850.2	470.6	400,137		9.186	3,908,208	89.720
	15.00		852.2	472.6	402,783		9.247	4,008,573	92.024
	15.25		854.2	474.6	405,437		9.308	4,109,601	94.343
	15.50		856.2	476.6	408,098		9.369	4,211,292	96.678
	15.75		858.2	478.6	410,768		9.430	4,313,650	99.028
	16.00		860.2	480.6	413,446		9.491	4,416,677	101.393
	16.25		862.2	482.6	416,132		9.553	4,520,374	103.774
	16.50		864.2	484.6	418,825		9.615	4,624,743	106.169
	16.75		866.2	486.6	421,527		9.677	4,729,787	108.581
	17.00		868.2	488.6	424,237		9.739	4,835,508	111.008
	17.25		870.2	490.6	426,954		9.802	4,941,906	113.451
	17.50		872.2	492.6	429,680		9.864	5,048,985	115.909
	17.75		874.2	494.6	432,414		9.927	5,156,747	118.383
	18.00		876.2	496.6	435,155		9.990	5,265,193	120.872
	18.25		878.2	498.6	437,905		10.053	5,374,325	123.378
	18.50		880.2	500.6	440,663		10.116	5,484,146	125.899
	18.75		882.2	502.6	443,429		10.180	5,594,657	128.436
	19.00		884.2	504.6	446,202		10.243	5,705,861	130.989
	19.25		886.2	506.6	448,984		10.307	5,817,759	133.557
	19.50		888.2	508.6	451,774		10.371	5,930,354	136.142
	19.75		890.2	510.6	454,571		10.436	6,043,647	138.743
	20.00		892.2	512.6	457,377		10.500	6,157,640	141.360
	20.25		894.2	514.6	460,191		10.565	6,272,336	143.993
	20.50		896.2	516.6	463,012		10.629	6,387,736	146.642
	20.75		898.2	518.6	465,842		10.694	6,503,843	149.308
	21.00		900.2	520.6	468,680		10.759	6,620,658	151.989
	21.25		902.2	522.6	471,526		10.825	6,738,183	154.687
	21.50		904.2	524.6	474,379		10.890	6,856,421	157.402
	21.75		906.2	526.6	477,241		10.956	6,975,374	160.133
	22.00		908.2	528.6	480,111		11.022	7,095,042	162.880
	22.25		910.2	530.6	482,988		11.088	7,215,429	165.643
	22.50		912.2	532.6	485,874		11.154	7,336,537	168.424
	22.75		914.2	534.6	488,768		11.221	7,458,367	171.221
	23.00		916.2	536.6	491,669		11.287	7,580,922	174.034
	23.25		918.2	538.6	494,579		11.354	7,704,203	176.864
	23.50		920.2	540.6	497,497		11.421	7,828,212	179.711
	23.75		922.2	542.6	500,423		11.488	7,952,952	182.575
	24.00		924.2	544.6	503,356		11.555	8,078,424	185.455

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: DP 618 (Basins 618+622), EURV



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.29	2.358	Orifice Plate
Zone 2 (EURV)	5.18	10.068	Weir&Pipe (Restrict)
Zone 3 (100-year)	6.50	9.466	Not Utilized
Total (all zones)		21.892	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	4.410E-02 ft^2
Depth at top of Zone using Orifice Plate =	3.29	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A feet
Orifice Plate: Orifice Vertical Spacing =	13.20	inches	Elliptical Slot Centroid =	N/A feet
Orifice Plate: Orifice Area per Row =	6.35	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A ft^2

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.10	2.19					
Orifice Area (sq. inches)	6.35	6.35	6.35					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected			
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A N/A ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A N/A feet
Vertical Orifice Diameter =	N/A	N/A	inches		

Calculated Parameters for Vertical Orifice

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected			Zone 2 Weir	Not Selected
Overflow Weir Front Edge Height, Ho =	3.29	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.29	N/A feet
Overflow Weir Front Edge Length =	4.00	N/A	feet	Overflow Weir Slope Length =	4.00	N/A feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	21.60	N/A
Horiz. Length of Weir Sides =	4.00	N/A	feet	Overflow Grate Open Area w/o Debris =	11.14	N/A ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	5.57	N/A ft^2
Debris Clogging % =	50%	N/A	%			

Calculated Parameters for Overflow Weir

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Restrictor	Not Selected			Zone 2 Restrictor	Not Selected
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.52	N/A ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.29	N/A feet
Restrictor Plate Height Above Pipe Invert =	6.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.23	N/A radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	5.19	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.27 feet
Spillway Crest Length =	1000.00	feet	Stage at Top of Freeboard =	6.46 feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	7.28 acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	21.63 acre-ft

Calculated Parameters for Spillway

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

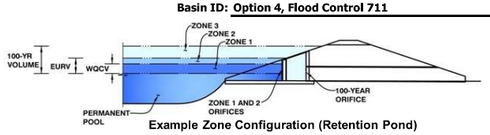
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	2.358	12.426	7.863	10.883	14.442	21.127	27.025	34.095	53.368
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	7.863	10.883	14.442	21.127	27.025	34.095	53.368
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.8	2.5	18.8	70.0	106.3	156.3	279.7
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.02	0.12	0.45	0.68	1.00	1.79
Peak Inflow Q (cfs) =	N/A	N/A	94.5	129.2	170.5	266.8	341.7	431.2	670.2
Peak Outflow Q (cfs) =	0.9	6.7	6.4	6.6	22.4	132.9	231.4	350.3	656.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	2.6	1.2	1.9	2.2	2.2	2.3
Structure Controlling Flow =	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	0.49	0.47	0.5	0.5	0.5	0.5	0.5	0.5
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	54	49	53	56	52	49	45	37
Time to Drain 99% of Inflow Volume (hours) =	**40**	60	54	58	63	61	60	58	54
Maximum Ponding Depth (ft) =	3.29	5.18	4.34	4.78	5.22	5.31	5.37	5.43	5.55
Area at Maximum Ponding Depth (acres) =	2.87	7.00	5.78	6.91	7.01	7.03	7.04	7.05	7.08
Maximum Volume Stored (acre-ft) =	2.376	12.490	6.786	9.708	12.770	13.402	13.754	14.176	15.095

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: 23.1447.001 Greeley - Oklahoma Drainage MP

Basin ID: Option 4, Flood Control 711



Example Zone Configuration (Retention Pond)

Watershed Information — **Flood Control Only**

Selected BMP Type =	No BMP	
Watershed Area =	90.00	acres
Watershed Length =	3,900	ft
Watershed Length to Centroid =	1,738	ft
Watershed Slope =	0.031	ft/ft
Watershed Imperviousness =	30.20%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	N/A	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	1.141	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	2.470	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	1.598	acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	2.810	acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	4.602	acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	8.506	acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	11.792	acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	15.995	acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	27.074	acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	1.515	acre-feet		
Approximate 5-yr Detention Volume =	2.643	acre-feet		
Approximate 10-yr Detention Volume =	3.285	acre-feet		
Approximate 25-yr Detention Volume =	4.314	acre-feet		
Approximate 50-yr Detention Volume =	4.931	acre-feet		
Approximate 100-yr Detention Volume =	6.534	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (100-year) =	6.534	acre-feet
Select Zone 2 Storage Volume (Optional) =		acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	6.534	acre-feet
Initial Surcharge Volume (ISV) =	N/A	ft^3
Initial Surcharge Depth (ISD) =	N/A	ft
Total Available Detention Depth (H_{total}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.003	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Initial Surcharge Area (A_{ISV}) =	0	ft^2
Surcharge Volume Length (L_{ISV}) =	0.0	ft
Surcharge Volume Width (W_{ISV}) =	0.0	ft
Depth of Basin Floor (H_{FLOOR}) =	0.00	ft
Length of Basin Floor (L_{FLOOR}) =	271.7	ft
Width of Basin Floor (W_{FLOOR}) =	135.9	ft
Area of Basin Floor (A_{FLOOR}) =	36,922	ft^2
Volume of Basin Floor (V_{FLOOR}) =	0	ft^3
Depth of Main Basin (H_{MAIN}) =	6.00	ft
Length of Main Basin (L_{MAIN}) =	319.7	ft
Width of Main Basin (W_{MAIN}) =	183.9	ft
Area of Main Basin (A_{MAIN}) =	58,791	ft^2
Volume of Main Basin (V_{MAIN}) =	284,607	ft^3
Calculated Total Basin Volume (V_{total}) =	**6.534**	acre-feet

Depth Increment = 0.50 ft

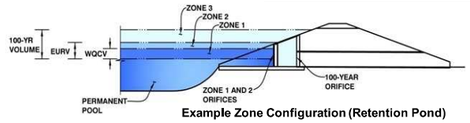
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Media Surface	0.00		271.7	135.9	36,922		0.848		
	0.50		275.7	139.9	38,568		0.885	18,871	0.433
	1.00		279.7	143.9	40,247		0.924	38,574	0.886
	1.50		283.7	147.9	41,957		0.963	59,123	1.357
	2.00		287.7	151.9	43,700		1.003	80,536	1.849
	2.50		291.7	155.9	45,474		1.044	102,828	2.361
	3.00		295.7	159.9	47,280		1.085	126,015	2.893
	3.50		299.7	163.9	49,119		1.128	150,114	3.446
	4.00		303.7	167.9	50,989		1.171	175,139	4.021
	4.50		307.7	171.9	52,892		1.214	201,108	4.617
	5.00		311.7	175.9	54,826		1.259	228,036	5.235
	5.50		315.7	179.9	56,793		1.304	255,940	5.876
Zone 1 (100-year)	6.00		319.7	183.9	58,791		1.350	284,834	6.539
	6.50		323.7	187.9	60,822		1.396	314,736	7.225
	7.00		327.7	191.9	62,884		1.444	345,661	7.935
	7.50		331.7	195.9	64,978		1.492	377,626	8.669
	8.00		335.7	199.9	67,105		1.541	410,645	9.427
	8.50		339.7	203.9	69,263		1.590	444,736	10.210
	9.00		343.7	207.9	71,454		1.640	479,914	11.017
	9.50		347.7	211.9	73,676		1.691	516,195	11.850
	10.00		351.7	215.9	75,931		1.743	553,595	12.709
	10.50		355.7	219.9	78,217		1.796	592,131	13.593
	11.00		359.7	223.9	80,536		1.849	631,818	14.505
	11.50		363.7	227.9	82,886		1.903	672,672	15.442
	12.00		367.7	231.9	85,268		1.957	714,709	16.407
	12.50		371.7	235.9	87,683		2.013	757,946	17.400
	13.00		375.7	239.9	90,129		2.069	802,398	18.421
	13.50		379.7	243.9	92,608		2.126	848,081	19.469
	14.00		383.7	247.9	95,118		2.184	895,011	20.547
	14.50		387.7	251.9	97,661		2.242	943,204	21.653
	15.00		391.7	255.9	100,235		2.301	992,677	22.789
	15.50		395.7	259.9	102,842		2.361	1,043,445	23.954
	16.00		399.7	263.9	105,480		2.421	1,095,524	25.150
	16.50		403.7	267.9	108,151		2.483	1,148,930	26.376
	17.00		407.7	271.9	110,853		2.545	1,203,680	27.633
	17.50		411.7	275.9	113,587		2.608	1,259,788	28.921
	18.00		415.7	279.9	116,354		2.671	1,317,272	30.240
	18.50		419.7	283.9	119,152		2.735	1,376,148	31.592
	19.00		423.7	287.9	121,983		2.800	1,436,430	32.976
	19.50		427.7	291.9	124,845		2.866	1,498,136	34.392
	20.00		431.7	295.9	127,740		2.932	1,561,281	35.842
	20.50		435.7	299.9	130,666		3.000	1,625,881	37.325
	21.00		439.7	303.9	133,625		3.068	1,691,952	38.842
	21.50		443.7	307.9	136,615		3.136	1,759,511	40.393
	22.00		447.7	311.9	139,637		3.206	1,828,573	41.978
	22.50		451.7	315.9	142,692		3.276	1,899,154	43.599
	23.00		455.7	319.9	145,778		3.347	1,971,270	45.254
	23.50		459.7	323.9	148,897		3.418	2,044,937	46.945
	24.00		463.7	327.9	152,047		3.491	2,120,172	48.672
	24.50		467.7	331.9	155,230		3.564	2,196,990	50.436
	25.00		471.7	335.9	158,444		3.637	2,275,407	52.236
	25.50		475.7	339.9	161,691		3.712	2,355,439	54.073
	26.00		479.7	343.9	164,969		3.787	2,437,103	55.948
	26.50		483.7	347.9	168,280		3.863	2,520,414	57.861
	27.00		487.7	351.9	171,622		3.940	2,605,388	59.811
	27.50		491.7	355.9	174,996		4.017	2,692,041	61.801
	28.00		495.7	359.9	178,403		4.096	2,780,390	63.829
	28.50		499.7	363.9	181,841		4.175	2,870,449	65.896
	29.00		503.7	367.9	185,312		4.254	2,962,236	68.004
	29.50		507.7	371.9	188,814		4.335	3,055,766	70.151
	30.00		511.7	375.9	192,349		4.416	3,151,056	72.338

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: 23.1447.001 Greeley - Oklahoma Drainage MP

Basin ID: Option 4, Flood Control 711



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (100-year)	6.00	6.534	Rectangular Orifice
Zone 2			
Zone 3			
Total (all zones)		6.534	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	N/A	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A ft^2
Depth at top of Zone using Orifice Plate =	N/A	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A ft^2

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (optional)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 1 Rectangular	Not Selected		Calculated Parameters for Vertical Orifice: Zone 1 Rectangular	Not Selected
Invert of Vertical Orifice =	0.00		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	30.00		ft^2
Depth at top of Zone using Vertical Orifice =	6.00		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	2.50		feet
Vertical Orifice Height =	60.00		inches				
Vertical Orifice Width =	72.00		inches				

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Not Selected	Not Selected		Calculated Parameters for Overflow Weir: Not Selected	Not Selected
Overflow Weir Front Edge Height, Ho =			ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =			feet
Overflow Weir Front Edge Length =			feet	Overflow Weir Slope Length =			feet
Overflow Weir Grate Slope =			H:V	Grate Open Area / 100-yr Orifice Area =			
Horiz. Length of Weir Sides =			feet	Overflow Grate Open Area w/o Debris =			ft^2
Overflow Grate Type =				Overflow Grate Open Area w/ Debris =			ft^2
Debris Clogging % =			%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Not Selected	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate: Not Selected	Not Selected
Depth to Invert of Outlet Pipe =			ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =			ft^2
Circular Orifice Diameter =			inches	Outlet Orifice Centroid =			feet
				Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway	
Spillway Invert Stage=		ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	feet
Spillway Crest Length =		feet	Stage at Top of Freeboard =	feet
Spillway End Slopes =		H:V	Basin Area at Top of Freeboard =	acres
Freeboard above Max Water Surface =		feet	Basin Volume at Top of Freeboard =	acre-ft

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

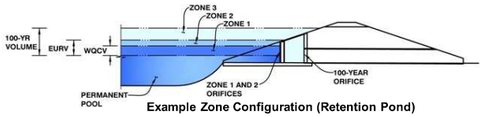
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	1.141	2.470	1.598	2.810	4.602	8.506	11.792	15.995	27.074
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.598	2.810	4.602	8.506	11.792	16.052	27.074
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.8	8.6	24.1	64.2	93.3	131.2	225.3
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.10	0.27	0.71	1.04	1.46	2.50
Peak Inflow Q (cfs) =	N/A	N/A	16.2	29.4	48.3	95.8	131.0	172.2	291.6
Peak Outflow Q (cfs) =	17.5	60.7	8.1	17.0	30.7	69.9	100.5	138.0	241.4
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	2.0	1.3	1.1	1.1	1.1	1.1
Structure Controlling Flow =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	14	8	12	8	6	5	4	4	3
Time to Drain 99% of Inflow Volume (hours) =	**34**	19	27	18	13	9	7	7	5
Maximum Ponding Depth (ft) =	1.28	2.61	0.79	1.19	1.65	2.60	3.18	3.78	5.29
Area at Maximum Ponding Depth (acres) =	0.95	1.05	0.91	0.94	0.98	1.05	1.10	1.15	1.28
Maximum Volume Stored (acre-ft) =	1.147	2.476	0.693	1.053	1.503	2.455	3.079	3.765	5.604

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: 23.1447.001 Greeley - Oklahoma Drainage MP

Basin ID: Option4 , EURV 711



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	90.00	acres
Watershed Length =	3,900	ft
Watershed Length to Centroid =	1,738	ft
Watershed Slope =	0.031	ft/ft
Watershed Imperviousness =	30.20%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	1.141	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	2.470	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	1.598	acre-feet	0.85 inches
5-yr Runoff Volume (P1 = 1.12 in.) =	2.810	acre-feet	1.12 inches
10-yr Runoff Volume (P1 = 1.4 in.) =	4.602	acre-feet	1.40 inches
25-yr Runoff Volume (P1 = 1.87 in.) =	8.506	acre-feet	1.87 inches
50-yr Runoff Volume (P1 = 2.3 in.) =	11.792	acre-feet	2.30 inches
100-yr Runoff Volume (P1 = 2.79 in.) =	15.995	acre-feet	2.79 inches
500-yr Runoff Volume (P1 = 4.16 in.) =	27.074	acre-feet	4.16 inches
Approximate 2-yr Detention Volume =	1.515	acre-feet	
Approximate 5-yr Detention Volume =	2.643	acre-feet	
Approximate 10-yr Detention Volume =	3.285	acre-feet	
Approximate 25-yr Detention Volume =	4.314	acre-feet	
Approximate 50-yr Detention Volume =	4.931	acre-feet	
Approximate 100-yr Detention Volume =	6.534	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.141	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.329	acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	2.470	acre-feet
Initial Surcharge Volume (ISV) =	578	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.003	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Initial Surcharge Area (A_{ISV}) =	1,752	ft^2
Surcharge Volume Length (L_{ISV}) =	41.9	ft
Surcharge Volume Width (W_{ISV}) =	41.9	ft
Depth of Basin Floor (H_{FLOOR}) =	0.35	ft
Length of Basin Floor (L_{FLOOR}) =	159.9	ft
Width of Basin Floor (W_{FLOOR}) =	100.2	ft
Area of Basin Floor (A_{FLOOR}) =	16,021	ft^2
Volume of Basin Floor (V_{FLOOR}) =	2,692	ft^3
Depth of Main Basin (H_{MAIN}) =	4.82	ft
Length of Main Basin (L_{MAIN}) =	198.5	ft
Width of Main Basin (W_{MAIN}) =	138.7	ft
Area of Main Basin (A_{MAIN}) =	27,538	ft^2
Volume of Main Basin (V_{MAIN}) =	103,732	ft^3
Calculated Total Basin Volume (V_{total}) =	**2.477**	acre-feet

Total detention volume is less than 100-year volume.

Depth Increment = 0.50 ft

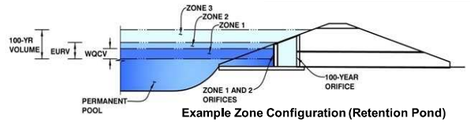
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		41.9	41.9	1,752		0.040		
ISV	0.33		41.9	41.9	1,752		0.040	578	0.013
	0.50		41.9	41.9	1,752		0.040	876	0.020
	1.00		99.2	70.2	6,962		0.160	2,148	0.049
Floor	1.18		159.9	100.2	16,021		0.368	4,162	0.096
	1.50		162.5	102.7	16,694		0.383	9,396	0.216
	2.00		166.5	106.7	17,771		0.408	18,011	0.413
	2.50		170.5	110.7	18,879		0.433	27,172	0.624
	3.00		174.5	114.7	20,020		0.460	36,896	0.847
	3.50		178.5	118.7	21,193		0.487	47,198	1.084
Zone 1 (WQCV)	3.62		179.4	119.7	21,479		0.493	49,758	1.142
	4.00		182.5	122.7	22,398		0.514	58,094	1.334
	4.50		186.5	126.7	23,635		0.543	69,601	1.598
	5.00		190.5	130.7	24,904		0.572	81,735	1.876
	5.50		194.5	134.7	26,205		0.602	94,511	2.170
Zone 2 (EURV)	5.99		198.4	138.7	27,511		0.632	107,670	2.472
	6.00		198.5	138.7	27,538		0.632	107,945	2.478
	6.50		202.5	142.7	28,903		0.664	122,054	2.802
	7.00		206.5	146.7	30,299		0.696	136,853	3.142
	7.50		210.5	150.7	31,728		0.728	152,358	3.498
	8.00		214.5	154.7	33,189		0.762	168,586	3.870
	8.50		218.5	158.7	34,682		0.796	185,553	4.260
	9.00		222.5	162.7	36,207		0.831	203,274	4.667
	9.50		226.5	166.7	37,764		0.867	221,765	5.091
	10.00		230.5	170.7	39,353		0.903	241,043	5.534
	10.50		234.5	174.7	40,974		0.941	261,123	5.995
	11.00		238.5	178.7	42,627		0.979	282,022	6.474
	11.50		242.5	182.7	44,311		1.017	303,755	6.973
	12.00		246.5	186.7	46,028		1.057	326,339	7.492
	12.50		250.5	190.7	47,777		1.097	349,789	8.030
	13.00		254.5	194.7	49,558		1.138	374,122	8.589
	13.50		258.5	198.7	51,371		1.179	399,353	9.168
	14.00		262.5	202.7	53,216		1.222	425,498	9.768
	14.50		266.5	206.7	55,093		1.265	452,574	10,390
	15.00		270.5	210.7	57,002		1.309	480,596	11.033
	15.50		274.5	214.7	58,943		1.353	509,581	11.698
	16.00		278.5	218.7	60,915		1.398	539,544	12.386
	16.50		282.5	222.7	62,920		1.444	570,502	13.097
	17.00		286.5	226.7	64,957		1.491	602,470	13.831
	17.50		290.5	230.7	67,026		1.539	635,464	14.588
	18.00		294.5	234.7	69,127		1.587	669,501	15.370
	18.50		298.5	238.7	71,260		1.636	704,597	16.175
	19.00		302.5	242.7	73,425		1.686	740,766	17.006
	19.50		306.5	246.7	75,622		1.736	778,027	17.861
	20.00		310.5	250.7	77,851		1.787	816,393	18.742
	20.50		314.5	254.7	80,111		1.839	855,883	19.648
	21.00		318.5	258.7	82,404		1.892	896,510	20.581
	21.50		322.5	262.7	84,729		1.945	938,292	21.540
	22.00		326.5	266.7	87,086		1.999	981,245	22.526
	22.50		330.5	270.7	89,475		2.054	1,025,384	23.540
	23.00		334.5	274.7	91,896		2.110	1,070,725	24.580
	23.50		338.5	278.7	94,349		2.166	1,117,285	25.649
	24.00		342.5	282.7	96,834		2.223	1,165,079	26.747
	24.50		346.5	286.7	99,351		2.281	1,214,124	27.872
	25.00		350.5	290.7	101,899		2.339	1,264,435	29.027
	25.50		354.5	294.7	104,480		2.399	1,316,029	30.212
	26.00		358.5	298.7	107,093		2.459	1,368,921	31.426
	26.50		362.5	302.7	109,738		2.519	1,423,127	32.671
	27.00		366.5	306.7	112,415		2.581	1,478,664	33.945
	27.50		370.5	310.7	115,124		2.643	1,535,548	35.251
	28.00		374.5	314.7	117,865		2.706	1,593,794	36.588
	28.50		378.5	318.7	120,638		2.769	1,653,418	37.957
	29.00		382.5	322.7	123,443		2.834	1,714,437	39.358
	29.50		386.5	326.7	126,279		2.899	1,776,866	40.791
	30.00		390.5	330.7	129,148		2.965	1,840,721	42.257

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: 23.1447.001 Greeley - Oklahoma Drainage MP

Basin ID: Option4 , EURV 711



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.62	1.141	Orifice Plate
Zone 2 (EURV)	5.99	1.329	Weir&Pipe (Restrict)
Zone 3			Not Utilized
Total (all zones)		2.470	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	3.063E-02	ft^2
Depth at top of Zone using Orifice Plate =	3.62	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	14.50	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	4.41	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.21	2.41					
Orifice Area (sq. inches)	4.41	4.41	4.41					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected		Calculated Parameters for Vertical Orifice	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected		Calculated Parameters for Overflow Weir	Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.00	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	7.33	N/A	feet
Overflow Weir Front Edge Length =	800.00	N/A	feet	Overflow Weir Slope Length =	10.54	N/A	feet
Overflow Weir Grate Slope =	3.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	11382.38	N/A	
Horiz. Length of Weir Sides =	10.00	N/A	feet	Overflow Grate Open Area w/o Debris =	5869.19	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	2934.59	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.52	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.29	N/A	feet
Restrictor Plate Height Above Pipe Invert =	6.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.23	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=	9.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.96	feet
Spillway Crest Length =	59.00	feet	Stage at Top of Freeboard =	10.96	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.98	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	6.44	acre-ft

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

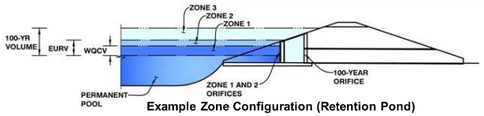
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	1.141	2.470	1.598	2.810	4.602	8.506	11.792	15.995	27.074
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.598	2.810	4.602	8.506	11.792	15.995	27.074
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.8	8.6	24.1	64.2	93.3	131.2	225.3
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.10	0.27	0.71	1.04	1.46	2.50
Peak Inflow Q (cfs) =	N/A	N/A	16.2	29.4	48.3	95.8	131.0	176.7	291.6
Peak Outflow Q (cfs) =	0.7	7.1	4.1	6.7	7.7	52.8	98.6	157.8	291.4
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.8	0.3	0.8	1.1	1.2	1.3
Structure Controlling Flow =	Plate	Outlet Plate 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	40	43	41	40	36	32	27	19
Time to Drain 99% of Inflow Volume (hours) =	**40**	44	46	45	46	45	43	40	35
Maximum Ponding Depth (ft) =	3.62	5.99	4.04	5.15	7.43	9.39	9.62	9.87	10.31
Area at Maximum Ponding Depth (acres) =	0.49	0.63	0.52	0.58	0.72	0.86	0.88	0.89	0.93
Maximum Volume Stored (acre-ft) =	1.142	2.472	1.354	1.963	3.447	4.996	5.196	5.408	5.808

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: 23.1447.001 Greeley - Oklahoma Drainage MP

Basin ID: 810 EURV



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	74.00	acres
Watershed Length =	2,939	ft
Watershed Length to Centroid =	2,015	ft
Watershed Slope =	0.025	ft/ft
Watershed Imperviousness =	48.10%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	1.240	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	3.357	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	2,291	acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	3.498	acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	5.073	acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	8.262	acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	11.025	acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	14.441	acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	23.593	acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	2.112	acre-feet		
Approximate 5-yr Detention Volume =	3.316	acre-feet		
Approximate 10-yr Detention Volume =	4.051	acre-feet		
Approximate 25-yr Detention Volume =	5.136	acre-feet		
Approximate 50-yr Detention Volume =	5.822	acre-feet		
Approximate 100-yr Detention Volume =	7.217	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.240	acre-feet
Zone 2 Volume (EURV - Zone 1) =	2.117	acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	3.357	acre-feet
Initial Surcharge Volume (ISV) =	578	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.003	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Total detention volume is less than 100-year volume.

Initial Surcharge Area (A_{ISV}) =	1,752	ft^2
Surcharge Volume Length (L_{ISV}) =	41.9	ft
Surcharge Volume Width (W_{ISV}) =	41.9	ft
Depth of Basin Floor (H_{FLOOR}) =	0.46	ft
Length of Basin Floor (L_{FLOOR}) =	197.0	ft
Width of Basin Floor (W_{FLOOR}) =	118.5	ft
Area of Basin Floor (A_{FLOOR}) =	23,351	ft^2
Volume of Basin Floor (V_{FLOOR}) =	4,830	ft^3
Depth of Main Basin (H_{MAIN}) =	4.71	ft
Length of Main Basin (L_{MAIN}) =	234.7	ft
Width of Main Basin (W_{MAIN}) =	156.2	ft
Area of Main Basin (A_{MAIN}) =	36,660	ft^2
Volume of Main Basin (V_{MAIN}) =	140,153	ft^3
Calculated Total Basin Volume (V_{total}) =	**3.362**	acre-feet

Depth Increment = 0.50 ft

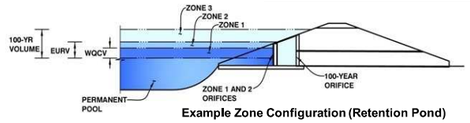
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		41.9	41.9	1,752		0.040		
ISV	0.33		41.9	41.9	1,752		0.040	578	0.013
	0.50		41.9	41.9	1,752		0.040	876	0.020
	1.00		99.2	70.2	6,962		0.160	2,148	0.049
	1.50		198.7	120.2	23,884		0.548	11,275	0.259
	2.00		202.7	124.2	25,175		0.578	23,538	0.540
Zone 1 (WQCV)	2.06		203.2	124.7	25,333		0.582	25,053	0.575
	2.50		206.7	128.2	26,499		0.608	36,456	0.837
Zone 2 (EURV)	2.63		207.7	129.2	26,848		0.616	39,923	0.917
	3.00		210.7	132.2	27,855		0.639	50,043	1.149
	3.50		214.7	136.2	29,242		0.671	64,316	1.476
	4.00		218.7	140.2	30,662		0.704	79,290	1.820
	4.50		222.7	144.2	32,113		0.737	94,983	2.181
	5.00		226.7	148.2	33,597		0.771	111,409	2.558
	5.50		230.7	152.2	35,113		0.806	128,585	2.952
Floor	6.00		234.7	156.2	36,660		0.842	146,527	3.364
	6.50		238.7	160.2	38,240		0.878	165,251	3.794
	7.00		242.7	164.2	39,852		0.915	184,772	4.242
	7.50		246.7	168.2	41,495		0.953	205,108	4.709
	8.00		250.7	172.2	43,171		0.991	226,273	5.195
	8.50		254.7	176.2	44,878		1.030	248,284	5.700
	9.00		258.7	180.2	46,618		1.070	271,157	6.225
	9.50		262.7	184.2	48,390		1.111	294,907	6.770
	10.00		266.7	188.2	50,193		1.152	319,551	7.336
	10.50		270.7	192.2	52,029		1.194	345,106	7.923
	11.00		274.7	196.2	53,896		1.237	371,586	8.530
	11.50		278.7	200.2	55,796		1.281	399,007	9.160
	12.00		282.7	204.2	57,728		1.325	427,387	9.811
	12.50		286.7	208.2	59,691		1.370	456,740	10.485
	13.00		290.7	212.2	61,687		1.416	487,083	11.182
	13.50		294.7	216.2	63,714		1.463	518,432	11.902
	14.00		298.7	220.2	65,774		1.510	550,803	12.645
	14.50		302.7	224.2	67,866		1.558	584,212	13.412
	15.00		306.7	228.2	69,989		1.607	618,674	14.203
	15.50		310.7	232.2	72,145		1.656	654,206	15.019
	16.00		314.7	236.2	74,332		1.706	690,824	15.859
	16.50		318.7	240.2	76,552		1.757	728,544	16.725
	17.00		322.7	244.2	78,804		1.809	767,382	17.617
	17.50		326.7	248.2	81,087		1.862	807,353	18.534
	18.00		330.7	252.2	83,403		1.915	848,474	19.478
	18.50		334.7	256.2	85,751		1.969	890,762	20.449
	19.00		338.7	260.2	88,130		2.023	934,230	21.447
	19.50		342.7	264.2	90,542		2.079	978,897	22.472
	20.00		346.7	268.2	92,985		2.135	1,024,777	23.526
	20.50		350.7	272.2	95,461		2.191	1,071,888	24.607
	21.00		354.7	276.2	97,969		2.249	1,120,244	25.717
	21.50		358.7	280.2	100,508		2.307	1,169,862	26.856
	22.00		362.7	284.2	103,080		2.366	1,220,757	28.025
	22.50		366.7	288.2	105,683		2.426	1,272,947	29.223
	23.00		370.7	292.2	108,319		2.487	1,326,446	30.451
	23.50		374.7	296.2	110,987		2.548	1,381,271	31.710
	24.00		378.7	300.2	113,686		2.610	1,437,438	32.999
	24.50		382.7	304.2	116,418		2.673	1,494,963	34.320
	25.00		386.7	308.2	119,181		2.736	1,553,861	35.672
	25.50		390.7	312.2	121,977		2.800	1,614,149	37.056
	26.00		394.7	316.2	124,805		2.865	1,675,844	38.472
	26.50		398.7	320.2	127,664		2.931	1,738,959	39.921
	27.00		402.7	324.2	130,556		2.997	1,803,513	41.403
	27.50		406.7	328.2	133,479		3.064	1,869,521	42.918
	28.00		410.7	332.2	136,435		3.132	1,936,998	44.467
	28.50		414.7	336.2	139,423		3.201	2,005,961	46.051
	29.00		418.7	340.2	142,442		3.270	2,076,426	47.668
	29.50		422.7	344.2	145,494		3.340	2,148,409	49.321
	30.00		426.7	348.2	148,578		3.411	2,221,925	51.008

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: 23.1447.001 Greeley - Oklahoma Drainage MP

Basin ID: 810 EURV



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.15	1.240	Orifice Plate
Zone 2 (EURV)	6.00	2.117	Weir&Pipe (Restrict)
Zone 3			Not Utilized
Total (all zones)		3.357	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	3.174E-02	ft^2
Depth at top of Zone using Orifice Plate =	3.02	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	12.10	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	4.57	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.01	2.01					
Orifice Area (sq. inches)	4.57	4.57	4.57					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected		Calculated Parameters for Vertical Orifice	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected		Calculated Parameters for Overflow Weir	Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.15	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	6.48	N/A	feet
Overflow Weir Front Edge Length =	800.00	N/A	feet	Overflow Weir Slope Length =	10.54	N/A	feet
Overflow Weir Grate Slope =	3.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	11382.38	N/A	
Horiz. Length of Weir Sides =	10.00	N/A	feet	Overflow Grate Open Area w/o Debris =	5869.19	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	2934.59	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	3.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.52	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.29	N/A	feet
Restrictor Plate Height Above Pipe Invert =	6.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.23	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=	6.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.97	feet
Spillway Crest Length =	64.00	feet	Stage at Top of Freeboard =	7.97	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.99	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	5.16	acre-ft

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

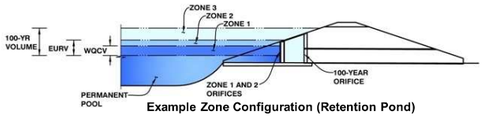
	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =									
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	1.240	3.357	2.291	3.498	5.073	8.262	11.025	14.441	23.593
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	2.291	3.498	5.073	8.262	11.025	14.441	23.593
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.6	6.6	18.6	49.6	72.2	101.7	175.1
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.09	0.25	0.67	0.98	1.37	2.37
Peak Inflow Q (cfs) =	N/A	N/A	28.4	44.2	64.4	112.2	148.5	192.9	308.7
Peak Outflow Q (cfs) =	0.7	7.3	6.3	6.9	21.0	80.4	123.6	180.2	304.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.1	1.1	1.6	1.7	1.8	1.7
Structure Controlling Flow =	Overflow Weir 1	Spillway	Outlet Plate 1	Outlet Plate 1	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	37	38	38	38	37	33	30	26	18
Time to Drain 99% of Inflow Volume (hours) =	**40**	42	42	43	43	41	40	38	34
Maximum Ponding Depth (ft) =	3.15	6.00	3.70	5.03	6.17	6.52	6.70	6.90	7.28
Area at Maximum Ponding Depth (acres) =	0.65	0.84	0.68	0.77	0.85	0.88	0.89	0.91	0.94
Maximum Volume Stored (acre-ft) =	1.245	3.364	1.605	2.581	3.499	3.802	3.962	4.151	4.501

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: 23.1447.001 Greeley - Oklahoma Drainage MP

Basin ID: Option 4, EURV 820



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	81.00	acres
Watershed Length =	2,600	ft
Watershed Length to Centroid =	720	ft
Watershed Slope =	0.022	ft/ft
Watershed Imperviousness =	69.80%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	1.850	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	5.493	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	3.732	acre-feet	0.85 inches
5-yr Runoff Volume (P1 = 1.12 in.) =	5.323	acre-feet	1.12 inches
10-yr Runoff Volume (P1 = 1.4 in.) =	7.165	acre-feet	1.40 inches
25-yr Runoff Volume (P1 = 1.87 in.) =	10.587	acre-feet	1.87 inches
50-yr Runoff Volume (P1 = 2.3 in.) =	13.634	acre-feet	2.30 inches
100-yr Runoff Volume (P1 = 2.79 in.) =	17.263	acre-feet	2.79 inches
500-yr Runoff Volume (P1 = 4.16 in.) =	27.180	acre-feet	4.16 inches
Approximate 2-yr Detention Volume =	3.526	acre-feet	
Approximate 5-yr Detention Volume =	5.146	acre-feet	
Approximate 10-yr Detention Volume =	6.318	acre-feet	
Approximate 25-yr Detention Volume =	7.856	acre-feet	
Approximate 50-yr Detention Volume =	8.825	acre-feet	
Approximate 100-yr Detention Volume =	10.325	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.850	acre-feet
Zone 2 Volume (EURV - Zone 1) =	3.643	acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	5.493	acre-feet
Initial Surcharge Volume (ISV) =	578	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.003	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Total detention volume is less than 100-year volume.

Initial Surcharge Area (A_{ISV}) =	1,752	ft^2
Surcharge Volume Length (L_{ISV}) =	41.9	ft
Surcharge Volume Width (W_{ISV}) =	41.9	ft
Depth of Basin Floor (H_{FLOOR}) =	0.68	ft
Length of Basin Floor (L_{FLOOR}) =	271.2	ft
Width of Basin Floor (W_{FLOOR}) =	155.2	ft
Area of Basin Floor (A_{FLOOR}) =	42,092	ft^2
Volume of Basin Floor (V_{FLOOR}) =	11,884	ft^3
Depth of Main Basin (H_{MAIN}) =	4.49	ft
Length of Main Basin (L_{MAIN}) =	307.2	ft
Width of Main Basin (W_{MAIN}) =	191.1	ft
Area of Main Basin (A_{MAIN}) =	58,699	ft^2
Volume of Main Basin (V_{MAIN}) =	225,245	ft^3
Calculated Total Basin Volume (V_{total}) =	**5.477**	acre-feet

Depth Increment = 0.50 ft

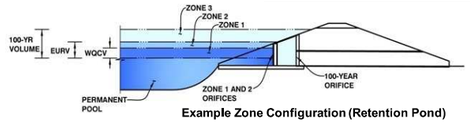
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		41.9	41.9	1,752		0.040		
ISV	0.33		41.9	41.9	1,752		0.040	578	0.013
	0.50		41.9	41.9	1,752		0.040	876	0.020
	1.00		99.2	70.2	6,962		0.160	2,148	0.049
	1.50		267.9	153.5	41,122		0.944	12,998	0.298
Floor	1.51		271.2	155.2	42,092		0.966	13,414	0.308
	2.00		275.2	159.1	43,779		1.005	34,451	0.791
	2.50		279.2	163.1	45,532		1.045	56,778	1.303
	3.00		283.2	167.1	47,317		1.086	79,988	1.836
Zone 1 (WQCV)	3.02		283.3	167.3	47,389		1.088	80,935	1.858
	3.50		287.2	171.1	49,134		1.128	104,100	2.390
	4.00		291.2	175.1	50,983		1.170	129,128	2.964
	4.50		295.2	179.1	52,864		1.214	155,088	3.560
	5.00		299.2	183.1	54,777		1.258	181,997	4.178
	5.50		303.2	187.1	56,722		1.302	209,871	4.818
	6.00		307.2	191.1	58,699		1.348	238,725	5.480
Zone 2 (EURV)	6.01		307.2	191.2	58,739		1.348	239,312	5.494
	6.50		311.2	195.1	60,708		1.394	268,575	6.166
	7.00		315.2	199.1	62,749		1.441	299,438	6.874
	7.50		319.2	203.1	64,822		1.488	331,330	7.606
	8.00		323.2	207.1	66,927		1.536	364,266	8.362
	8.50		327.2	211.1	69,064		1.586	398,263	9.143
	9.00		331.2	215.1	71,234		1.635	433,336	9.948
	9.50		335.2	219.1	73,435		1.686	469,501	10.778
	10.00		339.2	223.1	75,668		1.737	506,776	11.634
	10.50		343.2	227.1	77,933		1.789	545,174	12.515
	11.00		347.2	231.1	80,230		1.842	584,714	13.423
	11.50		351.2	235.1	82,559		1.895	625,409	14.357
	12.00		355.2	239.1	84,920		1.949	667,278	15.319
	12.50		359.2	243.1	87,313		2.004	710,335	16.307
	13.00		363.2	247.1	89,738		2.060	754,596	17.323
	13.50		367.2	251.1	92,195		2.117	800,078	18.367
	14.00		371.2	255.1	94,684		2.174	846,796	19.440
	14.50		375.2	259.1	97,205		2.232	894,767	20.541
	15.00		379.2	263.1	99,758		2.290	944,007	21.671
	15.50		383.2	267.1	102,343		2.349	994,530	22.831
	16.00		387.2	271.1	104,960		2.410	1,046,355	24.021
	16.50		391.2	275.1	107,609		2.470	1,099,496	25.241
	17.00		395.2	279.1	110,290		2.532	1,153,970	26.491
	17.50		399.2	283.1	113,003		2.594	1,209,792	27.773
	18.00		403.2	287.1	115,748		2.657	1,266,978	29.086
	18.50		407.2	291.1	118,525		2.721	1,325,545	30.430
	19.00		411.2	295.1	121,334		2.785	1,385,509	31.807
	19.50		415.2	299.1	124,176		2.851	1,446,885	33.216
	20.00		419.2	303.1	127,049		2.917	1,509,690	34.658
	20.50		423.2	307.1	129,954		2.983	1,573,939	36.133
	21.00		427.2	311.1	132,891		3.051	1,639,649	37.641
	21.50		431.2	315.1	135,860		3.119	1,706,835	39.184
	22.00		435.2	319.1	138,861		3.188	1,775,514	40.760
	22.50		439.2	323.1	141,894		3.257	1,845,701	42.371
	23.00		443.2	327.1	144,959		3.328	1,917,413	44.018
	23.50		447.2	331.1	148,056		3.399	1,990,665	45.699
	24.00		451.2	335.1	151,185		3.471	2,065,474	47.417
	24.50		455.2	339.1	154,346		3.543	2,141,856	49.170
	25.00		459.2	343.1	157,539		3.617	2,219,826	50.960
	25.50		463.2	347.1	160,764		3.691	2,299,400	52.787
	26.00		467.2	351.1	164,021		3.765	2,380,595	54.651
	26.50		471.2	355.1	167,310		3.841	2,463,427	56.552
	27.00		475.2	359.1	170,631		3.917	2,547,911	58.492
	27.50		479.2	363.1	173,984		3.994	2,634,063	60.470
	28.00		483.2	367.1	177,369		4.072	2,721,900	62.486
	28.50		487.2	371.1	180,786		4.150	2,811,438	64.542
	29.00		491.2	375.1	184,235		4.229	2,902,692	66.637
	29.50		495.2	379.1	187,717		4.309	2,995,679	68.771
	30.00		499.2	383.1	191,230		4.390	3,090,414	70.946

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: 23.1447.001 Greeley - Oklahoma Drainage MP

Basin ID: Option 4, EURV 820



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.02	1.850	Orifice Plate
Zone 2 (EURV)	6.01	3.643	Weir&Pipe (Restrict)
Zone 3			Not Utilized
Total (all zones)		5.493	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	5.097E-02	ft^2
Depth at top of Zone using Orifice Plate =	3.60	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	14.40	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	7.34	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.20	2.40					
Orifice Area (sq. inches)	7.34	7.34	7.34					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected		Calculated Parameters for Vertical Orifice	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected		Calculated Parameters for Overflow Weir	Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.02	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	6.35	N/A	feet
Overflow Weir Front Edge Length =	800.00	N/A	feet	Overflow Weir Slope Length =	10.54	N/A	feet
Overflow Weir Grate Slope =	3.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	11382.38	N/A	
Horiz. Length of Weir Sides =	10.00	N/A	feet	Overflow Grate Open Area w/o Debris =	5869.19	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	2934.59	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	3.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.52	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.29	N/A	feet
Restrictor Plate Height Above Pipe Invert =	6.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.23	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway	
Spillway Invert Stage=	6.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.97 feet
Spillway Crest Length =	72.00	feet	Stage at Top of Freeboard =	7.97 feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	1.53 acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	8.32 acre-ft

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

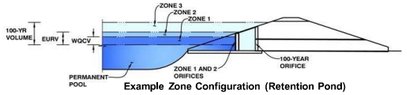
	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =									
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	1.850	5.493	3.732	5.323	7.165	10.587	13.634	17.263	27.180
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	3.732	5.323	7.165	10.587	13.634	17.263	27.180
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	1.1	11.7	32.5	82.7	120.4	166.0	285.0
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.14	0.40	1.02	1.49	2.05	3.52
Peak Inflow Q (cfs) =	N/A	N/A	76.5	108.0	143.4	215.3	277.2	355.1	547.6
Peak Outflow Q (cfs) =	0.9	7.3	6.4	7.0	17.3	102.6	169.8	269.5	507.4
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.6	0.5	1.2	1.4	1.6	1.8
Structure Controlling Flow =	Overflow Weir 1	Spillway	Outlet Plate 1	Outlet Plate 1	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	40	40	41	41	38	36	33	27
Time to Drain 99% of Inflow Volume (hours) =	**40**	45	43	45	46	45	44	43	40
Maximum Ponding Depth (ft) =	3.02	6.01	3.98	5.16	6.13	6.57	6.81	7.10	7.67
Area at Maximum Ponding Depth (acres) =	1.09	1.35	1.17	1.27	1.36	1.40	1.42	1.45	1.50
Maximum Volume Stored (acre-ft) =	1.858	5.494	2.941	4.368	5.643	6.249	6.588	7.019	7.846

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: 23.1447.001 Greeley - Oklahoma Drainage MP

Basin ID: Option 4, Flood Control 823



Example Zone Configuration (Retention Pond)

Watershed Information — **Flood Control Only**

Selected BMP Type =	No BMP	
Watershed Area =	327.00	acres
Watershed Length =	4,753	ft
Watershed Length to Centroid =	2,751	ft
Watershed Slope =	0.012	ft/ft
Watershed Imperviousness =	72.98%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	N/A	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	7.879	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	23.271	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	16.082	acre-feet	0.85 inches
5-yr Runoff Volume (P1 = 1.12 in.) =	22.795	acre-feet	1.12 inches
10-yr Runoff Volume (P1 = 1.4 in.) =	30.462	acre-feet	1.40 inches
25-yr Runoff Volume (P1 = 1.87 in.) =	44.522	acre-feet	1.87 inches
50-yr Runoff Volume (P1 = 2.3 in.) =	57.083	acre-feet	2.30 inches
100-yr Runoff Volume (P1 = 2.79 in.) =	71.969	acre-feet	2.79 inches
500-yr Runoff Volume (P1 = 4.16 in.) =	112.726	acre-feet	4.16 inches
Approximate 2-yr Detention Volume =	14.974	acre-feet	
Approximate 5-yr Detention Volume =	21.673	acre-feet	
Approximate 10-yr Detention Volume =	26.650	acre-feet	
Approximate 25-yr Detention Volume =	33.089	acre-feet	
Approximate 50-yr Detention Volume =	37.124	acre-feet	
Approximate 100-yr Detention Volume =	43.128	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (100-year) =	43.128	acre-feet
Select Zone 2 Storage Volume (Optional) =		acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	43.128	acre-feet
Initial Surcharge Volume (ISV) =	N/A	ft^3
Initial Surcharge Depth (ISD) =	N/A	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	user	acre-feet

Depth Increment = 0.50 ft

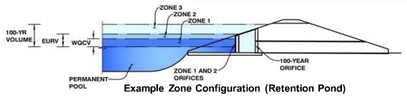
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Media Surface	0.00		--	--	--	37,664	0.865		
	1.00		--	--	--	77,436	1.778	57,550	1.321
	2.00		--	--	--	133,078	3.055	162,807	3.738
	3.00		--	--	--	163,864	3.762	311,278	7.146
	4.00		--	--	--	190,605	4.376	488,512	11.215
	5.00		--	--	--	204,897	4.704	686,263	15.754
	6.00		--	--	--	215,528	4.948	896,476	20.580
	7.00		--	--	--	226,286	5.195	1,117,383	25.652
	8.00		--	--	--	237,198	5.445	1,349,125	30.972
	8.49		--	--	--	273,603	6.281	1,474,271	33.845
	9.00		--	--	--	273,603	6.281	1,613,808	37.048
	10.00		--	--	--	273,603	6.281	1,887,411	43.329

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: 23.1447.001 Greeley - Oklahoma Drainage MP

Basin ID: Option 4, EURV 830



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	90.00	acres
Watershed Length =	2,406	ft
Watershed Length to Centroid =	1,738	ft
Watershed Slope =	0.031	ft/ft
Watershed Imperviousness =	67.80%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	1.991	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	5.915	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	4.073	acre-feet	0.85 inches
5-yr Runoff Volume (P1 = 1.12 in.) =	5.835	acre-feet	1.12 inches
10-yr Runoff Volume (P1 = 1.4 in.) =	7.895	acre-feet	1.40 inches
25-yr Runoff Volume (P1 = 1.87 in.) =	11.755	acre-feet	1.87 inches
50-yr Runoff Volume (P1 = 2.3 in.) =	15.181	acre-feet	2.30 inches
100-yr Runoff Volume (P1 = 2.79 in.) =	19.277	acre-feet	2.79 inches
500-yr Runoff Volume (P1 = 4.16 in.) =	30.442	acre-feet	4.16 inches
Approximate 2-yr Detention Volume =	3.791	acre-feet	
Approximate 5-yr Detention Volume =	5.563	acre-feet	
Approximate 10-yr Detention Volume =	6.823	acre-feet	
Approximate 25-yr Detention Volume =	8.494	acre-feet	
Approximate 50-yr Detention Volume =	9.547	acre-feet	
Approximate 100-yr Detention Volume =	11.222	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.991	acre-feet
Zone 2 Volume (EURV - Zone 1) =	3.924	acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	5.915	acre-feet
Initial Surcharge Volume (ISV) =	578	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{MAX}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.003	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Initial Surcharge Area (A_{ISV}) =	1,752	ft^2
Surcharge Volume Length (L_{ISV}) =	41.9	ft
Surcharge Volume Width (W_{ISV}) =	41.9	ft
Depth of Basin Floor (H_{FLOOR}) =	0.72	ft
Length of Basin Floor (L_{FLOOR}) =	284.7	ft
Width of Basin Floor (W_{FLOOR}) =	161.9	ft
Area of Basin Floor (A_{FLOOR}) =	46,084	ft^2
Volume of Basin Floor (V_{FLOOR}) =	13,637	ft^3
Depth of Main Basin (H_{MAIN}) =	4.45	ft
Length of Main Basin (L_{MAIN}) =	320.3	ft
Width of Main Basin (W_{MAIN}) =	197.5	ft
Area of Main Basin (A_{MAIN}) =	63,250	ft^2
Volume of Main Basin (V_{MAIN}) =	242,262	ft^3
Calculated Total Basin Volume (V_{total}) =	**5.908**	acre-feet

Total detention volume is less than 100-year volume.

Depth Increment = 0.50 ft

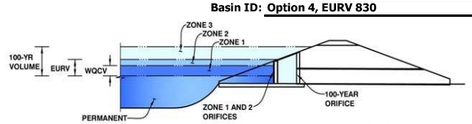
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		41.9	41.9	1,752		0.040		
ISV	0.33		41.9	41.9	1,752		0.040	578	0.013
	0.50		41.9	41.9	1,752		0.040	876	0.020
	1.00		99.2	70.2	6,962		0.160	2,148	0.049
	1.50		267.9	153.5	41,122		0.944	12,998	0.298
Floor	1.55		284.7	161.9	46,084		1.058	15,177	0.348
	2.00		288.3	165.5	47,705		1.095	36,279	0.833
	2.50		292.3	169.5	49,536		1.137	60,587	1.391
	3.00		296.3	173.5	51,399		1.180	85,820	1.970
Zone 1 (WQCV)	3.02		296.5	173.6	51,474		1.182	86,848	1.994
	3.50		300.3	177.5	53,294		1.223	111,992	2.571
	4.00		304.3	181.5	55,221		1.268	139,119	3.194
	4.50		308.3	185.5	57,180		1.313	167,218	3.839
	5.00		312.3	189.5	59,171		1.358	196,305	4.507
	5.50		316.3	193.5	61,195		1.405	226,395	5.197
	6.00		320.3	197.5	63,250		1.452	257,505	5.911
Zone 2 (EURV)	6.01		320.4	197.5	63,291		1.453	258,137	5.926
	6.50		324.3	201.5	65,337		1.500	289,650	6.649
	7.00		328.3	205.5	67,456		1.549	322,847	7.412
	7.50		332.3	209.5	69,607		1.598	357,111	8.198
	8.00		336.3	213.5	71,790		1.648	392,459	9.010
	8.50		340.3	217.5	74,005		1.699	428,907	9.846
	9.00		344.3	221.5	76,253		1.751	466,470	10.709
	9.50		348.3	225.5	78,532		1.803	505,165	11.597
	10.00		352.3	229.5	80,843		1.856	545,007	12.512
	10.50		356.3	233.5	83,186		1.910	586,013	13.453
	11.00		360.3	237.5	85,561		1.964	628,198	14.421
	11.50		364.3	241.5	87,968		2.019	671,579	15.417
	12.00		368.3	245.5	90,407		2.075	716,172	16.441
	12.50		372.3	249.5	92,878		2.132	761,992	17.493
	13.00		376.3	253.5	95,382		2.190	809,056	18.573
	13.50		380.3	257.5	97,917		2.248	857,379	19.683
	14.00		384.3	261.5	100,484		2.307	906,978	20.821
	14.50		388.3	265.5	103,083		2.366	957,868	21.990
	15.00		392.3	269.5	105,714		2.427	1,010,066	23.188
	15.50		396.3	273.5	108,377		2.488	1,063,587	24.417
	16.00		400.3	277.5	111,072		2.550	1,118,448	25.676
	16.50		404.3	281.5	113,799		2.612	1,174,665	26.967
	17.00		408.3	285.5	116,559		2.676	1,232,253	28.289
	17.50		412.3	289.5	119,350		2.740	1,291,229	29.643
	18.00		416.3	293.5	122,173		2.805	1,351,608	31.029
	18.50		420.3	297.5	125,028		2.870	1,413,407	32.447
	19.00		424.3	301.5	127,915		2.937	1,476,641	33.899
	19.50		428.3	305.5	130,834		3.004	1,541,327	35.384
	20.00		432.3	309.5	133,785		3.071	1,607,481	36.903
	20.50		436.3	313.5	136,768		3.140	1,675,118	38.455
	21.00		440.3	317.5	139,784		3.209	1,744,255	40.043
	21.50		444.3	321.5	142,831		3.279	1,814,907	41.665
	22.00		448.3	325.5	145,910		3.350	1,887,091	43.322
	22.50		452.3	329.5	149,021		3.421	1,960,822	45.014
	23.00		456.3	333.5	152,164		3.493	2,036,117	46.743
	23.50		460.3	337.5	155,339		3.566	2,112,992	48.508
	24.00		464.3	341.5	158,546		3.640	2,191,462	50.309
	24.50		468.3	345.5	161,785		3.714	2,271,543	52.147
	25.00		472.3	349.5	165,057		3.789	2,353,253	54.023
	25.50		476.3	353.5	168,360		3.865	2,436,605	55.937
	26.00		480.3	357.5	171,695		3.942	2,521,618	57.888
	26.50		484.3	361.5	175,062		4.019	2,608,305	59.878
	27.00		488.3	365.5	178,461		4.097	2,696,685	61.907
	27.50		492.3	369.5	181,892		4.176	2,786,772	63.975
	28.00		496.3	373.5	185,355		4.255	2,878,583	66.083
	28.50		500.3	377.5	188,851		4.335	2,972,133	68.231
	29.00		504.3	381.5	192,378		4.416	3,067,438	70.419
	29.50		508.3	385.5	195,937		4.498	3,164,516	72.647
	30.00		512.3	389.5	199,528		4.581	3,263,381	74.917

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: 23.1447.001 Greeley - Oklahoma Drainage MP

Basin ID: Option 4, EURV 830



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.02	1.991	Orifice Plate
Zone 2 (EURV)	6.01	3.924	Weir&Pipe (Restrict)
Zone 3			Not Utilized
Total (all zones)		5.915	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	4.840E-02	ft^2
Depth at top of Zone using Orifice Plate =	3.02	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	12.10	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	6.97	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.01	2.01					
Orifice Area (sq. inches)	6.97	6.97	6.97					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected		Calculated Parameters for Vertical Orifice	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected		Calculated Parameters for Overflow Weir	Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.02	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	6.35	N/A	feet
Overflow Weir Front Edge Length =	800.00	N/A	feet	Overflow Weir Slope Length =	10.54	N/A	feet
Overflow Weir Grate Slope =	3.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	12272.31	N/A	
Horiz. Length of Weir Sides =	10.00	N/A	feet	Overflow Grate Open Area w/o Debris =	5869.19	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	2934.59	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.48	N/A	ft^2
Outlet Pipe Diameter =	16.00	N/A	inches	Outlet Orifice Centroid =	0.29	N/A	feet
Restrictor Plate Height Above Pipe Invert =	6.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.32	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=	6.10	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.98	feet
Spillway Crest Length =	117.00	feet	Stage at Top of Freeboard =	8.08	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	1.66	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	9.14	acre-ft

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

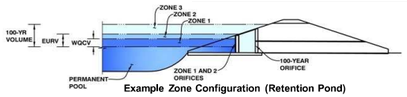
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	1.991	5.915	4.073	5.835	7.895	11.755	15.181	19.277	30.442
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	4.073	5.835	7.895	11.755	15.181	19.277	30.442
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	1.0	10.6	29.5	76.5	111.1	155.2	266.0
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.12	0.33	0.85	1.23	1.72	2.96
Peak Inflow Q (cfs) =	N/A	N/A	72.5	103.5	139.7	214.5	275.9	352.0	546.5
Peak Outflow Q (cfs) =	1.0	6.6	5.8	6.3	21.4	114.7	194.4	298.5	552.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.6	0.7	1.5	1.7	1.9	2.1
Structure Controlling Flow =	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	42	41	43	43	40	37	34	27
Time to Drain 99% of Inflow Volume (hours) =	**40**	46	44	47	48	47	46	44	41
Maximum Ponding Depth (ft) =	3.02	6.01	4.10	5.33	6.22	6.55	6.75	6.97	7.41
Area at Maximum Ponding Depth (acres) =	1.18	1.45	1.28	1.39	1.47	1.50	1.52	1.54	1.59
Maximum Volume Stored (acre-ft) =	1.994	5.926	3.308	4.946	6.233	6.725	7.027	7.350	8.055

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: 23.1447.001 Greeley - Oklahoma Drainage MP

Basin ID: Option4, Flood Control 838



Example Zone Configuration (Retention Pond)

Watershed Information — **Flood Control Only**

Selected BMP Type =	No BMP	
Watershed Area =	126.50	acres
Watershed Length =	2,939	ft
Watershed Length to Centroid =	1,428	ft
Watershed Slope =	0.031	ft/ft
Watershed Imperviousness =	76.20%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	N/A	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	3.226 acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	9.432 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	6.396 acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	9.013 acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	11.961 acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	17.299 acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	22.084 acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	27.727 acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	43.218 acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	6.083 acre-feet		
Approximate 5-yr Detention Volume =	8.736 acre-feet		
Approximate 10-yr Detention Volume =	10.760 acre-feet		
Approximate 25-yr Detention Volume =	13.343 acre-feet		
Approximate 50-yr Detention Volume =	14.954 acre-feet		
Approximate 100-yr Detention Volume =	17.253 acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (100-year) =	17.253	acre-feet
Select Zone 2 Storage Volume (Optional) =		acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	17.253	acre-feet
Initial Surcharge Volume (ISV) =	N/A	ft^3
Initial Surcharge Depth (ISD) =	N/A	ft
Total Available Detention Depth (H_{total}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.003	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Initial Surcharge Area (A_{ISV}) =	0	ft^2
Surcharge Volume Length (L_{ISV}) =	0.0	ft
Surcharge Volume Width (W_{ISV}) =	0.0	ft
Depth of Basin Floor (H_{FLOOR}) =	0.00	ft
Length of Basin Floor (L_{FLOOR}) =	464.4	ft
Width of Basin Floor (W_{FLOOR}) =	232.2	ft
Area of Basin Floor (A_{FLOOR}) =	107,813	ft^2
Volume of Basin Floor (V_{FLOOR}) =	0	ft^3
Depth of Main Basin (H_{MAIN}) =	6.00	ft
Length of Main Basin (L_{MAIN}) =	512.4	ft
Width of Main Basin (W_{MAIN}) =	280.2	ft
Area of Main Basin (A_{MAIN}) =	143,551	ft^2
Volume of Main Basin (V_{MAIN}) =	751,538	ft^3
Calculated Total Basin Volume (V_{total}) =	**17.253**	acre-feet

Depth Increment = 0.50 ft

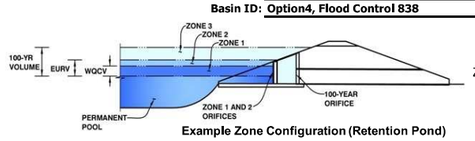
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Media Surface	0.00		464.4	232.2	107,813		2.475		
	0.50		468.4	236.2	110,615		2.539	54,606	1.254
	1.00		472.4	240.2	113,449		2.604	110,621	2.539
	1.50		476.4	244.2	116,315		2.670	168,060	3.858
	2.00		480.4	248.2	119,214		2.737	226,941	5.210
	2.50		484.4	252.2	122,144		2.804	287,279	6.595
	3.00		488.4	256.2	125,106		2.872	349,090	8.014
	3.50		492.4	260.2	128,100		2.941	412,391	9.467
	4.00		496.4	264.2	131,126		3.010	477,196	10.955
	4.50		500.4	268.2	134,184		3.080	543,522	12.478
	5.00		504.4	272.2	137,274		3.151	611,385	14.035
	5.50		508.4	276.2	140,397		3.223	680,802	15.629
Zone 1 (100-year)	6.00		512.4	280.2	143,551		3.295	751,787	17.259
	6.50		516.4	284.2	146,737		3.369	824,358	18.925
	7.00		520.4	288.2	149,955		3.442	898,529	20.627
	7.50		524.4	292.2	153,205		3.517	974,318	22.367
	8.00		528.4	296.2	156,487		3.592	1,051,740	24.145
	8.50		532.4	300.2	159,801		3.669	1,130,811	25.960
	9.00		536.4	304.2	163,147		3.745	1,211,546	27.813
	9.50		540.4	308.2	166,526		3.823	1,293,963	29.705
	10.00		544.4	312.2	169,936		3.901	1,378,077	31.636
	10.50		548.4	316.2	173,378		3.980	1,463,904	33.607
	11.00		552.4	320.2	176,852		4.060	1,551,461	35.617
	11.50		556.4	324.2	180,358		4.140	1,640,762	37.667
	12.00		560.4	328.2	183,896		4.222	1,731,824	39.757
	12.50		564.4	332.2	187,466		4.304	1,824,663	41.889
	13.00		568.4	336.2	191,069		4.386	1,919,296	44.061
	13.50		572.4	340.2	194,703		4.470	2,015,737	46.275
	14.00		576.4	344.2	198,369		4.554	2,114,004	48.531
	14.50		580.4	348.2	202,067		4.639	2,214,111	50.829
	15.00		584.4	352.2	205,797		4.724	2,316,076	53.170
	15.50		588.4	356.2	209,559		4.811	2,419,914	55.554
	16.00		592.4	360.2	213,353		4.898	2,525,641	57.981
	16.50		596.4	364.2	217,179		4.986	2,633,272	60.452
	17.00		600.4	368.2	221,038		5.074	2,742,825	62.967
	17.50		604.4	372.2	224,928		5.164	2,854,315	65.526
	18.00		608.4	376.2	228,850		5.254	2,967,758	68.130
	18.50		612.4	380.2	232,804		5.344	3,083,171	70.780
	19.00		616.4	384.2	236,790		5.436	3,200,568	73.475
	19.50		620.4	388.2	240,808		5.528	3,319,966	76.216
	20.00		624.4	392.2	244,858		5.621	3,441,381	79.003
	20.50		628.4	396.2	248,941		5.715	3,564,830	81.837
	21.00		632.4	400.2	253,055		5.809	3,690,327	84.718
	21.50		636.4	404.2	257,201		5.905	3,817,890	87.647
	22.00		640.4	408.2	261,379		6.000	3,947,533	90.623
	22.50		644.4	412.2	265,589		6.097	4,079,274	93.647
	23.00		648.4	416.2	269,831		6.194	4,213,128	96.720
	23.50		652.4	420.2	274,105		6.293	4,349,111	99.842
	24.00		656.4	424.2	278,411		6.391	4,487,238	103.013
	24.50		660.4	428.2	282,750		6.491	4,627,527	106.233
	25.00		664.4	432.2	287,120		6.591	4,769,993	109.504
	25.50		668.4	436.2	291,522		6.692	4,914,652	112.825
	26.00		672.4	440.2	295,956		6.794	5,061,521	116.197
	26.50		676.4	444.2	300,422		6.897	5,210,614	119.619
	27.00		680.4	448.2	304,920		7.000	5,361,948	123.093
	27.50		684.4	452.2	309,450		7.104	5,515,539	126.619
	28.00		688.4	456.2	314,013		7.209	5,671,404	130.198
	28.50		692.4	460.2	318,607		7.314	5,829,557	133.828
	29.00		696.4	464.2	323,233		7.420	5,990,016	137.512
	29.50		700.4	468.2	327,891		7.527	6,152,795	141.249
	30.00		704.4	472.2	332,581		7.635	6,317,912	145.039

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: 23.1447.001 Greeley - Oklahoma Drainage MP

Basin ID: Option4, Flood Control 838



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (100-year)	6.00	17,253	Rectangular Orifice
Zone 2			
Zone 3			
Total (all zones)		17,253	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	N/A	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	N/A	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (optional)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 1 Rectangular	Not Selected		Calculated Parameters for Vertical Orifice	Zone 1 Rectangular	Not Selected	
Invert of Vertical Orifice =	0.00		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	29.17		ft^2
Depth at top of Zone using Vertical Orifice =	6.00		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	2.50		feet
Vertical Orifice Height =	60.00		inches				
Vertical Orifice Width =	70.00		inches				

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Not Selected	Not Selected		Calculated Parameters for Overflow Weir	Not Selected	Not Selected	
Overflow Weir Front Edge Height, Ho =	0.00		ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =			feet
Overflow Weir Front Edge Length =			feet	Overflow Weir Slope Length =			feet
Overflow Weir Grate Slope =			H:V	Grate Open Area / 100-yr Orifice Area =			
Horiz. Length of Weir Sides =			feet	Overflow Grate Open Area w/o Debris =			ft^2
Overflow Grate Type =				Overflow Grate Open Area w/ Debris =			ft^2
Debris Clogging % =			%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Not Selected	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =			ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =			ft^2
Circular Orifice Diameter =			inches	Outlet Orifice Centroid =			feet
				Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=		ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=		feet
Spillway Crest Length =		feet	Stage at Top of Freeboard =		feet
Spillway End Slopes =		H:V	Basin Area at Top of Freeboard =		acres
Freeboard above Max Water Surface =		feet	Basin Volume at Top of Freeboard =		acre-ft

Routed Hydrograph Results — *The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).*

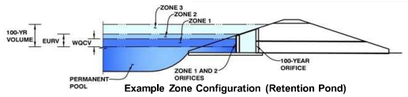
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	3.226	9.432	6.396	9.013	11.961	17.299	22.084	27.727	43.218
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	6.396	9.013	11.961	17.299	22.084	49.811	43.218
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	1.6	16.9	46.2	119.1	172.4	241.0	412.1
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.13	0.36	0.94	1.36	1.90	3.26
Peak Inflow Q (cfs) =	N/A	N/A	126.7	175.8	229.8	339.1	430.4	511.0	840.3
Peak Outflow Q (cfs) =	17.8	108.2	25.5	41.5	60.6	116.5	161.5	293.9	308.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	2.5	1.3	1.0	0.9	1.2	0.7
Structure Controlling Flow =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	41	18	24	19	15	12	10	8	7
Time to Drain 99% of Inflow Volume (hours) =	**100**	44	59	45	36	27	23	15	14
Maximum Ponding Depth (ft) =	1.27	3.49	1.51	1.98	2.44	3.50	4.19	6.88	7.34
Area at Maximum Ponding Depth (acres) =	2.64	2.94	2.67	2.73	2.80	2.94	3.04	3.42	3.49
Maximum Volume Stored (acre-ft) =	3.247	9.438	3.885	5.155	6.427	9.467	11.529	20.181	21.772

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: Option 4, EURV 840



Example Zone Configuration (Retention Pond)

Depth Increment = 0.25 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft²)	Optional Override Area (ft²)	Area (acre)	Volume (ft³)	Volume (ac-ft)
Top of Micropool	0.00		16.1	16.1	258		0.006		
ISV	0.50		16.1	16.1	258		0.006	129	0.003
	0.75		16.1	16.1	258		0.006	193	0.004
	1.00		16.1	16.1	258		0.006	258	0.006
	1.25		48.3	31.7	1,530		0.035	460	0.011
	1.50		80.6	47.3	3,810		0.087	1,107	0.025
	1.75		112.8	62.9	7,098		0.163	2,449	0.056
	2.00		145.1	78.6	11,394		0.262	4,740	0.109
	2.25		177.3	94.2	16,698		0.383	8,231	0.189
	2.50		209.6	109.8	23,010		0.528	13,173	0.302
	2.75		241.8	125.4	30,329		0.696	19,819	0.455
	3.00		274.1	141.1	38,656		0.887	28,421	0.652
	3.25		306.3	156.7	47,991		1.102	39,231	0.901
Zone 1 (WQCV)	3.33		316.6	161.7	51,191		1.175	43,198	0.992
	3.50		338.6	172.3	58,334		1.339	52,501	1.205
	3.75		370.8	187.9	69,684		1.600	68,482	1.572
	4.00		403.1	203.6	82,043		1.883	87,427	2.007
	4.25		435.3	219.2	95,409		2.190	109,587	2.516
	4.50		467.6	234.8	109,783		2.520	135,215	3.104
	4.75		499.8	250.4	125,165		2.873	164,563	3.778
Floor	4.83		510.1	255.4	130,300		2.991	174,781	4.012
	5.00		511.5	256.8	131,343		3.015	197,020	4.523
	5.25		513.5	258.8	132,883		3.051	230,048	5.281
Zone 2 (EURV)	5.28		513.7	259.0	133,069		3.055	234,038	5.373
	5.50		515.5	260.8	134,432		3.086	263,463	6.048
	5.75		517.5	262.8	135,988		3.122	297,265	6.824
	6.00		519.5	264.8	137,553		3.158	331,458	7.609
	6.25		521.5	266.8	139,125		3.194	366,042	8.403
Zone 3 (100-year)	6.50		523.5	268.8	140,706		3.230	401,021	9.206
	6.75		525.5	270.8	142,295		3.267	436,396	10.018
	7.00		527.5	272.8	143,891		3.303	472,169	10.840
	7.25		529.5	274.8	145,496		3.340	508,342	11.670
	7.50		531.5	276.8	147,108		3.377	544,917	12.510
	7.75		533.5	278.8	148,729		3.414	581,897	13.359
	8.00		535.5	280.8	150,357		3.452	619,282	14.217
	8.25		537.5	282.8	151,994		3.489	657,076	15.084
	8.50		539.5	284.8	153,638		3.527	695,280	15.961
	8.75		541.5	286.8	155,291		3.565	733,896	16.848
	9.00		543.5	288.8	156,951		3.603	772,926	17.744
	9.25		545.5	290.8	158,620		3.641	812,372	18.650
	9.50		547.5	292.8	160,297		3.680	852,237	19.565
	9.75		549.5	294.8	161,981		3.719	892,521	20.489
	10.00		551.5	296.8	163,674		3.757	933,228	21.424
	10.25		553.5	298.8	165,374		3.796	974,359	22.368
	10.50		555.5	300.8	167,083		3.836	1,015,916	23.322
	10.75		557.5	302.8	168,799		3.875	1,057,901	24.286
	11.00		559.5	304.8	170,524		3.915	1,100,316	25.260
	11.25		561.5	306.8	172,256		3.954	1,143,163	26.243
	11.50		563.5	308.8	173,997		3.994	1,186,445	27.237
	11.75		565.5	310.8	175,745		4.035	1,230,162	28.241
	12.00		567.5	312.8	177,502		4.075	1,274,318	29.254
	12.25		569.5	314.8	179,266		4.115	1,318,914	30.278
	12.50		571.5	316.8	181,039		4.156	1,363,952	31.312
	12.75		573.5	318.8	182,820		4.197	1,409,434	32.356
	13.00		575.5	320.8	184,608		4.238	1,455,362	33.411
	13.25		577.5	322.8	186,405		4.279	1,501,739	34.475
	13.50		579.5	324.8	188,209		4.321	1,548,565	35.550
	13.75		581.5	326.8	190,022		4.362	1,595,844	36.636
	14.00		583.5	328.8	191,842		4.404	1,643,577	37.731
	14.25		585.5	330.8	193,671		4.446	1,691,766	38.838
	14.50		587.5	332.8	195,507		4.488	1,740,413	39.954
	14.75		589.5	334.8	197,352		4.531	1,789,520	41.082
	15.00		591.5	336.8	199,204		4.573	1,839,090	42.220
	15.25		593.5	338.8	201,065		4.616	1,889,123	43.368
	15.50		595.5	340.8	202,934		4.659	1,939,623	44.528
	15.75		597.5	342.8	204,810		4.702	1,990,591	45.698
	16.00		599.5	344.8	206,695		4.745	2,042,028	46.879
	16.25		601.5	346.8	208,587		4.789	2,093,939	48.070
	16.50		603.5	348.8	210,488		4.832	2,146,323	49.273
	16.75		605.5	350.8	212,396		4.876	2,199,183	50.486
	17.00		607.5	352.8	214,313		4.920	2,252,522	51.711
	17.25		609.5	354.8	216,237		4.964	2,306,340	52.946
	17.50		611.5	356.8	218,170		5.008	2,360,641	54.193
	17.75		613.5	358.8	220,110		5.053	2,415,426	55.451
	18.00		615.5	360.8	222,059		5.098	2,470,697	56.719
	18.25		617.5	362.8	224,015		5.143	2,526,456	57.999
	18.50		619.5	364.8	225,980		5.188	2,582,705	59.291
	18.75		621.5	366.8	227,953		5.233	2,639,447	60.593
	19.00		623.5	368.8	229,933		5.279	2,696,682	61.907
	19.25		625.5	370.8	231,922		5.324	2,754,414	63.233
	19.50		627.5	372.8	233,918		5.370	2,812,644	64.569
	19.75		629.5	374.8	235,923		5.416	2,871,374	65.918
	20.00		631.5	376.8	237,935		5.462	2,930,606	67.277
	20.25		633.5	378.8	239,956		5.509	2,990,342	68.649
	20.50		635.5	380.8	241,984		5.555	3,050,584	70.032
	20.75		637.5	382.8	244,021		5.602	3,111,335	71.426
	21.00		639.5	384.8	246,065		5.649	3,172,595	72.833
	21.25		641.5	386.8	248,118		5.696	3,234,368	74.251
	21.50		643.5	388.8	250,179		5.743	3,296,655	75.681
	21.75		645.5	390.8	252,247		5.791	3,359,458	77.123
	22.00		647.5	392.8	254,324		5.838	3,422,779	78.576
	22.25		649.5	394.8	256,408		5.886	3,486,620	80.042
	22.50		651.5	396.8	258,501		5.934	3,550,984	81.519
	22.75		653.5	398.8	260,601		5.983	3,615,872	83.009
	23.00		655.5	400.8	262,710		6.031	3,681,285	84.511
	23.25		657.5	402.8	264,826		6.080	3,747,227	86.024
	23.50		659.5	404.8	266,951		6.128	3,813,699	87.550
	23.75		661.5	406.8	269,083		6.177	3,880,703	89.089
	24.00		663.5	408.8	271,224		6.226	3,948,241	90.639

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	63.86	acres
Watershed Length =	3,575	ft
Watershed Length to Centroid =	1,789	ft
Watershed Slope =	0.023	ft/ft
Watershed Imperviousness =	76.73%	percent
Percentage Hydrologic Soil Group A =	5.8%	percent
Percentage Hydrologic Soil Group B =	76.8%	percent
Percentage Hydrologic Soil Groups C/D =	17.4%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.986 acre-feet	0.986	acre-feet
Excess Urban Runoff Volume (EURV) =	5.367 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	3.261 acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	4.496 acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	5.952 acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	8.664 acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	11.063 acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	13.930 acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	21.754 acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	3.057 acre-feet		
Approximate 5-yr Detention Volume =	4.250 acre-feet		
Approximate 10-yr Detention Volume =	5.588 acre-feet		
Approximate 25-yr Detention Volume =	7.033 acre-feet		
Approximate 50-yr Detention Volume =	7.997 acre-feet		
Approximate 100-yr Detention Volume =	9.192 acre-feet		

Define Zones and Basin Geometry

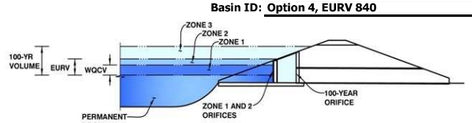
Zone 1 Volume (WQCV) =	0.986	acre-feet
Zone 2 Volume (EURV - Zone 1) =	4.381	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	3.825	acre-feet
Total Detention Basin Volume =	9.192	acre-feet
Initial Surcharge Volume (ISV) =	129	ft^3
Initial Surcharge Depth (ISD) =	0.50	ft
Total Available Detention Depth (H_{total}) =	6.50	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.008	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	
Initial Surcharge Area (A_{ISV}) =	258	ft^2
Surcharge Volume Length (L_{ISV}) =	16.1	ft
Surcharge Volume Width (W_{ISV}) =	16.1	ft
Depth of Basin Floor (H_{FLOOR}) =	3.83	ft
Length of Basin Floor (L_{FLOOR}) =	510.1	ft
Width of Basin Floor (W_{FLOOR}) =	255.4	ft
Area of Basin Floor (A_{FLOOR}) =	130,300	ft^2
Volume of Basin Floor (V_{FLOOR}) =	174,076	ft^3
Depth of Basin Main (H_{MAIN}) =	1.67	ft
Length of Main Basin (L_{MAIN}) =	523.5	ft
Width of Main Basin (W_{MAIN}) =	268.8	ft
Area of Main Basin (A_{MAIN}) =	140,706	ft^2
Volume of Main Basin (V_{MAIN}) =	226,234	ft^3
Calculated Total Basin Volume (V_{total}) =	**9.196**	acre-feet

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: Option 4, EURV 840



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.33	0.986	Orifice Plate
Zone 2 (EURV)	5.28	4.381	Weir&Pipe (Restrict)
Zone 3 (100-year)	6.50	3.825	Not Utilized
Total (all zones)		9.192	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	1.840E-02	ft^2
Depth at top of Zone using Orifice Plate =	3.33	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	13.30	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	2.65	sq. inches (diameter = 1-13/16 inches)	Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.11	2.22					
Orifice Area (sq. inches)	2.65	2.65	2.65					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected		Calculated Parameters for Vertical Orifice	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected		Calculated Parameters for Overflow Weir	Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.33	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.33	N/A	feet
Overflow Weir Front Edge Length =	4.00	N/A	feet	Overflow Weir Slope Length =	4.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	54.86	N/A	
Horiz. Length of Weir Sides =	4.00	N/A	feet	Overflow Grate Open Area w/o Debris =	11.14	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	5.57	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.20	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.15	N/A	feet
Restrictor Plate Height Above Pipe Invert =	3.10		inches	Half-Central Angle of Restrictor Plate on Pipe =	0.86	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=	5.29	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.16	feet
Spillway Crest Length =	1000.00	feet	Stage at Top of Freeboard =	6.45	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	3.22	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	9.04	acre-ft

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

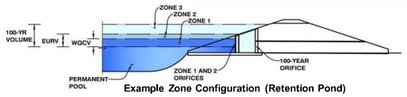
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	0.986	5.367	3.261	4.496	5.952	8.664	11.063	13.930	21.754
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	3.261	4.496	5.952	8.664	11.063	13.930	21.754
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.4	0.7	8.8	33.2	50.3	73.2	130.4
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.01	0.14	0.52	0.79	1.15	2.04
Peak Inflow Q (cfs) =	N/A	N/A	44.2	60.6	79.8	122.0	156.4	196.7	305.2
Peak Outflow Q (cfs) =	0.4	2.7	2.5	2.6	5.3	67.6	115.5	162.2	357.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	3.5	0.6	2.0	2.3	2.2	2.7
Structure Controlling Flow =	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	0.19	0.19	0.2	0.2	0.2	0.2	0.2	0.2
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	53	48	51	55	51	49	45	37
Time to Drain 99% of Inflow Volume (hours) =	**40**	60	52	57	62	60	59	57	54
Maximum Ponding Depth (ft) =	3.33	5.28	4.40	4.84	5.30	5.37	5.40	5.43	5.53
Area at Maximum Ponding Depth (acres) =	1.18	3.05	2.37	2.99	3.06	3.07	3.07	3.08	3.09
Maximum Volume Stored (acre-ft) =	0.992	5.373	2.835	4.042	5.403	5.618	5.740	5.833	6.141

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: Option 4, EURV 842



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	210.53	acres
Watershed Length =	4,665	ft
Watershed Length to Centroid =	2,450	ft
Watershed Slope =	0.019	ft/ft
Watershed Imperviousness =	64.54%	percent
Percentage Hydrologic Soil Group A =	8.7%	percent
Percentage Hydrologic Soil Group B =	45.0%	percent
Percentage Hydrologic Soil Groups C/D =	46.3%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	2.656	acre-feet	2.656 acre-feet
Excess Urban Runoff Volume (EURV) =	14.210	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	8.937	acre-feet	0.85 inches
5-yr Runoff Volume (P1 = 1.12 in.) =	12.514	acre-feet	1.12 inches
10-yr Runoff Volume (P1 = 1.4 in.) =	17.051	acre-feet	1.40 inches
25-yr Runoff Volume (P1 = 1.87 in.) =	26.080	acre-feet	1.87 inches
50-yr Runoff Volume (P1 = 2.3 in.) =	33.878	acre-feet	2.30 inches
100-yr Runoff Volume (P1 = 2.79 in.) =	43.453	acre-feet	2.79 inches
500-yr Runoff Volume (P1 = 4.16 in.) =	69.294	acre-feet	4.16 inches
Approximate 2-yr Detention Volume =	8.255	acre-feet	
Approximate 5-yr Detention Volume =	11.858	acre-feet	
Approximate 10-yr Detention Volume =	15.324	acre-feet	
Approximate 25-yr Detention Volume =	19.392	acre-feet	
Approximate 50-yr Detention Volume =	22.076	acre-feet	
Approximate 100-yr Detention Volume =	26.029	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	2.656	acre-feet
Zone 2 Volume (EURV - Zone 1) =	11.554	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	11.819	acre-feet
Total Detention Basin Volume =	26.029	acre-feet
Initial Surcharge Volume (ISV) =	347	ft^3
Initial Surcharge Depth (ISD) =	0.50	ft
Total Available Detention Depth (H_{MAX}) =	6.50	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.005	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Initial Surcharge Area (A_{ISV}) =	694	ft^2
Surcharge Volume Length (L_{ISV}) =	26.3	ft
Surcharge Volume Width (W_{ISV}) =	26.3	ft
Depth of Basin Floor (H_{FLOOR}) =	4.37	ft
Length of Basin Floor (L_{FLOOR}) =	917.8	ft
Width of Basin Floor (W_{FLOOR}) =	463.3	ft
Area of Basin Floor (A_{FLOOR}) =	425,273	ft^2
Volume of Basin Floor (V_{FLOOR}) =	645,520	ft^3
Depth of Main Basin (H_{MAIN}) =	1.13	ft
Length of Main Basin (L_{MAIN}) =	926.9	ft
Width of Main Basin (W_{MAIN}) =	472.4	ft
Area of Main Basin (A_{MAIN}) =	437,840	ft^2
Volume of Main Basin (V_{MAIN}) =	487,641	ft^3
Calculated Total Basin Volume (V_{total}) =	**26.030**	acre-feet

Depth Increment = 0.25 ft

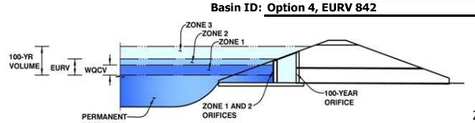
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		26.3	26.3	694		0.016		
ISV	0.50		26.3	26.3	694		0.016	347	0.008
	0.75		26.3	26.3	694		0.016	521	0.012
	1.00		26.3	26.3	694		0.016	694	0.016
	1.25		77.3	51.3	3,972		0.091	1,224	0.028
	1.50		128.3	76.3	9,799		0.225	2,892	0.066
	1.75		179.3	101.3	18,176		0.417	6,336	0.145
	2.00		230.3	126.3	29,104		0.668	12,193	0.280
	2.25		281.3	151.3	42,581		0.978	21,101	0.484
	2.50		332.3	176.3	58,608		1.345	33,696	0.774
	2.75		383.3	201.3	77,186		1.772	50,617	1.162
	3.00		434.3	226.3	98,313		2.257	72,502	1.664
	3.25		485.3	251.3	121,991		2.801	99,986	2.295
Zone 1 (WQCV)	3.38		511.9	264.3	135,311		3.106	116,704	2.679
	3.50		536.3	276.3	148,218		3.403	133,709	3.070
	3.75		587.3	301.3	176,995		4.063	174,308	4.002
	4.00		638.3	326.3	208,323		4.782	222,420	5.106
	4.25		689.3	351.3	242,200		5.560	278,682	6.398
	4.50		740.3	376.3	278,628		6.396	343,732	7.891
	4.75		791.3	401.3	317,605		7.291	418,208	9.601
	5.00		842.3	426.3	359,132		8.245	502,747	11.541
	5.25		893.3	451.3	403,210		9.256	597,987	13.728
Zone 2 (EURV)	5.31		905.6	457.3	414,168		9.508	622,507	14.291
Floor	5.37		917.8	463.3	425,273		9.763	647,690	14.869
	5.50		918.9	464.4	426,710		9.796	703,069	16.140
	5.75		920.9	466.4	429,481		9.860	810,092	18.597
	6.00		922.9	468.4	432,259		9.923	917,810	21.070
	6.25		924.9	470.4	435,046		9.987	1,026,223	23.559
Zone 3 (100-year)	6.50		926.9	472.4	437,840		10.051	1,135,333	26.064
	6.75		928.9	474.4	440,643		10.116	1,245,143	28.585
	7.00		930.9	476.4	443,453		10.180	1,355,655	31.122
	7.25		932.9	478.4	446,272		10.245	1,466,871	33.675
	7.50		934.9	480.4	449,098		10.310	1,578,792	36.244
	7.75		936.9	482.4	451,933		10.375	1,691,420	38.830
	8.00		938.9	484.4	454,775		10.440	1,804,759	41.432
	8.25		940.9	486.4	457,626		10.506	1,918,809	44.050
	8.50		942.9	488.4	460,484		10.571	2,033,572	46.684
	8.75		944.9	490.4	463,351		10.637	2,149,051	49.335
	9.00		946.9	492.4	466,225		10.703	2,265,248	52.003
	9.25		948.9	494.4	469,108		10.769	2,382,165	54.687
	9.50		950.9	496.4	471,998		10.836	2,499,803	57.388
	9.75		952.9	498.4	474,897		10.902	2,618,164	60.105
	10.00		954.9	500.4	477,803		10.969	2,737,252	62.839
	10.25		956.9	502.4	480,718		11.036	2,857,067	65.589
	10.50		958.9	504.4	483,640		11.103	2,977,611	68.357
	10.75		960.9	506.4	486,571		11.170	3,098,887	71.141
	11.00		962.9	508.4	489,509		11.238	3,220,897	73.942
	11.25		964.9	510.4	492,456		11.305	3,343,643	76.759
	11.50		966.9	512.4	495,410		11.373	3,467,126	79.594
	11.75		968.9	514.4	498,373		11.441	3,591,349	82.446
	12.00		970.9	516.4	501,343		11.509	3,716,313	85.315
	12.25		972.9	518.4	504,322		11.578	3,842,021	88.201
	12.50		974.9	520.4	507,308		11.646	3,968,474	91.104
	12.75		976.9	522.4	510,303		11.715	4,095,676	94.024
	13.00		978.9	524.4	513,305		11.784	4,223,627	96.961
	13.25		980.9	526.4	516,316		11.853	4,352,329	99.916
	13.50		982.9	528.4	519,334		11.922	4,481,785	102.888
	13.75		984.9	530.4	522,361		11.992	4,611,997	105.877
	14.00		986.9	532.4	525,395		12.061	4,742,966	108.884
	14.25		988.9	534.4	528,438		12.131	4,874,695	111.908
	14.50		990.9	536.4	531,488		12.201	5,007,186	114.949
	14.75		992.9	538.4	534,547		12.272	5,140,440	118.008
	15.00		994.9	540.4	537,613		12.342	5,274,460	121.085
	15.25		996.9	542.4	540,688		12.412	5,409,248	124.179
	15.50		998.9	544.4	543,770		12.483	5,544,805	127.291
	15.75		1,000.9	546.4	546,861		12.554	5,681,133	130.421
	16.00		1,002.9	548.4	549,959		12.625	5,818,236	133.568
	16.25		1,004.9	550.4	553,066		12.697	5,956,114	136.734
	16.50		1,006.9	552.4	556,180		12.768	6,094,769	139.917
	16.75		1,008.9	554.4	559,303		12.840	6,234,205	143.118
	17.00		1,010.9	556.4	562,433		12.912	6,374,422	146.337
	17.25		1,012.9	558.4	565,572		12.984	6,515,422	149.574
	17.50		1,014.9	560.4	568,719		13.056	6,657,208	152.828
	17.75		1,016.9	562.4	571,873		13.128	6,799,782	156.102
	18.00		1,018.9	564.4	575,036		13.201	6,943,145	159.393
	18.25		1,020.9	566.4	578,206		13.274	7,087,300	162.702
	18.50		1,022.9	568.4	581,385		13.347	7,232,249	166.030
	18.75		1,024.9	570.4	584,571		13.420	7,377,993	169.375
	19.00		1,026.9	572.4	587,766		13.493	7,524,535	172.740
	19.25		1,028.9	574.4	590,968		13.567	7,671,877	176.122
	19.50		1,030.9	576.4	594,179		13.640	7,820,020	179.523
	19.75		1,032.9	578.4	597,397		13.714	7,968,967	182.942
	20.00		1,034.9	580.4	600,624		13.788	8,118,719	186.380
	20.25		1,036.9	582.4	603,858		13.863	8,269,279	189.837
	20.50		1,038.9	584.4	607,101		13.937	8,420,649	193.311
	20.75		1,040.9	586.4	610,351		14.012	8,572,830	196.805
	21.00		1,042.9	588.4	613,610		14.087	8,725,825	200.317
	21.25		1,044.9	590.4	616,876		14.162	8,879,636	203.848
	21.50		1,046.9	592.4	620,151		14.237	9,034,264	207.398
	21.75		1,048.9	594.4	623,433		14.312	9,189,712	210.967
	22.00		1,050.9	596.4	626,724		14.388	9,345,981	214.554
	22.25		1,052.9	598.4	630,022		14.463	9,503,074	218.161
	22.50		1,054.9	600.4	633,329		14.539	9,660,993	221.786
	22.75		1,056.9	602.4	636,643		14.615	9,819,739	225.430
	23.00		1,058.9	604.4	639,966		14.692	9,979,315	229.094
	23.25		1,060.9	606.4	643,296		14.768	10,139,723	232.776
	23.50		1,062.9	608.4	646,635		14.845	10,300,964	236.478
	23.75		1,064.9	610.4	649,981		14.922	10,463,041	240.198
	24.00		1,066.9	612.4	653,336		14.999	10,625,955	243.938

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Greeley Oklahoma South

Basin ID: Option 4, EURV 842



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.38	2.656	Orifice Plate
Zone 2 (EURV)	5.31	11.554	Weir&Pipe (Restrict)
Zone 3 (100-year)	6.50	11.819	Not Utilized
Total (all zones)		26,029	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	4.924E-02	ft^2
Depth at top of Zone using Orifice Plate =	3.38	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	21.20	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	7.09	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.13	2.25					
Orifice Area (sq. inches)	7.09	7.09	7.09					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected		Calculated Parameters for Vertical Orifice	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected		Calculated Parameters for Overflow Weir	Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.38	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.38	N/A	feet
Overflow Weir Front Edge Length =	4.00	N/A	feet	Overflow Weir Slope Length =	4.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	19.36	N/A	
Horiz. Length of Weir Sides =	4.00	N/A	feet	Overflow Grate Open Area w/o Debris =	11.14	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	5.57	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.58	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.32	N/A	feet
Restrictor Plate Height Above Pipe Invert =	6.50		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.29	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=	6.51	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.36	feet
Spillway Crest Length =	1000.00	feet	Stage at Top of Freeboard =	7.87	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	10.41	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	40.08	acre-ft

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

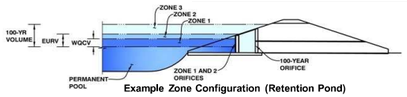
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	2.656	14.210	8.937	12.514	17.051	26.080	33.878	43.453	69.294
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	8.937	12.514	17.051	26.080	33.878	43.453	69.294
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	1.6	5.5	35.7	125.8	188.7	272.4	482.2
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.03	0.17	0.60	0.90	1.29	2.29
Peak Inflow Q (cfs) =	N/A	N/A	126.1	174.4	239.1	392.2	509.2	653.8	1027.4
Peak Outflow Q (cfs) =	1.0	7.6	7.2	7.4	7.7	8.1	132.1	342.0	805.4
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.3	0.2	0.1	0.7	1.3	1.7
Structure Controlling Flow =	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	0.55	0.53	0.5	0.6	0.6	0.6	0.6	0.6
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	54	50	53	58	67	66	62	52
Time to Drain 99% of Inflow Volume (hours) =	**40**	60	54	59	65	77	77	75	71
Maximum Ponding Depth (ft) =	3.38	5.31	4.49	4.97	5.45	6.36	6.63	6.74	6.92
Area at Maximum Ponding Depth (acres) =	3.11	9.51	6.33	8.09	9.78	10.01	10.08	10.11	10.16
Maximum Volume Stored (acre-ft) =	2.679	14.291	7.764	11.215	15.651	24.559	27.272	28.483	30.308

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: 23.1447.001 Greeley - Oklahoma Drainage MP

Basin ID: Option 4, EURV 844



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	126.50	acres
Watershed Length =	2,939	ft
Watershed Length to Centroid =	1,428	ft
Watershed Slope =	0.031	ft/ft
Watershed Imperviousness =	76.20%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	3.226 acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	9.432 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	6.396 acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	9.013 acre-feet	1.12	inches
10-yr Runoff Volume (P1 = 1.4 in.) =	11.961 acre-feet	1.40	inches
25-yr Runoff Volume (P1 = 1.87 in.) =	17.299 acre-feet	1.87	inches
50-yr Runoff Volume (P1 = 2.3 in.) =	22.084 acre-feet	2.30	inches
100-yr Runoff Volume (P1 = 2.79 in.) =	27.727 acre-feet	2.79	inches
500-yr Runoff Volume (P1 = 4.16 in.) =	43.218 acre-feet	4.16	inches
Approximate 2-yr Detention Volume =	6.083 acre-feet		
Approximate 5-yr Detention Volume =	8.736 acre-feet		
Approximate 10-yr Detention Volume =	10.760 acre-feet		
Approximate 25-yr Detention Volume =	13.343 acre-feet		
Approximate 50-yr Detention Volume =	14.954 acre-feet		
Approximate 100-yr Detention Volume =	17.253 acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	3.226	acre-feet
Zone 2 Volume (EURV - Zone 1) =	6.206	acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	9.432	acre-feet
Initial Surcharge Volume (ISV) =	578	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.003	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Initial Surcharge Area (A_{ISV}) =	1,752	ft^2
Surcharge Volume Length (L_{ISV}) =	41.9	ft
Surcharge Volume Width (W_{ISV}) =	41.9	ft
Depth of Basin Floor (H_{FLOOR}) =	1.01	ft
Length of Basin Floor (L_{FLOOR}) =	382.6	ft
Width of Basin Floor (W_{FLOOR}) =	210.2	ft
Area of Basin Floor (A_{FLOOR}) =	80,408	ft^2
Volume of Basin Floor (V_{FLOOR}) =	31,656	ft^3
Depth of Main Basin (H_{MAIN}) =	4.16	ft
Length of Main Basin (L_{MAIN}) =	415.8	ft
Width of Main Basin (W_{MAIN}) =	243.5	ft
Area of Main Basin (A_{MAIN}) =	101,242	ft^2
Volume of Main Basin (V_{MAIN}) =	377,000	ft^3
Calculated Total Basin Volume (V_{total}) =	**9.415**	acre-feet

Total detention volume is less than 100-year volume.

Depth Increment = 0.50 ft

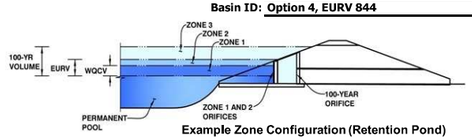
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		41.9	41.9	1,752		0.040		
ISV	0.33		41.9	41.9	1,752		0.040	578	0.013
	0.50		41.9	41.9	1,752		0.040	876	0.020
	1.00		99.2	70.2	6,962		0.160	2,148	0.049
	1.50		267.9	153.5	41,122		0.944	12,998	0.298
Floor	1.84		382.6	210.2	80,408		1.846	33,290	0.764
	2.00		383.8	211.5	81,168		1.863	46,216	1.061
	2.50		387.8	215.5	83,565		1.918	87,398	2.006
	3.00		391.8	219.5	85,994		1.974	129,786	2.979
Zone 1 (WQCV)	3.13		392.9	220.5	86,631		1.989	141,007	3.237
	3.50		395.8	223.5	88,456		2.031	173,398	3.981
	4.00		399.8	227.5	90,949		2.088	218,247	5.010
	4.50		403.8	231.5	93,474		2.146	264,352	6.069
	5.00		407.8	235.5	96,031		2.205	311,727	7.156
	5.50		411.8	239.5	98,621		2.264	360,388	8.273
	6.00		415.8	243.5	101,242		2.324	410,353	9.420
Zone 2 (EURV)	6.01		415.9	243.5	101,294		2.325	411,365	9.444
	6.50		419.8	247.5	103,895		2.385	461,636	10.598
	7.00		423.8	251.5	106,580		2.447	514,253	11.806
	7.50		427.8	255.5	109,297		2.509	568,221	13.045
	8.00		431.8	259.5	112,047		2.572	623,556	14.315
	8.50		435.8	263.5	114,828		2.636	680,273	15.617
	9.00		439.8	267.5	117,641		2.701	738,389	16.951
	9.50		443.8	271.5	120,486		2.766	797,919	18.318
	10.00		447.8	275.5	123,363		2.832	858,880	19.717
	10.50		451.8	279.5	126,273		2.899	921,288	21.150
	11.00		455.8	283.5	129,214		2.966	985,158	22.616
	11.50		459.8	287.5	132,187		3.035	1,050,507	24.116
	12.00		463.8	291.5	135,192		3.104	1,117,350	25.651
	12.50		467.8	295.5	138,229		3.173	1,185,705	27.220
	13.00		471.8	299.5	141,299		3.244	1,255,585	28.824
	13.50		475.8	303.5	144,400		3.315	1,327,009	30.464
	14.00		479.8	307.5	147,533		3.387	1,399,990	32.139
	14.50		483.8	311.5	150,698		3.460	1,474,547	33.851
	15.00		487.8	315.5	153,895		3.533	1,550,694	35.599
	15.50		491.8	319.5	157,125		3.607	1,628,448	37.384
	16.00		495.8	323.5	160,386		3.682	1,707,824	39.206
	16.50		499.8	327.5	163,679		3.758	1,788,839	41.066
	17.00		503.8	331.5	167,004		3.834	1,871,508	42.964
	17.50		507.8	335.5	170,362		3.911	1,955,849	44.900
	18.00		511.8	339.5	173,751		3.989	2,041,875	46.875
	18.50		515.8	343.5	177,172		4.067	2,129,605	48.889
	19.00		519.8	347.5	180,625		4.147	2,219,053	50.942
	19.50		523.8	351.5	184,110		4.227	2,310,235	53.036
	20.00		527.8	355.5	187,628		4.307	2,403,168	55.169
	20.50		531.8	359.5	191,177		4.389	2,497,868	57.343
	21.00		535.8	363.5	194,758		4.471	2,594,350	59.558
	21.50		539.8	367.5	198,371		4.554	2,692,631	61.814
	22.00		543.8	371.5	202,016		4.638	2,792,727	64.112
	22.50		547.8	375.5	205,694		4.722	2,894,653	66.452
	23.00		551.8	379.5	209,403		4.807	2,998,426	68.834
	23.50		555.8	383.5	213,144		4.893	3,104,061	71.259
	24.00		559.8	387.5	216,917		4.980	3,211,575	73.728
	24.50		563.8	391.5	220,722		5.067	3,320,984	76.239
	25.00		567.8	395.5	224,560		5.155	3,432,303	78.795
	25.50		571.8	399.5	228,429		5.244	3,545,549	81.395
	26.00		575.8	403.5	232,330		5.334	3,660,737	84.039
	26.50		579.8	407.5	236,263		5.424	3,777,884	86.728
	27.00		583.8	411.5	240,228		5.515	3,897,006	89.463
	27.50		587.8	415.5	244,226		5.607	4,018,118	92.243
	28.00		591.8	419.5	248,255		5.699	4,141,237	95.070
	28.50		595.8	423.5	252,316		5.792	4,266,378	97.943
	29.00		599.8	427.5	256,409		5.886	4,393,558	100.862
	29.50		603.8	431.5	260,535		5.981	4,522,793	103.829
	30.00		607.8	435.5	264,692		6.076	4,654,098	106.843

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: 23.1447.001 Greeley - Oklahoma Drainage MP

Basin ID: Option 4, EURV 844



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.13	3.226	Orifice Plate
Zone 2 (EURV)	6.01	6.206	Weir&Pipe (Restrict)
Zone 3			Not Utilized
Total (all zones)		9.432	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	8.056E-02	ft^2
Depth at top of Zone using Orifice Plate =	3.63	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	14.50	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	11.60	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.21	2.42					
Orifice Area (sq. inches)	11.60	11.60	11.60					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected		Calculated Parameters for Vertical Orifice	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected		Calculated Parameters for Overflow Weir	Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.13	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	6.46	N/A	feet
Overflow Weir Front Edge Length =	800.00	N/A	feet	Overflow Weir Slope Length =	10.54	N/A	feet
Overflow Weir Grate Slope =	3.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	11382.38	N/A	
Horiz. Length of Weir Sides =	10.00	N/A	feet	Overflow Grate Open Area w/o Debris =	5869.19	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	2934.59	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	3.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.52	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.29	N/A	feet
Restrictor Plate Height Above Pipe Invert =	6.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.23	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=	6.10	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.98	feet
Spillway Crest Length =	183.00	feet	Stage at Top of Freeboard =	8.08	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	2.58	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	14.52	acre-ft

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

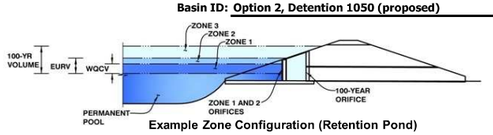
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.12	1.40	1.87	2.30	2.79	4.16
CUHP Runoff Volume (acre-ft) =	3.226	9.432	6.396	9.013	11.961	17.299	22.084	27.727	43.218
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	6.396	9.013	11.961	17.299	22.084	27.727	43.218
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	1.6	16.9	46.2	119.1	172.4	241.0	412.1
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.13	0.36	0.94	1.36	1.90	3.26
Peak Inflow Q (cfs) =	N/A	N/A	126.7	175.8	229.8	339.1	430.4	547.8	840.3
Peak Outflow Q (cfs) =	1.5	7.3	6.5	7.1	28.9	156.4	272.4	435.5	823.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.4	0.6	1.3	1.6	1.8	2.0
Structure Controlling Flow =	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	46	43	46	47	45	42	40	34
Time to Drain 99% of Inflow Volume (hours) =	**40**	50	46	50	52	51	50	49	46
Maximum Ponding Depth (ft) =	3.13	6.01	4.25	5.38	6.21	6.52	6.71	6.94	7.38
Area at Maximum Ponding Depth (acres) =	1.99	2.33	2.12	2.25	2.35	2.39	2.41	2.44	2.49
Maximum Volume Stored (acre-ft) =	3.237	9.444	5.515	7.980	9.911	10.622	11.101	11.635	12.744

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley - Oklahoma Master Basin Study

Basin ID: Option 2, Detention 1050 (proposed)



Example Zone Configuration (Retention Pond)

Watershed Information — **Flood Control Only**

Selected BMP Type =	No BMP	
Watershed Area =	1000.00	acres
Watershed Length =	11,400	ft
Watershed Length to Centroid =	5,700	ft
Watershed Slope =	0.011	ft/ft
Watershed Imperviousness =	36.36%	percent
Percentage Hydrologic Soil Group A =	7.0%	percent
Percentage Hydrologic Soil Group B =	39.5%	percent
Percentage Hydrologic Soil Groups C/D =	53.5%	percent
Target WQCV Drain Time =	N/A	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	14.169	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	35.591	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.86 in.) =	21.915	acre-feet	0.86	inches
5-yr Runoff Volume (P1 = 1.13 in.) =	33.647	acre-feet	1.13	inches
10-yr Runoff Volume (P1 = 1.41 in.) =	51.820	acre-feet	1.41	inches
25-yr Runoff Volume (P1 = 1.86 in.) =	93.573	acre-feet	1.86	inches
50-yr Runoff Volume (P1 = 2.27 in.) =	127.589	acre-feet	2.27	inches
100-yr Runoff Volume (P1 = 2.73 in.) =	171.083	acre-feet	2.73	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	206.956	acre-feet	3.14	inches
Approximate 2-yr Detention Volume =	20.326	acre-feet		
Approximate 5-yr Detention Volume =	32.011	acre-feet		
Approximate 10-yr Detention Volume =	42.609	acre-feet		
Approximate 25-yr Detention Volume =	55.287	acre-feet		
Approximate 50-yr Detention Volume =	63.081	acre-feet		
Approximate 100-yr Detention Volume =	79.751	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (100-year) =	79.751	acre-feet
Select Zone 2 Storage Volume (Optional) =		acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	79.751	acre-feet
Initial Surcharge Volume (ISV) =	N/A	ft^3
Initial Surcharge Depth (ISD) =	N/A	ft
Total Available Detention Depth (H_{total}) =	10.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.003	ft/ft
Slopes of Main Basin Sides (S_{main}) =	3	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Initial Surcharge Area (A_{ISV}) =	0	ft^2
Surcharge Volume Length (L_{ISV}) =	0.0	ft
Surcharge Volume Width (W_{ISV}) =	0.0	ft
Depth of Basin Floor (H_{FLOOR}) =	0.00	ft
Length of Basin Floor (L_{FLOOR}) =	788.4	ft
Width of Basin Floor (W_{FLOOR}) =	394.2	ft
Area of Basin Floor (A_{FLOOR}) =	310,784	ft^2
Volume of Basin Floor (V_{FLOOR}) =	0	ft^3
Depth of Main Basin (H_{MAIN}) =	10.00	ft
Length of Main Basin (L_{MAIN}) =	848.4	ft
Width of Main Basin (W_{MAIN}) =	454.2	ft
Area of Main Basin (A_{MAIN}) =	385,339	ft^2
Volume of Main Basin (V_{MAIN}) =	3,473,943	ft^3
Calculated Total Basin Volume (V_{total}) =	**79.751**	acre-feet

Depth Increment = 1.00 ft

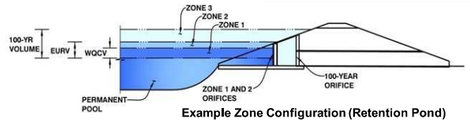
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Media Surface	0.00		788.4	394.2	310,784		7.135		
	1.00		794.4	400.2	317,915		7.298	314,344	7.216
	2.00		800.4	406.2	325,119		7.464	635,855	14.597
	3.00		806.4	412.2	332,394		7.631	964,605	22.144
	4.00		812.4	418.2	339,742		7.799	1,300,668	29.859
	5.00		818.4	424.2	347,162		7.970	1,644,114	37.744
	6.00		824.4	430.2	354,653		8.142	1,995,015	45.799
	7.00		830.4	436.2	362,217		8.315	2,353,444	54.028
	8.00		836.4	442.2	369,852		8.491	2,719,472	62.430
	9.00		842.4	448.2	377,560		8.668	3,093,172	71.009
Zone 1 (100-year)	10.00		848.4	454.2	385,339		8.846	3,474,616	79.766
	11.00		854.4	460.2	393,191		9.026	3,863,875	88.702
	12.00		860.4	466.2	401,115		9.208	4,261,022	97.820
	13.00		866.4	472.2	409,110		9.392	4,666,128	107.120
	14.00		872.4	478.2	417,178		9.577	5,079,266	116.604
	15.00		878.4	484.2	425,317		9.764	5,500,508	126.274
	16.00		884.4	490.2	433,529		9.952	5,929,925	136.132
	17.00		890.4	496.2	441,812		10.143	6,367,589	146.180
	18.00		896.4	502.2	450,168		10.334	6,813,573	156.418
	19.00		902.4	508.2	458,595		10.528	7,267,949	166.849
	20.00		908.4	514.2	467,095		10.723	7,730,788	177.474
	21.00		914.4	520.2	475,667		10.920	8,202,163	188.296
	22.00		920.4	526.2	484,310		11.118	8,682,145	199.315
	23.00		926.4	532.2	493,026		11.318	9,170,807	210.533
	24.00		932.4	538.2	501,813		11.520	9,668,221	221.952
	25.00		938.4	544.2	510,673		11.723	10,174,458	233.573
	26.00		944.4	550.2	519,604		11.928	10,689,591	245.399
	27.00		950.4	556.2	528,608		12.135	11,213,691	257.431
	28.00		956.4	562.2	537,684		12.344	11,746,830	269.670
	29.00		962.4	568.2	546,831		12.554	12,289,082	282.118
	30.00		968.4	574.2	556,051		12.765	12,840,517	294.778

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley - Oklahoma Master Basin Study

Basin ID: Option 2, Detention 1050 (proposed)



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (100-year)	10.00	79.751	Rectangular Orifice
Zone 2			Weir&Pipe (Rect.)
Zone 3			
Total (all zones)		79.751	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	N/A	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	N/A	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (optional)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 1 Rectangular	Not Selected		Calculated Parameters for Vertical Orifice: Zone 1 Rectangular	Not Selected	
Invert of Vertical Orifice =	0.00		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	9.00		ft^2
Depth at top of Zone using Vertical Orifice =	8.00		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	1.50		feet
Vertical Orifice Height =	36.00		inches				
Vertical Orifice Width =	36.00		inches				

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected		Calculated Parameters for Overflow Weir: Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	5.60		ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	5.60		feet
Overflow Weir Front Edge Length =	14.00		feet	Overflow Weir Slope Length =	14.00		feet
Overflow Weir Grate Slope =	0.00		H:V	Grate Open Area / 100-yr Orifice Area =			
Horiz. Length of Weir Sides =	14.00		feet	Overflow Grate Open Area w/o Debris =	136.42		ft^2
Overflow Grate Type =	Type C Grate			Overflow Grate Open Area w/ Debris =	136.42		ft^2
Debris Clogging % =	0%		%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Rectangular	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate: Zone 2 Rectangular	Not Selected	
Depth to Invert of Outlet Pipe =			ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =			ft^2
Rectangular Orifice Width =			inches	Outlet Orifice Centroid =			feet
Rectangular Orifice Height =			inches	Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	9.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	3.37 feet
Spillway Crest Length =	100.00	feet	Stage at Top of Freeboard =	13.37 feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	9.46 acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	110.61 acre-ft

Calculated Parameters for Spillway

Routed Hydrograph Results — *The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).*

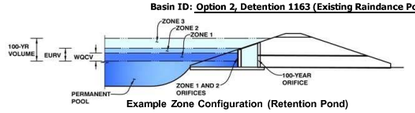
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.86	1.13	1.41	1.86	2.27	2.73	3.14
CUHP Runoff Volume (acre-ft) =	14.169	35.591	21.915	33.647	51.820	93.573	127.589	171.083	206.956
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	21.915	33.647	51.820	93.573	127.589	171.083	206.956
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	5.0	26.5	117.8	402.4	602.1	883.2	1099.3
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.03	0.12	0.40	0.60	0.88	1.10
Peak Inflow Q (cfs) =	N/A	N/A	161.1	251.4	399.7	801.4	1086.9	1463.4	1760.4
Peak Outflow Q (cfs) =	23.9	77.5	32.2	57.7	80.6	373.9	648.9	1033.7	1333.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	2.2	0.7	0.9	1.1	1.2	1.2
Structure Controlling Flow =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	-0.7	-0.8	-0.8	-0.9
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	>120	66	98	70	51	33	26	21	19
Time to Drain 99% of Inflow Volume (hours) =	**>120**	>120	>120	>120	>120	78	62	49	42
Maximum Ponding Depth (ft) =	1.95	4.73	2.27	3.27	4.96	6.92	7.68	8.56	9.16
Area at Maximum Ponding Depth (acres) =	7.46	7.92	7.51	7.68	7.96	8.30	8.43	8.59	8.69
Maximum Volume Stored (acre-ft) =	14.224	35.598	16.618	24.211	37.345	53.280	59.638	67.127	72.312

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley - Oklahoma Master Basin Study

Basin ID: Option 2, Detention 1163 (Existing Raindance Pond F)



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	172.60	acres
Watershed Length =	4,311	ft
Watershed Length to Centroid =	2,285	ft
Watershed Slope =	0.015	ft/ft
Watershed Imperviousness =	7.00%	percent
Percentage Hydrologic Soil Group A =	50.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	50.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	0.706	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	0.890	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 0.95 in.) =	0.433	acre-feet	0.95 inches
5-yr Runoff Volume (P1 = 1.35 in.) =	1.269	acre-feet	1.35 inches
10-yr Runoff Volume (P1 = 1.63 in.) =	3.427	acre-feet	1.63 inches
25-yr Runoff Volume (P1 = 1.69 in.) =	5.625	acre-feet	inches
50-yr Runoff Volume (P1 = 2.28 in.) =	12.689	acre-feet	2.28 inches
100-yr Runoff Volume (P1 = 2.58 in.) =	18.119	acre-feet	2.58 inches
500-yr Runoff Volume (P1 = 3.14 in.) =	25.682	acre-feet	inches
Approximate 2-yr Detention Volume =	0.499	acre-feet	
Approximate 5-yr Detention Volume =	1.270	acre-feet	
Approximate 10-yr Detention Volume =	1.837	acre-feet	
Approximate 25-yr Detention Volume =	2.065	acre-feet	
Approximate 50-yr Detention Volume =	2.807	acre-feet	
Approximate 100-yr Detention Volume =	4.442	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.706	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.184	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	3.552	acre-feet
Total Detention Basin Volume =	4.442	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	user	acre-feet

Depth Increment = ft

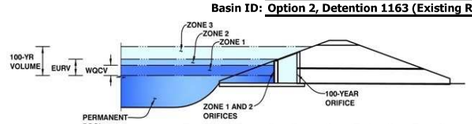
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	3,300	0.076		
4944	--	1.00	--	--	--	32,700	0.751	18,000	0.413
4945	--	2.00	--	--	--	71,400	1.639	70,050	1.608
4949.9	--	6.90	--	--	--	252,000	5.785	862,379	19.798
4952	--	9.00	--	--	--	260,000	5.969	1,399,979	32.139

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley - Oklahoma Master Basin Study

Basin ID: Option 2, Detention 1163 (Existing Raindance Pond F)



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.33	0.706	Orifice Plate
Zone 2 (EURV)	1.50	0.184	Orifice Plate
Zone 3 (100-year)	3.30	3.552	Weir&Pipe (Restrict)
Total (all zones)		4.442	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	3.125E-02	ft^2
Depth at top of Zone using Orifice Plate =	1.33	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	6.00	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	4.50	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.50	1.00					
Orifice Area (sq. inches)	4.50	4.50	4.50					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected		Calculated Parameters for Vertical Orifice	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 3 Weir	Not Selected		Calculated Parameters for Overflow Weir	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.86	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.86	N/A	feet
Overflow Weir Front Edge Length =	5.00	N/A	feet	Overflow Weir Slope Length =	9.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =		N/A	
Horiz. Length of Weir Sides =	9.00	N/A	feet	Overflow Grate Open Area w/o Debris =	31.32	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	15.66	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =		N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =		N/A	ft^2
Outlet Pipe Diameter =		N/A	inches	Outlet Orifice Centroid =		N/A	feet
Restrictor Plate Height Above Pipe Invert =			inches	Half-Central Angle of Restrictor Plate on Pipe =		N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway	
Spillway Invert Stage=		ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	feet
Spillway Crest Length =		feet	Stage at Top of Freeboard =	feet
Spillway End Slopes =		H:V	Basin Area at Top of Freeboard =	acres
Freeboard above Max Water Surface =		feet	Basin Volume at Top of Freeboard =	acre-ft

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

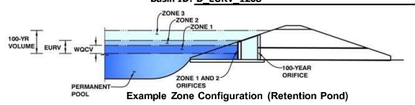
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.95	1.35	1.63	1.69	2.28	2.58	3.14
CUHP Runoff Volume (acre-ft) =	0.706	0.890	0.433	1.269	3.427	5.625	12.689	18.119	25.682
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.433	1.269	3.427	5.625	12.689	18.119	25.682
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	1.2	6.0	27.3	49.9	117.3	162.1	227.7
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.03	0.16	0.29	0.68	0.94	1.32
Peak Inflow Q (cfs) =	N/A	N/A	4.2	12.3	34.1	57.1	125.0	168.5	234.0
Peak Outflow Q (cfs) =	0.4	0.4	0.2	0.5	0.7	0.8	34.1	66.8	106.4
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.1	0.0	0.0	0.3	0.4	0.5
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	0.0	0.0	0.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	42	47	36	55	89	118	>120	115	108
Time to Drain 99% of Inflow Volume (hours) =	**46**	50	38	60	99	>120	>120	>120	>120
Maximum Ponding Depth (ft) =	1.33	1.50	0.95	1.70	2.83	3.64	4.67	5.14	5.73
Area at Maximum Ponding Depth (acres) =	1.04	1.19	0.72	1.37	2.34	3.03	3.89	4.30	4.79
Maximum Volume Stored (acre-ft) =	0.709	0.900	0.377	1.156	3.260	5.434	8.962	10.926	13.560

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley Oklahoma Basin - Option 4 LID

Basin ID: D_EURV_1208



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	63.08	acres
Watershed Length =	3,086	ft
Watershed Length to Centroid =	1,279	ft
Watershed Slope =	0.029	ft/ft
Watershed Imperviousness =	31.75%	percent
Percentage Hydrologic Soil Group A =	90.3%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	9.7%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	0.824	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	2.014	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 0.95 in.) =	1.055	acre-feet	0.95 inches
5-yr Runoff Volume (P1 = 1.35 in.) =	1.760	acre-feet	1.35 inches
10-yr Runoff Volume (P1 = 1.63 in.) =	2.272	acre-feet	1.63 inches
25-yr Runoff Volume (P1 = 1.69 in.) =	2.655	acre-feet	inches
50-yr Runoff Volume (P1 = 2.28 in.) =	5.030	acre-feet	2.28 inches
100-yr Runoff Volume (P1 = 2.58 in.) =	6.631	acre-feet	2.58 inches
500-yr Runoff Volume (P1 = 3.14 in.) =	9.421	acre-feet	inches
Approximate 2-yr Detention Volume =	1.046	acre-feet	
Approximate 5-yr Detention Volume =	1.614	acre-feet	
Approximate 10-yr Detention Volume =	2.061	acre-feet	
Approximate 25-yr Detention Volume =	2.320	acre-feet	
Approximate 50-yr Detention Volume =	3.166	acre-feet	
Approximate 100-yr Detention Volume =	3.860	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.824	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.189	acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	2.014	acre-feet
Initial Surcharge Volume (ISV) =	108	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.003	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio (R_{LW}) =	2	

Initial Surcharge Area (A_{ISV}) =	326	ft^2
Surcharge Volume Length (L_{ISV}) =	18.1	ft
Surcharge Volume Width (W_{ISV}) =	18.1	ft
Depth of Basin Floor (H_{FLOOR}) =	0.40	ft
Length of Basin Floor (L_{FLOOR}) =	153.0	ft
Width of Basin Floor (W_{FLOOR}) =	84.7	ft
Area of Basin Floor (A_{FLOOR}) =	12,964	ft^2
Volume of Basin Floor (V_{FLOOR}) =	2,046	ft^3
Depth of Main Basin (H_{MAIN}) =	4.77	ft
Length of Main Basin (L_{MAIN}) =	191.2	ft
Width of Main Basin (W_{MAIN}) =	122.9	ft
Area of Main Basin (A_{MAIN}) =	23,493	ft^2
Volume of Main Basin (V_{MAIN}) =	85,715	ft^3
Calculated Total Basin Volume (V_{total}) =	**2.021**	acre-feet

Depth Increment = 0.50 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		18.1	18.1	326		0.007		
ISV	0.33		18.1	18.1	326		0.007	108	0.002
	0.50		18.1	18.1	326		0.007	163	0.004
	1.00		75.4	46.4	3,499		0.080	550	0.013
Floor	1.23		153.0	84.7	12,964		0.298	2,329	0.053
	1.50		155.2	86.9	13,483		0.310	5,900	0.135
	2.00		159.2	90.9	14,467		0.332	12,886	0.296
	2.50		163.2	94.9	15,483		0.355	20,372	0.468
	3.00		167.2	98.9	16,531		0.380	28,374	0.651
Zone 1 (WQCV)	3.45		170.8	102.5	17,502		0.402	36,030	0.827
	3.50		171.2	102.9	17,611		0.404	36,908	0.847
	4.00		175.2	106.9	18,724		0.430	45,991	1.056
	4.50		179.2	110.9	19,868		0.456	55,637	1.277
	5.00		183.2	114.9	21,044		0.483	65,864	1.512
	5.50		187.2	118.9	22,252		0.511	76,687	1.760
Zone 2 (EURV)	5.99		191.1	122.8	23,467		0.539	87,887	2.018
	6.00		191.2	122.9	23,493		0.539	88,122	2.023
	6.50		195.2	126.9	24,765		0.569	100,185	2.300
	7.00		199.2	130.9	26,069		0.598	112,892	2.592
	7.50		203.2	134.9	27,405		0.629	126,259	2.899
	8.00		207.2	138.9	28,773		0.661	140,302	3.221
	8.50		211.2	142.9	30,174		0.693	155,038	3.559
	9.00		215.2	146.9	31,606		0.726	170,481	3.914
	9.50		219.2	150.9	33,070		0.759	186,649	4.285
	10.00		223.2	154.9	34,566		0.794	203,557	4.673
	10.50		227.2	158.9	36,095		0.829	221,220	5.079
	11.00		231.2	162.9	37,655		0.864	239,656	5.502
	11.50		235.2	166.9	39,247		0.901	258,881	5.943
	12.00		239.2	170.9	40,871		0.938	278,909	6.403
	12.50		243.2	174.9	42,527		0.976	299,757	6.881
	13.00		247.2	178.9	44,216		1.015	321,442	7.379
	13.50		251.2	182.9	45,936		1.055	343,978	7.897
	14.00		255.2	186.9	47,688		1.095	367,383	8.434
	14.50		259.2	190.9	49,472		1.136	391,671	8.992
	15.00		263.2	194.9	51,289		1.177	416,860	9.570
	15.50		267.2	198.9	53,137		1.220	442,965	10.169
	16.00		271.2	202.9	55,017		1.263	470,002	10.790
	16.50		275.2	206.9	56,929		1.307	497,988	11.432
	17.00		279.2	210.9	58,873		1.352	526,937	12.097
	17.50		283.2	214.9	60,850		1.397	556,866	12.784
	18.00		287.2	218.9	62,858		1.443	587,792	13.494
	18.50		291.2	222.9	64,898		1.490	619,729	14.227
	19.00		295.2	226.9	66,970		1.537	652,695	14.984
	19.50		299.2	230.9	69,074		1.586	686,705	15.765
	20.00		303.2	234.9	71,211		1.635	721,775	16.570
	20.50		307.2	238.9	73,379		1.685	757,921	17.399
	21.00		311.2	242.9	75,579		1.735	795,159	18.254
	21.50		315.2	246.9	77,811		1.786	833,506	19.135
	22.00		319.2	250.9	80,076		1.838	872,976	20.041
	22.50		323.2	254.9	82,372		1.891	913,587	20.973
	23.00		327.2	258.9	84,700		1.944	955,353	21.932
	23.50		331.2	262.9	87,060		1.999	998,292	22.918
	24.00		335.2	266.9	89,452		2.054	1,042,419	23.931
	24.50		339.2	270.9	91,877		2.109	1,087,750	24.971
	25.00		343.2	274.9	94,333		2.166	1,134,301	26.040
	25.50		347.2	278.9	96,821		2.223	1,182,088	27.137
	26.00		351.2	282.9	99,341		2.281	1,231,127	28.263
	26.50		355.2	286.9	101,894		2.339	1,281,435	29.418
	27.00		359.2	290.9	104,478		2.398	1,333,026	30.602
	27.50		363.2	294.9	107,094		2.459	1,385,918	31.816
	28.00		367.2	298.9	109,742		2.519	1,440,125	33.061
	28.50		371.2	302.9	112,422		2.581	1,495,665	34.336
	29.00		375.2	306.9	115,135		2.643	1,552,553	35.642
	29.50		379.2	310.9	117,879		2.706	1,610,805	36.979
	30.00		383.2	314.9	120,655		2.770	1,670,437	38.348

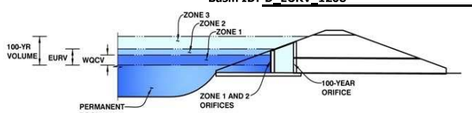
Total detention volume is less than 100-year volume.

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley Oklahoma Basin - Option 4 LID

Basin ID: D_EURV_1208



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.45	0.824	Orifice Plate
Zone 2 (EURV)	5.99	1.189	Weir&Pipe (Restrict)
Zone 3			
Total (all zones)		2.014	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	2.014E-02	ft^2
Depth at top of Zone using Orifice Plate =	3.45	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	13.80	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	2.90	sq. inches (diameter = 1-15/16 inches)	Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.15	2.30					
Orifice Area (sq. inches)	2.90	2.90	2.90					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected		Calculated Parameters for Vertical Orifice	Not Selected	Not Selected	
Invert of Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =			ft^2
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =			feet
Vertical Orifice Diameter =			inches				

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected		Calculated Parameters for Overflow Weir	Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.45		ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.45		feet
Overflow Weir Front Edge Length =	4.00		feet	Overflow Weir Slope Length =	4.00		feet
Overflow Weir Grate Slope =	0.00		H:V	Grate Open Area / 100-yr Orifice Area =	288.33		
Horiz. Length of Weir Sides =	4.00		feet	Overflow Grate Open Area w/o Debris =	11.14		ft^2
Overflow Grate Type =	Type C Grate			Overflow Grate Open Area w/ Debris =	5.57		ft^2
Debris Clogging % =	50%		%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	3.00		ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.04		ft^2
Outlet Pipe Diameter =	18.00		inches	Outlet Orifice Centroid =	0.05		feet
Restrictor Plate Height Above Pipe Invert =	1.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	0.48	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=	6.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	1.11	feet
Spillway Crest Length =	20.00	feet	Stage at Top of Freeboard =	8.11	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.67	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	3.29	acre-ft

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

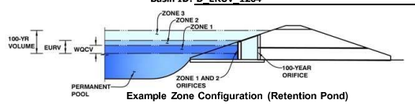
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.95	1.35	1.63	1.69	2.28	2.58	3.14
CUHP Runoff Volume (acre-ft) =	0.824	2.014	1.055	1.760	2.272	2.655	5.030	6.631	9.421
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.055	1.760	2.272	2.655	5.030	6.631	9.421
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.2	0.7	1.1	3.7	28.3	44.4	71.6
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.01	0.02	0.06	0.45	0.70	1.14
Peak Inflow Q (cfs) =	N/A	N/A	10.5	18.5	24.3	30.7	63.7	83.1	117.5
Peak Outflow Q (cfs) =	0.4	0.6	0.5	0.5	2.4	8.1	40.1	64.7	103.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.8	2.2	2.2	1.4	1.5	1.4
Structure Controlling Flow =	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	-0.01	0.00	0.0	0.0	0.0	0.0	0.0	0.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	63	44	59	66	65	60	57	52
Time to Drain 99% of Inflow Volume (hours) =	**41**	67	47	62	71	70	68	66	64
Maximum Ponding Depth (ft) =	3.45	5.99	3.78	5.27	6.10	6.25	6.71	6.95	7.26
Area at Maximum Ponding Depth (acres) =	0.40	0.54	0.42	0.50	0.54	0.55	0.58	0.60	0.61
Maximum Volume Stored (acre-ft) =	0.827	2.018	0.958	1.639	2.072	2.154	2.415	2.562	2.749

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley Oklahoma Basin - Option 4 LID

Basin ID: D_ERUV_1264



Example Zone Configuration (Retention Pond)

Depth Increment = 0.50 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		9.4	9.4	88		0.002		
ISV	0.33		9.4	9.4	88		0.002	29	0.001
	0.50		9.4	9.4	88		0.002	44	0.001
Floor	0.92		39.8	24.4	970		0.022	114	0.003
	1.00		40.4	25.0	1,012		0.023	193	0.004
	1.50		44.4	29.0	1,289		0.030	767	0.018
	2.00		48.4	33.0	1,599		0.037	1,488	0.034
	2.50		52.4	37.0	1,941		0.045	2,372	0.054
	3.00		56.4	41.0	2,315		0.053	3,435	0.079
	3.50		60.4	45.0	2,721		0.062	4,692	0.108
	4.00		64.4	49.0	3,158		0.073	6,160	0.141
	4.50		68.4	53.0	3,628		0.083	7,856	0.180
Zone 1 (WQCV)	4.99		72.3	57.0	4,119		0.095	9,752	0.224
	5.00		72.4	57.0	4,130		0.095	9,794	0.225
	5.50		76.4	61.0	4,664		0.107	11,991	0.275
	6.00		80.4	65.0	5,229		0.120	14,463	0.332
Zone 2 (EURV)	6.06		80.9	65.5	5,299		0.122	14,779	0.339
	6.50		84.4	69.0	5,827		0.134	17,225	0.395
	7.00		88.4	73.0	6,457		0.148	20,295	0.466
	7.50		92.4	77.0	7,119		0.163	23,688	0.544
	8.00		96.4	81.0	7,812		0.179	27,419	0.629
	8.50		100.4	85.0	8,538		0.196	31,505	0.723
	9.00		104.4	89.0	9,296		0.213	35,963	0.826
	9.50		108.4	93.0	10,086		0.232	40,807	0.937
	10.00		112.4	97.0	10,907		0.250	46,054	1.057
	10.50		116.4	101.0	11,761		0.270	51,720	1.187
	11.00		120.4	105.0	12,647		0.290	57,820	1.327
	11.50		124.4	109.0	13,565		0.311	64,372	1.478
	12.00		128.4	113.0	14,515		0.333	71,390	1.639
	12.50		132.4	117.0	15,496		0.356	78,892	1.811
	13.00		136.4	121.0	16,510		0.379	86,892	1.995
	13.50		140.4	125.0	17,556		0.403	95,407	2.190
	14.00		144.4	129.0	18,634		0.428	104,453	2.398
	14.50		148.4	133.0	19,743		0.453	114,046	2.618
	15.00		152.4	137.0	20,885		0.479	124,202	2.851
	15.50		156.4	141.0	22,059		0.506	134,937	3.098
	16.00		160.4	145.0	23,265		0.534	146,266	3.358
	16.50		164.4	149.0	24,502		0.562	158,207	3.632
	17.00		168.4	153.0	25,772		0.592	170,774	3.920
	17.50		172.4	157.0	27,074		0.622	183,984	4.224
	18.00		176.4	161.0	28,408		0.652	197,853	4.542
	18.50		180.4	165.0	29,774		0.684	212,397	4.876
	19.00		184.4	169.0	31,171		0.716	227,632	5.226
	19.50		188.4	173.0	32,601		0.748	243,574	5.592
	20.00		192.4	177.0	34,063		0.782	260,239	5.974
	20.50		196.4	181.0	35,557		0.816	277,642	6.374
	21.00		200.4	185.0	37,082		0.851	295,801	6.791
	21.50		204.4	189.0	38,640		0.887	314,730	7.225
	22.00		208.4	193.0	40,230		0.924	334,446	7.678
	22.50		212.4	197.0	41,852		0.961	354,965	8.149
	23.00		216.4	201.0	43,505		0.999	376,303	8.639
	23.50		220.4	205.0	45,191		1.037	398,476	9.148
	24.00		224.4	209.0	46,909		1.077	421,500	9.676
	24.50		228.4	213.0	48,659		1.117	445,390	10.225
	25.00		232.4	217.0	50,441		1.158	470,164	10.793
	25.50		236.4	221.0	52,254		1.200	495,836	11.383
	26.00		240.4	225.0	54,100		1.242	522,423	11.993
	26.50		244.4	229.0	55,978		1.285	549,941	12.625
	27.00		248.4	233.0	57,888		1.329	578,406	13.278
	27.50		252.4	237.0	59,829		1.373	607,834	13.954
	28.00		256.4	241.0	61,803		1.419	638,241	14.652
	28.50		260.4	245.0	63,809		1.465	669,643	15.373
	29.00		264.4	249.0	65,847		1.512	702,055	16.117
	29.50		268.4	253.0	67,916		1.559	735,495	16.885
	30.00		272.4	257.0	70,018		1.607	769,977	17.676

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	39.53	acres
Watershed Length =	2,783	ft
Watershed Length to Centroid =	1,135	ft
Watershed Slope =	0.028	ft/ft
Watershed Imperviousness =	10.13%	percent
Percentage Hydrologic Soil Group A =	47.1%	percent
Percentage Hydrologic Soil Group B =	52.4%	percent
Percentage Hydrologic Soil Groups C/D =	0.5%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	0.223	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	0.338	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 0.95 in.) =	0.140	acre-feet	0.95 inches
5-yr Runoff Volume (P1 = 1.35 in.) =	0.310	acre-feet	1.35 inches
10-yr Runoff Volume (P1 = 1.63 in.) =	0.777	acre-feet	1.63 inches
25-yr Runoff Volume (P1 = 1.69 in.) =	1.282	acre-feet	inches
50-yr Runoff Volume (P1 = 2.28 in.) =	2.839	acre-feet	2.28 inches
100-yr Runoff Volume (P1 = 2.58 in.) =	4.079	acre-feet	2.58 inches
500-yr Runoff Volume (P1 = 3.14 in.) =	5.814	acre-feet	inches
Approximate 2-yr Detention Volume =	0.168	acre-feet	
Approximate 5-yr Detention Volume =	0.284	acre-feet	
Approximate 10-yr Detention Volume =	0.524	acre-feet	
Approximate 25-yr Detention Volume =	0.657	acre-feet	
Approximate 50-yr Detention Volume =	0.886	acre-feet	
Approximate 100-yr Detention Volume =	1.248	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.223	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.115	acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	0.338	acre-feet
Initial Surcharge Volume (ISV) =	29	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.003	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio (R_{LW}) =	2	

Initial Surcharge Area (A_{ISV}) =	88	ft^2
Surcharge Volume Length (L_{ISV}) =	9.4	ft
Surcharge Volume Width (W_{ISV}) =	9.4	ft
Depth of Basin Floor (H_{FLOOR}) =	0.09	ft
Length of Basin Floor (L_{FLOOR}) =	39.8	ft
Width of Basin Floor (W_{FLOOR}) =	24.4	ft
Area of Basin Floor (A_{FLOOR}) =	970	ft^2
Volume of Basin Floor (V_{FLOOR}) =	41	ft^3
Depth of Main Basin (H_{MAIN}) =	5.08	ft
Length of Main Basin (L_{MAIN}) =	80.4	ft
Width of Main Basin (W_{MAIN}) =	65.0	ft
Area of Main Basin (A_{MAIN}) =	5,229	ft^2
Volume of Main Basin (V_{MAIN}) =	14,312	ft^3
Calculated Total Basin Volume (V_{total}) =	**0.331**	acre-feet

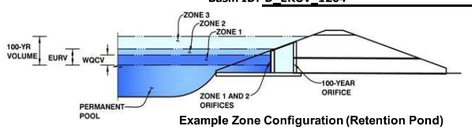
Total detention volume is less than 100-year volume.

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley Oklahoma Basin - Option 4 LID

Basin ID: D_ERUV_1264



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	4.99	0.223	Orifice Plate
Zone 2 (EURV)	6.06	0.115	Weir&Pipe (Restrict)
Zone 3			
Total (all zones)		0.338	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	4.514E-03 ft^2
Depth at top of Zone using Orifice Plate =	4.99	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A feet
Orifice Plate: Orifice Vertical Spacing =	20.00	inches	Elliptical Slot Centroid =	N/A feet
Orifice Plate: Orifice Area per Row =	0.65	sq. inches (diameter = 7/8 inch)	Elliptical Slot Area =	N/A ft^2

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.66	3.33					
Orifice Area (sq. inches)	0.65	0.65	0.65					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected		
Invert of Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =
Vertical Orifice Diameter =			inches	

Calculated Parameters for Vertical Orifice

Not Selected	Not Selected
	ft^2
	feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected			Zone 2 Weir	Not Selected
Overflow Weir Front Edge Height, Ho =	4.99		ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	4.99	feet
Overflow Weir Front Edge Length =	4.00		feet	Overflow Weir Slope Length =	4.00	feet
Overflow Weir Grate Slope =	0.00		H:V	Grate Open Area / 100-yr Orifice Area =	808.56	
Horiz. Length of Weir Sides =	4.00		feet	Overflow Grate Open Area w/o Debris =	11.14	ft^2
Overflow Grate Type =	Type C Grate			Overflow Grate Open Area w/ Debris =	5.57	ft^2
Debris Clogging % =	50%		%			

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Restrictor	Not Selected			Zone 2 Restrictor	Not Selected
Depth to Invert of Outlet Pipe =	3.00		ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.01	ft^2
Outlet Pipe Diameter =	18.00		inches	Outlet Orifice Centroid =	0.02	feet
Restrictor Plate Height Above Pipe Invert =	0.50		inches	Half-Central Angle of Restrictor Plate on Pipe =	0.33	N/A radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.10	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.71 feet
Spillway Crest Length =	20.00	feet	Stage at Top of Freeboard =	7.81 feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.17 acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	0.60 acre-ft

Calculated Parameters for Spillway

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

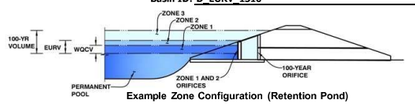
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.95	1.35	1.63	1.69	2.28	2.58	3.14
CUHP Runoff Volume (acre-ft) =	0.223	0.338	0.140	0.310	0.777	1.282	2.839	4.079	5.814
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.140	0.310	0.777	1.282	2.839	4.079	5.814
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.3	0.6	5.3	10.9	26.6	37.2	53.0
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.02	0.13	0.28	0.67	0.94	1.34
Peak Inflow Q (cfs) =	N/A	N/A	1.4	3.1	8.0	13.8	29.7	40.1	56.0
Peak Outflow Q (cfs) =	0.1	0.2	0.1	0.2	5.4	12.1	34.8	45.0	62.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.3	1.0	1.1	1.3	1.2	1.2
Structure Controlling Flow =	Overflow Weir 1	Outlet Plate 1	Plate	Outlet Plate 1	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	0.01	N/A	0.0	0.0	0.0	0.0	0.0	0.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	40	46	33	46	44	39	29	23	17
Time to Drain 99% of Inflow Volume (hours) =	**43**	50	35	49	51	48	42	39	35
Maximum Ponding Depth (ft) =	4.99	6.05	3.73	5.50	6.29	6.43	6.75	6.86	7.03
Area at Maximum Ponding Depth (acres) =	0.09	0.12	0.07	0.11	0.13	0.13	0.14	0.14	0.15
Maximum Volume Stored (acre-ft) =	0.224	0.338	0.122	0.275	0.368	0.385	0.428	0.445	0.470

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley Oklahoma Basin - Option 4 LID

Basin ID: D_EURV_1316



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	127.02	acres
Watershed Length =	3,070	ft
Watershed Length to Centroid =	1,540	ft
Watershed Slope =	0.041	ft/ft
Watershed Imperviousness =	10.62%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	60.9%	percent
Percentage Hydrologic Soil Groups C/D =	39.1%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.746 acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	1.217 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.95 in.) =	0.732 acre-feet	0.95	inches
5-yr Runoff Volume (P1 = 1.35 in.) =	3.029 acre-feet	1.35	inches
10-yr Runoff Volume (P1 = 1.63 in.) =	5.363 acre-feet	1.63	inches
25-yr Runoff Volume (P1 = 1.69 in.) =	7.036 acre-feet		inches
50-yr Runoff Volume (P1 = 2.28 in.) =	12.886 acre-feet	2.28	inches
100-yr Runoff Volume (P1 = 2.58 in.) =	16.784 acre-feet	2.58	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	22.819 acre-feet		inches
Approximate 2-yr Detention Volume =	0.683 acre-feet		
Approximate 5-yr Detention Volume =	1.448 acre-feet		
Approximate 10-yr Detention Volume =	2.486 acre-feet		
Approximate 25-yr Detention Volume =	2.947 acre-feet		
Approximate 50-yr Detention Volume =	3.689 acre-feet		
Approximate 100-yr Detention Volume =	4.933 acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.746	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.470	acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	1.217	acre-feet
Initial Surcharge Volume (ISV) =	98	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.003	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio (R_{LW}) =	2	

Initial Surcharge Area (A_{ISV}) =	296	ft^2
Surcharge Volume Length (L_{ISV}) =	17.2	ft
Surcharge Volume Width (W_{ISV}) =	17.2	ft
Depth of Basin Floor (H_{FLOOR}) =	0.27	ft
Length of Basin Floor (L_{FLOOR}) =	108.3	ft
Width of Basin Floor (W_{FLOOR}) =	62.2	ft
Area of Basin Floor (A_{FLOOR}) =	6,733	ft^2
Volume of Basin Floor (V_{FLOOR}) =	760	ft^3
Depth of Main Basin (H_{MAIN}) =	4.90	ft
Length of Main Basin (L_{MAIN}) =	147.5	ft
Width of Main Basin (W_{MAIN}) =	101.4	ft
Area of Main Basin (A_{MAIN}) =	14,952	ft^2
Volume of Main Basin (V_{MAIN}) =	51,809	ft^3
Calculated Total Basin Volume (V_{total}) =	**1.212**	acre-feet

Depth Increment = 0.50 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		17.2	17.2	296		0.007		
ISV	0.33		17.2	17.2	296		0.007	98	0.002
	0.50		17.2	17.2	296		0.007	148	0.003
	1.00		74.5	45.5	3,393		0.078	513	0.012
Floor	1.10		108.3	62.2	6,733		0.155	1,010	0.023
	1.50		111.5	65.4	7,289		0.167	3,814	0.088
	2.00		115.5	69.4	8,013		0.184	7,638	0.175
	2.50		119.5	73.4	8,768		0.201	11,832	0.272
	3.00		123.5	77.4	9,556		0.219	16,411	0.377
	3.50		127.5	81.4	10,375		0.238	21,392	0.491
	4.00		131.5	85.4	11,226		0.258	26,792	0.615
Zone 1 (WQCV)	4.50		135.5	89.4	12,110		0.278	32,624	0.749
	5.00		139.5	93.4	13,025		0.299	38,907	0.893
	5.50		143.5	97.4	13,973		0.321	45,655	1.048
	6.00		147.5	101.4	14,952		0.343	52,885	1.214
Zone 2 (EURV)	6.01		147.6	101.5	14,972		0.344	53,034	1.218
	6.50		151.5	105.4	15,964		0.366	60,613	1.391
	7.00		155.5	109.4	17,007		0.390	68,854	1.581
	7.50		159.5	113.4	18,083		0.415	77,625	1.782
	8.00		163.5	117.4	19,190		0.441	86,942	1.996
	8.50		167.5	121.4	20,329		0.467	96,820	2.223
	9.00		171.5	125.4	21,501		0.494	107,277	2.463
	9.50		175.5	129.4	22,704		0.521	118,327	2.716
	10.00		179.5	133.4	23,940		0.550	129,986	2.984
	10.50		183.5	137.4	25,207		0.579	142,272	3.266
	11.00		187.5	141.4	26,507		0.609	155,199	3.563
	11.50		191.5	145.4	27,838		0.639	168,784	3.875
	12.00		195.5	149.4	29,202		0.670	183,042	4.202
	12.50		199.5	153.4	30,597		0.702	197,991	4.545
	13.00		203.5	157.4	32,025		0.735	213,645	4.905
	13.50		207.5	161.4	33,484		0.769	230,021	5.281
	14.00		211.5	165.4	34,975		0.803	247,134	5.673
	14.50		215.5	169.4	36,499		0.838	265,001	6.084
	15.00		219.5	173.4	38,054		0.874	283,638	6.511
	15.50		223.5	177.4	39,642		0.910	303,061	6.957
	16.00		227.5	181.4	41,261		0.947	323,285	7.422
	16.50		231.5	185.4	42,913		0.985	344,328	7.905
	17.00		235.5	189.4	44,596		1.024	366,203	8.407
	17.50		239.5	193.4	46,312		1.063	388,929	8.929
	18.00		243.5	197.4	48,059		1.103	412,520	9.470
	18.50		247.5	201.4	49,838		1.144	436,993	10.032
	19.00		251.5	205.4	51,650		1.186	462,364	10.614
	19.50		255.5	209.4	53,493		1.228	488,649	11.218
	20.00		259.5	213.4	55,369		1.271	515,863	11.843
	20.50		263.5	217.4	57,276		1.315	544,023	12.489
	21.00		267.5	221.4	59,216		1.359	573,144	13.158
	21.50		271.5	225.4	61,187		1.405	603,244	13.849
	22.00		275.5	229.4	63,191		1.451	634,337	14.562
	22.50		279.5	233.4	65,226		1.497	666,440	15.299
	23.00		283.5	237.4	67,293		1.545	699,568	16.060
	23.50		287.5	241.4	69,393		1.593	733,738	16.844
	24.00		291.5	245.4	71,524		1.642	768,966	17.653
	24.50		295.5	249.4	73,688		1.692	805,268	18.486
	25.00		299.5	253.4	75,883		1.742	842,660	19.345
	25.50		303.5	257.4	78,111		1.793	881,157	20.229
	26.00		307.5	261.4	80,370		1.845	920,776	21.138
	26.50		311.5	265.4	82,662		1.898	961,532	22.074
	27.00		315.5	269.4	84,985		1.951	1,003,443	23.036
	27.50		319.5	273.4	87,341		2.005	1,046,523	24.025
	28.00		323.5	277.4	89,728		2.060	1,090,788	25.041
	28.50		327.5	281.4	92,147		2.115	1,136,256	26.085
	29.00		331.5	285.4	94,599		2.172	1,182,941	27.157
	29.50		335.5	289.4	97,082		2.229	1,230,860	28.257
	30.00		339.5	293.4	99,598		2.286	1,280,029	29.385

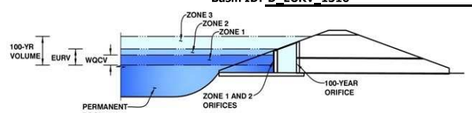
Total detention volume is less than 100-year volume.

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley Oklahoma Basin - Option 4 LID

Basin ID: D_EURV_1316



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	4.50	0.746	Orifice Plate
Zone 2 (EURV)	6.01	0.470	Weir&Pipe (Restrict)
Zone 3			
Total (all zones)		1.217	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	1.736E-02	ft^2
Depth at top of Zone using Orifice Plate =	4.50	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	18.00	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	2.50	sq. inches (diameter = 1-3/4 inches)	Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.50	3.00					
Orifice Area (sq. inches)	2.50	2.50	2.50					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected		Calculated Parameters for Vertical Orifice	Not Selected	Not Selected	
Invert of Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =			ft^2
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =			feet
Vertical Orifice Diameter =			inches				

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected		Calculated Parameters for Overflow Weir	Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.50		ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	4.50		feet
Overflow Weir Front Edge Length =	4.00		feet	Overflow Weir Slope Length =	4.00		feet
Overflow Weir Grate Slope =	0.00		H:V	Grate Open Area / 100-yr Orifice Area =	288.33		
Horiz. Length of Weir Sides =	4.00		feet	Overflow Grate Open Area w/o Debris =	11.14		ft^2
Overflow Grate Type =	Type C Grate			Overflow Grate Open Area w/ Debris =	5.57		ft^2
Debris Clogging % =	50%		%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	3.00		ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.04		ft^2
Outlet Pipe Diameter =	18.00		inches	Outlet Orifice Centroid =	0.05		feet
Restrictor Plate Height Above Pipe Invert =	1.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	0.48	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=	6.50	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	1.20	feet
Spillway Crest Length =	50.00	feet	Stage at Top of Freeboard =	8.70	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.48	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	2.32	acre-ft

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

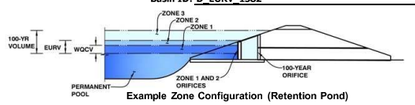
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.95	1.35	1.63	1.69	2.28	2.58	3.14
CUHP Runoff Volume (acre-ft) =	0.746	1.217	0.732	3.029	5.363	7.036	12.886	16.784	22.819
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.732	3.029	5.363	7.036	12.886	16.784	22.819
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	1.9	34.4	61.7	89.2	161.4	206.0	276.3
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.27	0.49	0.70	1.27	1.62	2.18
Peak Inflow Q (cfs) =	N/A	N/A	10.1	44.8	73.2	98.0	171.5	214.6	284.4
Peak Outflow Q (cfs) =	0.4	0.6	0.4	29.5	71.2	101.4	178.7	248.8	317.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.9	1.2	1.1	1.1	1.2	1.1
Structure Controlling Flow =	Plate	Outlet Plate 1	Plate	Spillway	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	0.00	N/A	0.0	0.0	0.0	0.0	0.0	0.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	40	48	40	48	43	39	30	25	20
Time to Drain 99% of Inflow Volume (hours) =	**42**	52	42	56	53	51	45	42	39
Maximum Ponding Depth (ft) =	4.49	6.01	4.21	6.83	7.09	7.24	7.57	7.82	8.05
Area at Maximum Ponding Depth (acres) =	0.28	0.34	0.27	0.38	0.39	0.40	0.42	0.43	0.44
Maximum Volume Stored (acre-ft) =	0.746	1.218	0.667	1.511	1.616	1.676	1.811	1.917	2.014

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley Oklahoma Basin - Option 4 LID

Basin ID: D_EURV_1382



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	91.62	acres
Watershed Length =	4,649	ft
Watershed Length to Centroid =	3,113	ft
Watershed Slope =	0.014	ft/ft
Watershed Imperviousness =	10.39%	percent
Percentage Hydrologic Soil Group A =	6.6%	percent
Percentage Hydrologic Soil Group B =	93.2%	percent
Percentage Hydrologic Soil Groups C/D =	0.2%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	0.528	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	0.885	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 0.95 in.) =	0.459	acre-feet	0.95 inches
5-yr Runoff Volume (P1 = 1.35 in.) =	1.732	acre-feet	1.35 inches
10-yr Runoff Volume (P1 = 1.63 in.) =	3.112	acre-feet	1.63 inches
25-yr Runoff Volume (P1 = 1.69 in.) =	4.452	acre-feet	inches
50-yr Runoff Volume (P1 = 2.28 in.) =	8.577	acre-feet	2.28 inches
100-yr Runoff Volume (P1 = 2.58 in.) =	11.404	acre-feet	2.58 inches
500-yr Runoff Volume (P1 = 3.14 in.) =	15.614	acre-feet	inches
Approximate 2-yr Detention Volume =	0.451	acre-feet	
Approximate 5-yr Detention Volume =	0.792	acre-feet	
Approximate 10-yr Detention Volume =	1.645	acre-feet	
Approximate 25-yr Detention Volume =	2.069	acre-feet	
Approximate 50-yr Detention Volume =	2.618	acre-feet	
Approximate 100-yr Detention Volume =	3.441	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.528	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.356	acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	0.885	acre-feet
Initial Surcharge Volume (ISV) =	69	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.003	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio (R_{LW}) =	2	

Initial Surcharge Area (A_{ISV}) =	209	ft^2
Surcharge Volume Length (L_{ISV}) =	14.5	ft
Surcharge Volume Width (W_{ISV}) =	14.5	ft
Depth of Basin Floor (H_{FLOOR}) =	0.22	ft
Length of Basin Floor (L_{FLOOR}) =	88.7	ft
Width of Basin Floor (W_{FLOOR}) =	51.1	ft
Area of Basin Floor (A_{FLOOR}) =	4,534	ft^2
Volume of Basin Floor (V_{FLOOR}) =	419	ft^3
Depth of Main Basin (H_{MAIN}) =	4.95	ft
Length of Main Basin (L_{MAIN}) =	128.3	ft
Width of Main Basin (W_{MAIN}) =	90.7	ft
Area of Main Basin (A_{MAIN}) =	11,639	ft^2
Volume of Main Basin (V_{MAIN}) =	38,673	ft^3
Calculated Total Basin Volume (V_{total}) =	**0.901**	acre-feet

Total detention volume is less than 100-year volume.

Depth Increment = 0.50 ft

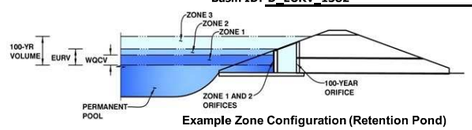
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		14.5	14.5	209		0.005		
ISV	0.33		14.5	14.5	209		0.005	69	0.002
	0.50		14.5	14.5	209		0.005	105	0.002
	1.00		71.8	42.8	3,074		0.071	407	0.009
Floor	1.05		88.7	51.1	4,534		0.104	596	0.014
	1.50		92.3	54.7	5,051		0.116	2,751	0.063
	2.00		96.3	58.7	5,655		0.130	5,426	0.125
	2.50		100.3	62.7	6,291		0.144	8,412	0.193
	3.00		104.3	66.7	6,959		0.160	11,723	0.269
	3.50		108.3	70.7	7,659		0.176	15,376	0.353
	4.00		112.3	74.7	8,391		0.193	19,387	0.445
Zone 1 (WQCV)	4.42		115.6	78.1	9,031		0.207	23,045	0.529
	4.50		116.3	78.7	9,155		0.210	23,772	0.546
	5.00		120.3	82.7	9,951		0.228	28,547	0.655
	5.50		124.3	86.7	10,779		0.247	33,728	0.774
Zone 2 (EURV)	5.94		127.8	90.3	11,534		0.265	38,637	0.887
	6.00		128.3	90.7	11,639		0.267	39,332	0.903
	6.50		132.3	94.7	12,531		0.288	45,373	1.042
	7.00		136.3	98.7	13,455		0.309	51,868	1.191
	7.50		140.3	102.7	14,411		0.331	58,834	1.351
	8.00		144.3	106.7	15,399		0.354	66,285	1.522
	8.50		148.3	110.7	16,419		0.377	74,238	1.704
	9.00		152.3	114.7	17,471		0.401	82,710	1.899
	9.50		156.3	118.7	18,556		0.426	91,715	2.105
	10.00		160.3	122.7	19,672		0.452	101,271	2.325
	10.50		164.3	126.7	20,820		0.478	111,392	2.557
	11.00		168.3	130.7	22,000		0.505	122,096	2.803
	11.50		172.3	134.7	23,212		0.533	133,397	3.062
	12.00		176.3	138.7	24,456		0.561	145,313	3.336
	12.50		180.3	142.7	25,732		0.591	157,858	3.624
	13.00		184.3	146.7	27,040		0.621	171,050	3.927
	13.50		188.3	150.7	28,380		0.652	184,903	4.245
	14.00		192.3	154.7	29,752		0.683	199,435	4.578
	14.50		196.3	158.7	31,156		0.715	214,661	4.928
	15.00		200.3	162.7	32,592		0.748	230,596	5.294
	15.50		204.3	166.7	34,060		0.782	247,258	5.676
	16.00		208.3	170.7	35,560		0.816	264,662	6.076
	16.50		212.3	174.7	37,092		0.852	282,824	6.493
	17.00		216.3	178.7	38,656		0.887	301,760	6.927
	17.50		220.3	182.7	40,252		0.924	321,485	7.380
	18.00		224.3	186.7	41,880		0.961	342,017	7.852
	18.50		228.3	190.7	43,540		1.000	363,371	8.342
	19.00		232.3	194.7	45,232		1.038	385,563	8.851
	19.50		236.3	198.7	46,957		1.078	408,609	9.380
	20.00		240.3	202.7	48,713		1.118	432,525	9.929
	20.50		244.3	206.7	50,501		1.159	457,327	10.499
	21.00		248.3	210.7	52,321		1.201	483,031	11.089
	21.50		252.3	214.7	54,173		1.244	509,653	11.700
	22.00		256.3	218.7	56,057		1.287	537,209	12.333
	22.50		260.3	222.7	57,973		1.331	565,715	12.987
	23.00		264.3	226.7	59,921		1.376	595,187	13.664
	23.50		268.3	230.7	61,901		1.421	625,641	14.363
	24.00		272.3	234.7	63,913		1.467	657,093	15.085
	24.50		276.3	238.7	65,957		1.514	689,559	15.830
	25.00		280.3	242.7	68,033		1.562	723,056	16.599
	25.50		284.3	246.7	70,141		1.610	757,598	17.392
	26.00		288.3	250.7	72,281		1.659	793,202	18.209
	26.50		292.3	254.7	74,453		1.709	829,884	19.052
	27.00		296.3	258.7	76,657		1.760	867,661	19.919
	27.50		300.3	262.7	78,893		1.811	906,547	20.811
	28.00		304.3	266.7	81,161		1.863	946,559	21.730
	28.50		308.3	270.7	83,461		1.916	987,714	22.675
	29.00		312.3	274.7	85,793		1.970	1,030,026	23.646
	29.50		316.3	278.7	88,158		2.024	1,073,513	24.644
	30.00		320.3	282.7	90,554		2.079	1,118,189	25.670

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley Oklahoma Basin - Option 4 LID

Basin ID: D_EURV_1382



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	4.42	0.528	Orifice Plate
Zone 2 (EURV)	5.94	0.356	Weir&Pipe (Restrict)
Zone 3			
Total (all zones)		0.885	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	1.250E-02	ft^2
Depth at top of Zone using Orifice Plate =	4.42	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	17.70	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	1.80	sq. inches (diameter = 1-1/2 inches)	Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.47	2.95					
Orifice Area (sq. inches)	1.80	1.80	1.80					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected		Calculated Parameters for Vertical Orifice	Not Selected	Not Selected	
Invert of Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =			ft^2
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =			feet
Vertical Orifice Diameter =			inches				

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected		Calculated Parameters for Overflow Weir	Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.42		ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	4.42		feet
Overflow Weir Front Edge Length =	4.00		feet	Overflow Weir Slope Length =	4.00		feet
Overflow Weir Grate Slope =	0.00		H:V	Grate Open Area / 100-yr Orifice Area =	288.33		
Horiz. Length of Weir Sides =	4.00		feet	Overflow Grate Open Area w/o Debris =	11.14		ft^2
Overflow Grate Type =	Type C Grate			Overflow Grate Open Area w/ Debris =	5.57		ft^2
Debris Clogging % =	50%		%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	3.00		ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.04		ft^2
Outlet Pipe Diameter =	18.00		inches	Outlet Orifice Centroid =	0.05		feet
Restrictor Plate Height Above Pipe Invert =	1.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	0.48	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=	6.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	1.04	feet
Spillway Crest Length =	20.00	feet	Stage at Top of Freeboard =	8.04	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.36	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	1.54	acre-ft

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

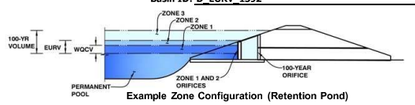
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.95	1.35	1.63	1.69	2.28	2.58	3.14
CUHP Runoff Volume (acre-ft) =	0.528	0.885	0.459	1.732	3.112	4.452	8.577	11.404	15.614
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.459	1.732	3.112	4.452	8.577	11.403	15.613
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.5	7.6	16.2	26.5	52.2	70.2	95.6
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.08	0.18	0.29	0.57	0.77	1.04
Peak Inflow Q (cfs) =	N/A	N/A	3.0	11.4	20.4	30.5	56.7	74.7	100.4
Peak Outflow Q (cfs) =	0.3	0.6	0.3	6.4	16.8	28.9	56.6	74.6	100.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.8	1.0	1.1	1.1	1.1	1.0
Structure Controlling Flow =	Overflow Weir 1	Outlet Plate 1	Plate	Spillway	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	0.02	N/A	0.0	0.0	0.0	0.0	0.0	0.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	45	38	46	41	37	27	23	17
Time to Drain 99% of Inflow Volume (hours) =	**41**	48	40	52	50	48	42	39	35
Maximum Ponding Depth (ft) =	4.42	5.94	3.67	6.21	6.40	6.57	6.88	7.04	7.24
Area at Maximum Ponding Depth (acres) =	0.21	0.26	0.18	0.28	0.28	0.29	0.30	0.31	0.32
Maximum Volume Stored (acre-ft) =	0.529	0.887	0.383	0.957	1.013	1.062	1.151	1.200	1.266

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley Oklahoma Basin - Option 4 LID

Basin ID: D_EURV_1392



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	432.77	acres
Watershed Length =	7,920	ft
Watershed Length to Centroid =	3,960	ft
Watershed Slope =	0.016	ft/ft
Watershed Imperviousness =	35.93%	percent
Percentage Hydrologic Soil Group A =	1.2%	percent
Percentage Hydrologic Soil Group B =	23.8%	percent
Percentage Hydrologic Soil Groups C/D =	75.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	6.089 acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	14.794 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.95 in.) =	11.035 acre-feet	0.95	inches
5-yr Runoff Volume (P1 = 1.35 in.) =	22.262 acre-feet	1.35	inches
10-yr Runoff Volume (P1 = 1.63 in.) =	31.606 acre-feet	1.63	inches
25-yr Runoff Volume (P1 = 1.69 in.) =	35.811 acre-feet		inches
50-yr Runoff Volume (P1 = 2.28 in.) =	57.141 acre-feet	2.28	inches
100-yr Runoff Volume (P1 = 2.58 in.) =	70.091 acre-feet	2.58	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	91.291 acre-feet		inches
Approximate 2-yr Detention Volume =	9.779 acre-feet		
Approximate 5-yr Detention Volume =	17.135 acre-feet		
Approximate 10-yr Detention Volume =	21.330 acre-feet		
Approximate 25-yr Detention Volume =	21.580 acre-feet		
Approximate 50-yr Detention Volume =	27.069 acre-feet		
Approximate 100-yr Detention Volume =	32.423 acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	6.089	acre-feet
Zone 2 Volume (EURV - Zone 1) =	8.705	acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	14.794	acre-feet
Initial Surcharge Volume (ISV) =	796	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.003	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio (R_{LW}) =	2	

Initial Surcharge Area (A_{ISV}) =	2,411	ft^2
Surcharge Volume Length (L_{ISV}) =	49.1	ft
Surcharge Volume Width (W_{ISV}) =	49.1	ft
Depth of Basin Floor (H_{FLOOR}) =	1.34	ft
Length of Basin Floor (L_{FLOOR}) =	501.1	ft
Width of Basin Floor (W_{FLOOR}) =	272.4	ft
Area of Basin Floor (A_{FLOOR}) =	136,527	ft^2
Volume of Basin Floor (V_{FLOOR}) =	70,163	ft^3
Depth of Main Basin (H_{MAIN}) =	3.83	ft
Length of Main Basin (L_{MAIN}) =	531.8	ft
Width of Main Basin (W_{MAIN}) =	303.1	ft
Area of Main Basin (A_{MAIN}) =	161,168	ft^2
Volume of Main Basin (V_{MAIN}) =	569,434	ft^3
Calculated Total Basin Volume (V_{total}) =	**14.729**	acre-feet

Total detention volume is less than 100-year volume.

Depth Increment = 0.50 ft

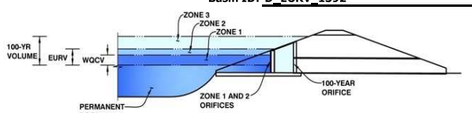
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		49.1	49.1	2,411		0.055		
ISV	0.33		49.1	49.1	2,411		0.055	796	0.018
	0.50		49.1	49.1	2,411		0.055	1,206	0.028
	1.00		106.5	77.4	8,243		0.189	2,861	0.066
	1.50		275.1	160.8	44,231		1.015	14,808	0.340
	2.00		443.8	244.1	108,330		2.487	51,777	1.189
Floor	2.17		501.1	272.4	136,527		3.134	72,544	1.665
	2.50		503.8	275.1	138,576		3.181	117,936	2.707
	3.00		507.8	279.1	141,708		3.253	188,005	4.316
	3.50		511.8	283.1	144,871		3.326	259,649	5.961
Zone 1 (WQCV)	3.54		512.1	283.4	145,126		3.332	265,449	6.094
	4.00		515.8	287.1	148,067		3.399	332,882	7.642
	4.50		519.8	291.1	151,294		3.473	407,721	9.360
	5.00		523.8	295.1	154,553		3.548	484,181	11.115
	5.50		527.8	299.1	157,845		3.624	562,279	12.908
	6.00		531.8	303.1	161,168		3.700	642,031	14.739
Zone 2 (EURV)	6.02		531.9	303.2	161,302		3.703	645,256	14.813
	6.50		535.8	307.1	164,524		3.777	723,453	16.608
	7.00		539.8	311.1	167,911		3.855	806,560	18.516
	7.50		543.8	315.1	171,330		3.933	891,369	20.463
	8.00		547.8	319.1	174,782		4.012	977,896	22.449
	8.50		551.8	323.1	178,265		4.092	1,066,156	24.476
	9.00		555.8	327.1	181,780		4.173	1,156,166	26.542
	9.50		559.8	331.1	185,328		4.255	1,247,942	28.649
	10.00		563.8	335.1	188,907		4.337	1,341,499	30.797
	10.50		567.8	339.1	192,519		4.420	1,436,854	32.986
	11.00		571.8	343.1	196,162		4.503	1,534,023	35.216
	11.50		575.8	347.1	199,837		4.588	1,633,022	37.489
	12.00		579.8	351.1	203,545		4.673	1,733,866	39.804
	12.50		583.8	355.1	207,284		4.759	1,836,572	42.162
	13.00		587.8	359.1	211,056		4.845	1,941,156	44.563
	13.50		591.8	363.1	214,859		4.932	2,047,633	47.007
	14.00		595.8	367.1	218,694		5.021	2,156,020	49.495
	14.50		599.8	371.1	222,562		5.109	2,266,333	52.028
	15.00		603.8	375.1	226,461		5.199	2,378,587	54.605
	15.50		607.8	379.1	230,393		5.289	2,492,799	57.227
	16.00		611.8	383.1	234,356		5.380	2,608,985	59.894
	16.50		615.8	387.1	238,351		5.472	2,727,161	62.607
	17.00		619.8	391.1	242,379		5.564	2,847,342	65.366
	17.50		623.8	395.1	246,438		5.657	2,969,545	68.171
	18.00		627.8	399.1	250,530		5.751	3,093,785	71.024
	18.50		631.8	403.1	254,653		5.846	3,220,080	73.923
	19.00		635.8	407.1	258,808		5.941	3,348,444	76.870
	19.50		639.8	411.1	262,996		6.038	3,478,894	79.864
	20.00		643.8	415.1	267,215		6.134	3,611,445	82.907
	20.50		647.8	419.1	271,467		6.232	3,746,114	85.999
	21.00		651.8	423.1	275,750		6.330	3,882,917	89.140
	21.50		655.8	427.1	280,065		6.429	4,021,869	92.329
	22.00		659.8	431.1	284,413		6.529	4,162,988	95.569
	22.50		663.8	435.1	288,792		6.630	4,306,288	98.859
	23.00		667.8	439.1	293,204		6.731	4,451,785	102.199
	23.50		671.8	443.1	297,647		6.833	4,599,496	105.590
	24.00		675.8	447.1	302,122		6.936	4,749,437	109.032
	24.50		679.8	451.1	306,630		7.039	4,901,624	112.526
	25.00		683.8	455.1	311,169		7.143	5,056,073	116.071
	25.50		687.8	459.1	315,741		7.248	5,212,799	119.669
	26.00		691.8	463.1	320,344		7.354	5,371,819	123.320
	26.50		695.8	467.1	324,979		7.460	5,533,148	127.024
	27.00		699.8	471.1	329,647		7.568	5,696,803	130.781
	27.50		703.8	475.1	334,346		7.676	5,862,800	134.591
	28.00		707.8	479.1	339,078		7.784	6,031,155	138.456
	28.50		711.8	483.1	343,841		7.894	6,201,883	142.376
	29.00		715.8	487.1	348,636		8.004	6,375,001	146.350
	29.50		719.8	491.1	353,464		8.114	6,550,525	150.379
	30.00		723.8	495.1	358,323		8.226	6,728,470	154.464

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley Oklahoma Basin - Option 4 LID

Basin ID: D_EURV_1392



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.54	6.089	Orifice Plate
Zone 2 (EURV)	6.02	8.705	Weir&Pipe (Restrict)
Zone 3			
Total (all zones)		14.794	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	1.285E-01	ft^2
Depth at top of Zone using Orifice Plate =	3.54	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	14.20	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	18.50	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.18	2.36					
Orifice Area (sq. inches)	18.50	18.50	18.50					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected		Calculated Parameters for Vertical Orifice	Not Selected	Not Selected	
Invert of Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =			ft^2
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =			feet
Vertical Orifice Diameter =			inches				

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 2 Weir	Not Selected		Calculated Parameters for Overflow Weir	Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.54		ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.54		feet
Overflow Weir Front Edge Length =	4.00		feet	Overflow Weir Slope Length =	4.00		feet
Overflow Weir Grate Slope =	0.00		H:V	Grate Open Area / 100-yr Orifice Area =	46.08		
Horiz. Length of Weir Sides =	4.00		feet	Overflow Grate Open Area w/o Debris =	11.14		ft^2
Overflow Grate Type =	Type C Grate			Overflow Grate Open Area w/ Debris =	5.57		ft^2
Debris Clogging % =	50%		%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	3.00		ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.24		ft^2
Outlet Pipe Diameter =	18.00		inches	Outlet Orifice Centroid =	0.17		feet
Restrictor Plate Height Above Pipe Invert =	3.50		inches	Half-Central Angle of Restrictor Plate on Pipe =	0.91	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway	
Spillway Invert Stage=	6.03	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	2.45 feet
Spillway Crest Length =	50.00	feet	Stage at Top of Freeboard =	9.48 feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	4.25 acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	28.56 acre-ft

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

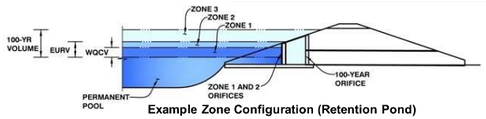
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.95	1.35	1.63	1.69	2.28	2.58	3.14
CUHP Runoff Volume (acre-ft) =	6.089	14.794	11.035	22.262	31.606	35.811	57.141	70.091	91.291
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	11.035	22.262	31.606	35.811	57.141	70.091	91.291
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	3.6	69.6	124.3	177.1	320.6	418.6	563.4
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.16	0.29	0.41	0.74	0.97	1.30
Peak Inflow Q (cfs) =	N/A	N/A	94.8	202.6	279.7	346.0	547.5	669.5	866.2
Peak Outflow Q (cfs) =	2.8	3.5	3.2	64.9	147.7	196.7	404.4	551.7	757.7
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.9	1.2	1.1	1.3	1.3	1.3
Structure Controlling Flow =	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Spillway	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	-0.05	-0.02	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	68	57	71	69	68	63	60	55
Time to Drain 99% of Inflow Volume (hours) =	**41**	72	60	76	75	74	72	71	69
Maximum Ponding Depth (ft) =	3.54	6.02	4.75	6.57	6.97	7.16	7.82	8.20	8.67
Area at Maximum Ponding Depth (acres) =	3.33	3.70	3.51	3.79	3.85	3.88	3.98	4.04	4.12
Maximum Volume Stored (acre-ft) =	6.094	14.813	10.233	16.835	18.362	19.096	21.730	23.255	25.174

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley Oklahoma Basin - Option 4 LID

Basin ID: D_EURV_1395



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	129.65	acres
Watershed Length =	3,582	ft
Watershed Length to Centroid =	1,775	ft
Watershed Slope =	0.010	ft/ft
Watershed Imperviousness =	74.97%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	3.234	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	9.498	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.95 in.) =	7.474	acre-feet	0.95	inches
5-yr Runoff Volume (P1 = 1.35 in.) =	11.779	acre-feet	1.35	inches
10-yr Runoff Volume (P1 = 1.63 in.) =	14.921	acre-feet	1.63	inches
25-yr Runoff Volume (P1 = 1.69 in.) =	15.785	acre-feet		inches
50-yr Runoff Volume (P1 = 2.28 in.) =	22.571	acre-feet	2.28	inches
100-yr Runoff Volume (P1 = 2.58 in.) =	26.231	acre-feet	2.58	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	32.748	acre-feet		inches
Approximate 2-yr Detention Volume =	6.841	acre-feet		
Approximate 5-yr Detention Volume =	10.626	acre-feet		
Approximate 10-yr Detention Volume =	12.634	acre-feet		
Approximate 25-yr Detention Volume =	12.166	acre-feet		
Approximate 50-yr Detention Volume =	14.962	acre-feet		
Approximate 100-yr Detention Volume =	16.145	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	3.234	acre-feet
Zone 2 Volume (EURV - Zone 1) =	6.264	acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	9.498	acre-feet
Initial Surcharge Volume (ISV) =	578	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.003	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Initial Surcharge Area (A_{ISV}) =	1,752	ft^2
Surcharge Volume Length (L_{ISV}) =	41.9	ft
Surcharge Volume Width (W_{ISV}) =	41.9	ft
Depth of Basin Floor (H_{FLOOR}) =	1.02	ft
Length of Basin Floor (L_{FLOOR}) =	385.9	ft
Width of Basin Floor (W_{FLOOR}) =	211.9	ft
Area of Basin Floor (A_{FLOOR}) =	81,760	ft^2
Volume of Basin Floor (V_{FLOOR}) =	32,463	ft^3
Depth of Main Basin (H_{MAIN}) =	4.15	ft
Length of Main Basin (L_{MAIN}) =	419.1	ft
Width of Main Basin (W_{MAIN}) =	245.1	ft
Area of Main Basin (A_{MAIN}) =	102,709	ft^2
Volume of Main Basin (V_{MAIN}) =	381,947	ft^3
Calculated Total Basin Volume (V_{total}) =	**9.547**	acre-feet

Total detention volume is less than 100-year volume.

Depth Increment = 0.50 ft

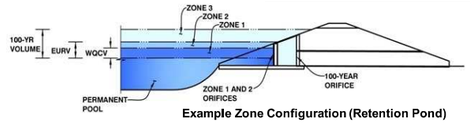
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		41.9	41.9	1,752		0.040		
ISV	0.33		41.9	41.9	1,752		0.040	578	0.013
	0.50		41.9	41.9	1,752		0.040	876	0.020
	1.00		99.2	70.2	6,962		0.160	2,148	0.049
	1.50		267.9	153.5	41,122		0.944	12,998	0.298
Floor	1.85		385.9	211.9	81,760		1.877	34,101	0.783
	2.00		387.1	213.1	82,479		1.893	46,419	1.066
	2.50		391.1	217.1	84,895		1.949	88,261	2.026
	3.00		395.1	221.1	87,344		2.005	131,319	3.015
Zone 1 (WQCV)	3.11		396.0	221.9	87,887		2.018	140,957	3.236
	3.50		399.1	225.1	89,825		2.062	175,610	4.031
	4.00		403.1	229.1	92,338		2.120	221,150	5.077
	4.50		407.1	233.1	94,882		2.178	267,953	6.151
	5.00		411.1	237.1	97,459		2.237	316,037	7.255
	5.50		415.1	241.1	100,068		2.297	365,418	8.389
Zone 2 (EURV)	5.98		419.0	244.9	102,602		2.355	414,057	9.505
	6.00		419.1	245.1	102,709		2.358	416,110	9.553
	6.50		423.1	249.1	105,381		2.419	468,131	10.747
	7.00		427.1	253.1	108,086		2.481	521,497	11.972
	7.50		431.1	257.1	110,823		2.544	576,223	13.228
	8.00		435.1	261.1	113,591		2.608	632,325	14.516
	8.50		439.1	265.1	116,392		2.672	689,820	15.836
	9.00		443.1	269.1	119,225		2.737	748,723	17.188
	9.50		447.1	273.1	122,090		2.803	809,050	18.573
	10.00		451.1	277.1	124,986		2.869	870,818	19.991
	10.50		455.1	281.1	127,915		2.937	934,042	21.443
	11.00		459.1	285.1	130,876		3.004	998,738	22.928
	11.50		463.1	289.1	133,869		3.073	1,064,923	24.447
	12.00		467.1	293.1	136,893		3.143	1,132,612	26.001
	12.50		471.1	297.1	139,950		3.213	1,201,821	27.590
	13.00		475.1	301.1	143,039		3.284	1,272,567	29.214
	13.50		479.1	305.1	146,159		3.355	1,344,865	30.874
	14.00		483.1	309.1	149,312		3.428	1,418,732	32.570
	14.50		487.1	313.1	152,497		3.501	1,494,183	34.302
	15.00		491.1	317.1	155,714		3.575	1,571,234	36.071
	15.50		495.1	321.1	158,962		3.649	1,649,902	37.877
	16.00		499.1	325.1	162,243		3.725	1,730,202	39.720
	16.50		503.1	329.1	165,556		3.801	1,812,150	41.601
	17.00		507.1	333.1	168,901		3.877	1,895,763	43.521
	17.50		511.1	337.1	172,277		3.955	1,981,056	45.479
	18.00		515.1	341.1	175,686		4.033	2,068,046	47.476
	18.50		519.1	345.1	179,127		4.112	2,156,748	49.512
	19.00		523.1	349.1	182,599		4.192	2,247,178	51.588
	19.50		527.1	353.1	186,104		4.272	2,339,353	53.704
	20.00		531.1	357.1	189,641		4.354	2,433,287	55.861
	20.50		535.1	361.1	193,210		4.435	2,528,999	58.058
	21.00		539.1	365.1	196,810		4.518	2,626,502	60.296
	21.50		543.1	369.1	200,443		4.602	2,725,815	62.576
	22.00		547.1	373.1	204,108		4.686	2,826,951	64.898
	22.50		551.1	377.1	207,805		4.771	2,929,928	67.262
	23.00		555.1	381.1	211,533		4.856	3,034,761	69.669
	23.50		559.1	385.1	215,294		4.942	3,141,466	72.118
	24.00		563.1	389.1	219,087		5.030	3,250,060	74.611
	24.50		567.1	393.1	222,912		5.117	3,360,559	77.148
	25.00		571.1	397.1	226,768		5.206	3,472,977	79.729
	25.50		575.1	401.1	230,657		5.295	3,587,332	82.354
	26.00		579.1	405.1	234,578		5.385	3,703,639	85.024
	26.50		583.1	409.1	238,530		5.476	3,821,915	87.739
	27.00		587.1	413.1	242,515		5.567	3,942,175	90.500
	27.50		591.1	417.1	246,532		5.660	4,064,436	93.307
	28.00		595.1	421.1	250,581		5.753	4,188,712	96.160
	28.50		599.1	425.1	254,661		5.846	4,315,022	99.059
	29.00		603.1	429.1	258,774		5.941	4,443,379	102.006
	29.50		607.1	433.1	262,919		6.036	4,573,801	105.000
	30.00		611.1	437.1	267,096		6.132	4,706,303	108.042

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: 24.906.009 Greeley Oklahoma Basin - Option 4 LID

Basin ID: D_EURV_1395



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.11	3.234	Orifice Plate
Zone 2 (EURV)	5.98	6.264	Rectangular Orifice
Zone 3			
Total (all zones)		9.498	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	6.944E-02 ft^2
Depth at top of Zone using Orifice Plate =	3.11	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A feet
Orifice Plate: Orifice Area per Row =	10.00	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A ft^2

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.00	2.00					
Orifice Area (sq. inches)	10.00	10.00	10.00					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangular	Not Selected		Calculated Parameters for Vertical Orifice: Zone 2 Rectangular	Not Selected
Invert of Vertical Orifice =	3.11		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.13		ft^2
Depth at top of Zone using Vertical Orifice =	5.98		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.13		feet
Vertical Orifice Height =	3.00		inches				
Vertical Orifice Width =	6.00		inches				

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Not Selected	Not Selected		Calculated Parameters for Overflow Weir: Not Selected	Not Selected
Overflow Weir Front Edge Height, Ho =			ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =			feet
Overflow Weir Front Edge Length =			feet	Overflow Weir Slope Length =			feet
Overflow Weir Grate Slope =			H:V	Grate Open Area / 100-yr Orifice Area =			
Horiz. Length of Weir Sides =			feet	Overflow Grate Open Area w/o Debris =			ft^2
Overflow Grate Type =				Overflow Grate Open Area w/ Debris =			ft^2
Debris Clogging % =			%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Not Selected	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate: Not Selected	Not Selected
Depth to Invert of Outlet Pipe =			ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =			ft^2
Circular Orifice Diameter =			inches	Outlet Orifice Centroid =			feet
				Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	1.99 feet
Spillway Crest Length =	40.00	feet	Stage at Top of Freeboard =	8.99 feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	2.74 acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	17.16 acre-ft

Calculated Parameters for Spillway

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.95	1.35	1.63	1.69	2.28	2.58	3.14
CUHP Runoff Volume (acre-ft) =	3.234	9.498	7.474	11.779	14.921	15.785	22.571	26.231	32.748
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	7.474	11.779	14.921	15.785	22.571	26.231	32.748
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	1.5	31.3	51.5	69.7	122.9	156.7	208.3
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.24	0.40	0.54	0.95	1.21	1.61
Peak Inflow Q (cfs) =	N/A	N/A	108.7	172.6	214.9	235.6	338.1	392.4	487.1
Peak Outflow Q (cfs) =	1.4	3.2	2.7	23.4	58.0	79.0	175.4	240.6	338.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.7	1.1	1.1	1.4	1.5	1.6
Structure Controlling Flow =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Spillway	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	67	61	69	68	67	64	62	59
Time to Drain 99% of Inflow Volume (hours) =	**41**	71	64	74	73	73	72	71	70
Maximum Ponding Depth (ft) =	3.11	5.98	4.90	6.30	6.57	6.71	7.20	7.46	7.81
Area at Maximum Ponding Depth (acres) =	2.02	2.36	2.23	2.39	2.43	2.44	2.51	2.54	2.58
Maximum Volume Stored (acre-ft) =	3.236	9.505	7.032	10.242	10.916	11.233	12.446	13.127	14.023

APPENDIX F-3
Master Plan SWMM Input

```
[TITLE]
;;Project Title/Notes
City of Greeley
Comprehensive Drainage Plan Oklahoma Basins
Concept Design
Matrix Design Group, Inc. 2025

[OPTIONS]
;;Option             Value
FLOW_UNITS           CFS
INFILTRATION         HORTON
FLOW_ROUTING         KINWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           01/01/2024
START_TIME           00:00:00
REPORT_START_DATE    01/01/2024
REPORT_START_TIME    00:00:00
END_DATE             01/04/2024
END_TIME             00:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:05:00
WET_STEP             00:05:00
DRY_STEP             01:00:00
ROUTING_STEP         0:00:20
RULE_STEP            00:00:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         12.566
MAX_TRIALS           8
HEAD_TOLERANCE       0.005
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              1

[FILES]
;;Interfacing Files
USE INFLOWS "R:\24.906.009 Greeley - Oklahoma Master Basin Study\200 Design\220 Drainage-WR\221 Models\01 CUHP_SWMM\01 CUHP\Concept Design\15_Fut_100yr_0mi^2_GOM_Output.txt"

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
CONSTANT         0.0
DRY_ONLY         NO

[JUNCTIONS]
;;Name           Elevation  MaxDepth   InitDepth  SurDepth   Aponded
;;-------------- ---------- ---------- ---------- ---------- ----------
1002_Drop        4759       0          0          0          0
1004             4769       0          0          0          0
1006_RR          4772       0          0          0          0
1008             4774       0          0          0          0
1010             4774.9     0          0          0          0
1012             4777.9     0          0          0          0
1014             4779       0          0          0          0
1016             4781       0          0          0          0
```

67	1018	4782	0	0	0	0
68	1020	4784	0	0	0	0
69	1022	4789	0	0	0	0
70	1024	4792	0	0	0	0
71	1026	4793	0	0	0	0
72	1028	4802.9	0	0	0	0
73	1030	4811.9	0	0	0	0
74	1032	4770	0	0	0	0
75	1034	4814.9	0	0	0	0
76	1036	4818	0	0	0	0
77	1038	4821	0	0	0	0
78	1040	4827.9	0	0	0	0
79	1042	4838	0	0	0	0
80	1044	4844	0	0	0	0
81	1046	4851	0	0	0	0
82	1048	4855	0	0	0	0
83	109	4779	0	0	0	0
84	110	4794	0	0	0	0
85	1108	4816	0	0	0	0
86	1110	4855	0	0	0	0
87	1115	4790	0	0	0	0
88	1116	4850	0	0	0	0
89	1123	4825	0	0	0	0
90	1124	4864	0	0	0	0
91	1125	4852	0	0	0	0
92	1126	4864	0	0	0	0
93	1127	4841	0	0	0	0
94	113	4784	0	0	0	0
95	1130	4854	0	0	0	0
96	1132	4874	0	0	0	0
97	1139	4857	0	0	0	0
98	114	4798	0	0	0	0
99	1140	4879	0	0	0	0
100	1141	4878	0	0	0	0
101	1142	4902	0	0	0	0
102	1144	4925	0	0	0	0
103	1147	4893	0	0	0	0
104	1148	4946	10	0	0	0
105	115	4816.7	0	0	0	0
106	1150	4955	0	0	0	0
107	1151	4941	0	0	0	0
108	1152	4966	0	0	0	0
109	1153	4943	0	0	0	0
110	1154	4976	0	0	0	0
111	1156	4935	0	0	0	0
112	1164	4958	0	0	0	0
113	117	4818	0	0	0	0
114	1172	4832	0	0	0	0
115	118	4830	0	0	0	0
116	1180	4838	0	0	0	0
117	119	4834	0	0	0	0
118	1208	4868	10	0	0	0
119	1209	4877	10	0	0	0
120	121	4835	0	0	0	0
121	1210	4889	0	0	0	0
122	1215	4868	0	0	0	0
123	1216	4882	0	0	0	0
124	1217	4873	0	0	0	0
125	122	4983	10	0	0	0
126	1223	4880	0	0	0	0
127	1224	4890	0	0	0	0
128	1226	4895	10	0	0	0
129	1228	4903	0	0	0	0
130	1230	4883	0	0	0	0
131	1231	4908	0	0	0	0
132	1232	4955	0	0	0	0

133	1233	4917	0	0	0	0
134	1233_Lake	4911	0	0	0	0
135	1234	4960	0	0	0	0
136	1235	4941	0	0	0	0
137	1236	4998	0	0	0	0
138	1237	4973	0	0	0	0
139	1238	5005	0	0	0	0
140	1239	4954	0	0	0	0
141	1239_Lake	4941	0	0	0	0
142	1240	4981	0	0	0	0
143	1247	4946	0	0	0	0
144	1248	4967	0	0	0	0
145	1249	4957	0	0	0	0
146	1255	4965	0	0	0	0
147	1256	4993	0	0	0	0
148	1257	4970	0	0	0	0
149	1258	4989	0	0	0	0
150	1259	4990	0	0	0	0
151	126	4999	0	0	0	0
152	1260	5019	0	0	0	0
153	1264	4876	0	0	0	0
154	1272	4880	0	0	0	0
155	1273	4959	0	0	0	0
156	1274	4978	0	0	0	0
157	129	4835	0	0	0	0
158	130	4910	0	0	0	0
159	1308	4891	0	0	0	0
160	1310	4912	0	0	0	0
161	1315	4893	0	0	0	0
162	1316	4904	0	0	0	0
163	1318	4923	0	0	0	0
164	1319	4929	0	0	0	0
165	1320	4970	0	0	0	0
166	1321	4931	0	0	0	0
167	1322	4975	0	0	0	0
168	1323	4966	0	0	0	0
169	1324	4975	0	0	0	0
170	1327	4984	0	0	0	0
171	1328	4989	0	0	0	0
172	133	4917	0	0	0	0
173	1339	4933.66	0	0	0	0
174	134	4945	0	0	0	0
175	1341	4957	0	0	0	0
176	1347	4949	0	0	0	0
177	1348	4981	0	0	0	0
178	1349	4952	0	0	0	0
179	1351	4979	0	0	0	0
180	1352	5019	0	0	0	0
181	1353	4985	0	0	0	0
182	1354	5028	0	0	0	0
183	1355	4971	0	0	0	0
184	1356	4989	0	0	0	0
185	1357	4981	0	0	0	0
186	1358	4993	0	0	0	0
187	1361	5024	0	0	0	0
188	1362	5035	0	0	0	0
189	1363	5038	0	0	0	0
190	1364	5058	0	0	0	0
191	1367	5033	0	0	0	0
192	1368	5059	0	0	0	0
193	1371	4971	0	0	0	0
194	1372	4988	0	0	0	0
195	138	4970	0	0	0	0
196	1382	4921	0	0	0	0
197	1386	4960	0	0	0	0
198	1387	4943	0	0	0	0

199	1388	4995	0	0	0	0
200	139	4817	0	0	0	0
201	1392	4938	0	0	0	0
202	1393	4940	0	0	0	0
203	1394	4997	0	0	0	0
204	1395	4947	0	0	0	0
205	1396	4969	0	0	0	0
206	1398	4972	0	0	0	0
207	141	4827	0	0	0	0
208	142	4820	0	0	0	0
209	146	4849	0	0	0	0
210	149	4869	0	0	0	0
211	150	4890	0	0	0	0
212	154	4904	0	0	0	0
213	210	4770	0	0	0	0
214	220	4777	0	0	0	0
215	221	4790.6	0	0	0	0
216	223	4793	0	0	0	0
217	224	4810	0	0	0	0
218	225	4840	0	0	0	0
219	226	4850	0	0	0	0
220	228	4864	0	0	0	0
221	231	4790.8	0	0	0	0
222	232	4810	0	0	0	0
223	235	4845	0	0	0	0
224	236	4847	0	0	0	0
225	237	4846	0	0	0	0
226	239	4850	0	0	0	0
227	240	4849	0	0	0	0
228	241	4862	0	0	0	0
229	243	4863	0	0	0	0
230	244	4894	0	0	0	0
231	245	4980	0	0	0	0
232	247	4981	0	0	0	0
233	248	4986	0	0	0	0
234	250	5015	0	0	0	0
235	252	4990	0	0	0	0
236	256	4851	0	0	0	0
237	259	4863	0	0	0	0
238	260	4905	0	0	0	0
239	263	4922	0	0	0	0
240	264	4991	0	0	0	0
241	268	4991	0	0	0	0
242	310	4778.1	0	0	0	0
243	314	4839	0	0	0	0
244	410	4793	0	0	0	0
245	414	4796	0	0	0	0
246	418	4802	0	0	0	0
247	422	4800	0	0	0	0
248	426	4810	0	0	0	0
249	510	4856	0	0	0	0
250	513	4880	0	0	0	0
251	514	4931	0	0	0	0
252	515	4879	0	0	0	0
253	518	4940	0	0	0	0
254	610	4858	0	0	0	0
255	613	4888	0	0	0	0
256	614	4899	0	0	0	0
257	616	4941	0	0	0	0
258	617	4942	0	0	0	0
259	618	4950	0	0	0	0
260	620	4920	0	0	0	0
261	622	4981	0	0	0	0
262	708	4851	0	0	0	0
263	709	4866	0	0	0	0
264	710	4871	0	0	0	0

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711              4889       0          0          0          0
712              4915       0          0          0          0
713              4898       0          0          0          0
714              4864       0          0          0          0
804              4882       0          0          0          0
808              4885       0          0          0          0
809              4890       0          0          0          0
810              4925       0          0          0          0
811              4893       0          0          0          0
819              4901       0          0          0          0
820              4945       0          0          0          0
822              4932       0          0          0          0
823              4908       0          0          0          0
824              4961       0          0          0          0
829              4918       15         0          0          0
830              4972       0          0          0          0
831              4928.5     0          0          0          0
834              4932       0          0          0          0
838              4949       0          0          0          0
839              4965       0          0          0          0
840              4990       0          0          0          0
841              4967       0          0          0          0
842              5000       0          0          0          0
843              4959       0          0          0          0
844              4995       0          0          0          0
850              4990       0          0          0          0
910              4916       0          0          0          0
911              4913       0          0          0          0
912              4920       0          0          0          0
929              4922       0          0          0          0
930              4927       0          0          0          0
931              4954       0          0          0          0
940              4986       0          0          0          0
950              4977       0          0          0          0
960              4970       0          0          0          0
CulvertOut_1233  4914       0          0          0          0
Drop_1030        4808       0          0          0          0
Drop_1042        4830.9     0          0          0          0
Drop_1046        4850       0          0          0          0
Drop_1048        4854       0          0          0          0
Drop_1115        4786       0          0          0          0
;Represents drop structures along L_1147 (6' vertical drop).
Drop_1147        4884       0          0          0          0
;Represents drop structures along L_1151.
Drop_1151        4911       0          0          0          0
Drop_1239        4951       0          0          0          0
O_1107           4778       0          0          0          0
O_1263           4858       0          0          0          0
O_1307           4865       0          0          0          0
O_220            4772       0          0          0          0
O_300            4778       0          0          0          0
O_500            4826       0          0          0          0
O_600            4815       0          0          0          0
O_708            4828       0          0          0          0
O_803            4865       0          0          0          0
O_909            4865       0          0          0          0
1006_Drop        4770       0          0          0          0

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
O_100            4778       FREE                        NO
O_1000           4756       FREE                        NO

[DIVIDERS]
;;Name           Elevation  Diverted Link    Type       Parameters
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;;-------------- ---------- ---------------- ---------- ----------
836              4945       Overflow_836     OVERFLOW   0          0          0          0

[STORAGE]
;;Name           Elev.    MaxDepth   InitDepth  Shape      Curve Type/Params             SurDepth  Fevap    Psi      Ksat     IMD
;;-------------- -------- ---------- ---------- ---------- ----------------------------- --------- --------          -------- --------
;South Hill Pond A, see South Hill 2nd FDR.
D_1141           4858     10.52      0          TABULAR    Detention_1141                0         0
;South Hill Pond B, see South Hill 2nd FDR.
D_1155           4893     10         0          TABULAR    Detention_1155                0         0
;Raindance Pond F
D_1163           4943     9          0          TABULAR    Detention_1163                0         0
;Hilltop Pond, see South Hill 2nd FDR.
D_1170           4901.1   5.9        0          TABULAR    Detention_1170                0         0
;Raindance Pond A / Reservoir 2, see Smith Farm (Raindance Reservoir) plans and Raindance Filing 1 FDR and Trautman Hydrology memo (Table 2).
D_1233           4908     9          0          TABULAR    D_1233                        0         0
D_1340           4933.66  12.33      4.33       TABULAR    Detention_1340                0         0
D_EURV_1172      4775     10         0          TABULAR    D_EURV_1172                   0         0
D_EURV_1208      4793     10         0          TABULAR    D_EURV_1208                   0         0
D_EURV_121       4835     10         0          TABULAR    D_EURV_121                    0         0
D_EURV_1264      4858     10         0          TABULAR    D_EURV_1364                   0         0
D_EURV_1316      4905     10         0          TABULAR    D_EURV_1316                   0         0
D_EURV_134       4940     10         0          TABULAR    D_EURV_134                    0         0
D_EURV_1382      4945     10         0          TABULAR    D_EURV_1382                   0         0
D_EURV_1392      4894     10         0          TABULAR    D_EURV_1392                   0         0
D_EURV_1395      4947     10         0          TABULAR    D_EURV_1395                   0         0
D_EURV_146       4827     10         0          TABULAR    D_EURV_146                    0         0
D_EURV_150       4870     10         0          TABULAR    D_EURV_150                    0         0
D_EURV_225       4840     10         0          TABULAR    D_EURV_225                    0         0
D_EURV_236       4846     10         0          TABULAR    D_EURV_236                    0         0
D_EURV_244       4863     10         0          TABULAR    D_EURV_244                    0         0
D_EURV_245       4980     10         0          TABULAR    D_EURV_245                    0         0
D_EURV_256       4851.5   10         0          TABULAR    D_EURV_256                    0         0
D_EURV_263       4922     10         0          TABULAR    D_EURV_263                    0         0
D_EURV_510       4879     10         0          TABULAR    D_EURV_510                    0         0
D_EURV_614       4889     10         0          TABULAR    D_EURV_614                    0         0
D_EURV_618       4941     10         0          TABULAR    D_EURV_618                    0         0
D_EURV_711       4880     10         0          TABULAR    D_EURV_711                    0         0
D_EURV_820       4931     10         0          TABULAR    D_EURV_820                    0         0
D_EURV_830       4935     10         0          TABULAR    D_EURV_830                    0         0
D_EURV_840       4965     10         0          TABULAR    D_EURV_840                    0         0
D_EURV_842       4967     10         0          TABULAR    D_EURV_842                    0         0
D_EURV_844       4977     10         0          TABULAR    D_EURV_844                    0         0
D_FC__842        4967     10         0          TABULAR    D_FC_814                      0         0
D_FC_1050        4855     10         0          TABULAR    D_FC_1050                     0         0
D_FC_134         4939     10         0          TABULAR    D_FC_134                      0         0
D_FC_150         4869     10         0          TABULAR    88'x175'                      0         0
D_FC_245         4980     10         0          TABULAR    D_FC_245                      0         0
D_FC_263         4922     10         0          TABULAR    D_FC_263                      0         0
D_FC_510         4879     10         0          TABULAR    D_FC_510                      0         0
D_FC_618         4941     10         0          TABULAR    D_FC_618                      0         0
D_FC_711         4875     10         0          TABULAR    D_FC_711                      0         0
D_FC_823         4905     10         0          TABULAR    D_FC_811                      0         0
D_FC_838         4948     10         0          TABULAR    D_FC_838                      0         0

[CONDUITS]
;;Name          From Node        To Node          Length     Roughness  InOffset   OutOffset  InitFlow   MaxFlow
;;-------------- ---------------- ---------------- ---------- ---------- ---------- ---------- ---------- ----------
Dummy_1002       1002_Drop        O_1000           400        0.044      0          0          0          0
Dummy_1030       Drop_1030        1028             400        0.01       0          0          0          0
Dummy_1032       1032             1002_Drop        400        0.035      0          0          0          0
Dummy_1042       Drop_1042        1040             400        0.01       0          0          0          0
Dummy_1046       Drop_1046        1044             400        0.01       0          0          0          0
Dummy_1048       Drop_1048        1046             400        0.01       0          0          0          0
Dummy_109        109              O_100            400        0.01       0          0          0          0
Dummy_110        110              109              400        0.01       0          0          0          0
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397	Dummy_1107	O_1107	1012	400	0.01	0	0	0	0
398	Dummy_1108	1108	O_1107	400	0.035	0	0	0	0
399	Dummy_1110	1110	1115	400	0.035	0	0	0	0
400	Dummy_1115	Drop_1115	O_1107	400	0.035	0	0	0	0
401	Dummy_1116	1116	1115	400	0.035	0	0	0	0
402	Dummy_1124	1124	1123	400	0.035	0	0	0	0
403	Dummy_1126	1126	1125	400	0.035	0	0	0	0
404	Dummy_1132	1132	1130	400	0.035	0	0	0	0
405	Dummy_1139	1139	1130	300	0.013	0	0	0	0
406	Dummy_114	114	113	400	0.01	0	0	0	0
407	Dummy_1140	1140	D_1141	400	0.035	0	0	0	0
408	Dummy_1141	1141	D_1141	1900	0.055	0	0	0	0
409	Dummy_1142	1142	1141	400	0.035	0	0	0	0
410	Dummy_1144	1144	D_1155	400	0.035	0	0	0	0
411	Dummy_1147	Drop_1147	1141	400	0.035	0	0	0	0
412	Dummy_1148	1148	D_1155	400	0.035	0	0	0	0
413	Dummy_1150	1150	1147	400	0.035	0	0	0	0
414	Dummy_1151	Drop_1151	D_1155	400	0.035	0	0	0	0
415	Dummy_1152	1152	1151	400	0.01	0	0	0	0
416	Dummy_1153	1153	1151	400	0.035	0	0	0	0
417	Dummy_1154	1154	D_1163	400	0.035	0	0	0	0
418	Dummy_1156	1156	D_1170	400	0.035	0	0	0	0
419	Dummy_1164	1164	D_1163	400	0.035	0	0	0	0
420	Dummy_1172	1172	D_EURV_1172	400	0.035	0	0	0	0
421	Dummy_118	118	117	400	0.01	0	0	0	0
422	Dummy_1180	1180	1016	400	0.035	0	0	0	0
423	Dummy_1208	1208	D_EURV_1208	400	0.035	0	0	0	0
424	Dummy_121	121	119	400	0.01	0	0	0	0
425	Dummy_1210	1210	1209	400	0.035	0	0	0	0
426	Dummy_1215	1215	O_1263	1937.8	.01	0	0	0	0
427	Dummy_1216	1216	1217	400	0.035	0	0	0	0
428	Dummy_122	122	D_EURV_121	400	0.01	0	0	0	0
429	Dummy_1224	1224	1223	400	0.035	0	0	0	0
430	Dummy_1226	1226	1223	400	0.035	0	0	0	0
431	Dummy_1228	1228	1223	400	0.035	0	0	0	0
432	Dummy_1230	1230	1223	400	0.035	0	0	0	0
433	Dummy_1232	1232	1231	400	0.035	0	0	0	0
434	Dummy_1233	1233	CulvertOut_1233	400	0.035	0	0	0	0
435	Dummy_1233_Lake	1233_Lake	D_1233	400	0.01	0	0	0	0
436	Dummy_1234	1234	1233	400	0.01	0	0	0	0
437	Dummy_1236	1236	1235	400	0.01	0	0	0	0
438	Dummy_1238	1238	1237	400	0.01	0	0	0	0
439	Dummy_1239	Drop_1239	1239_Lake	400	0.035	0	0	0	0
440	Dummy_1239_Lake	1239_Lake	D_1233	400	0.01	0	0	0	0
441	Dummy_1240	1240	1239	400	0.01	0	0	0	0
442	Dummy_1248	1248	1247	400	0.01	0	0	0	0
443	Dummy_1249	1249	1247	400	0.01	0	0	0	0
444	Dummy_1256	1256	1255	400	0.01	0	0	0	0
445	Dummy_1258	1258	1257	400	0.01	0	0	0	0
446	Dummy_1260	1260	1259	400	0.01	0	0	0	0
447	Dummy_1263	O_1263	1030	400	0.01	0	0	0	0
448	Dummy_1264	1264	D_EURV_1264	400	0.035	0	0	0	0
449	Dummy_1272	1272	1038	400	0.035	0	0	0	0
450	Dummy_1274	1274	1273	400	0.01	0	0	0	0
451	Dummy_129	129	119	400	0.01	0	0	0	0
452	Dummy_130	130	129	400	0.01	0	0	0	0
453	Dummy_1307	O_1307	D_FC_1050	400	0.01	0	0	0	0
454	Dummy_1308	1308	O_1307	400	0.01	0	0	0	0
455	Dummy_1310	1310	1315	400	0.01	0	0	0	0
456	Dummy_1318	1318	1315	400	0.01	0	0	0	0
457	Dummy_1320	1320	1319	400	0.01	0	0	0	0
458	Dummy_1322	1322	1321	400	0.01	0	0	0	0
459	Dummy_1324	1324	1323	400	0.01	0	0	0	0
460	Dummy_1328	1328	1327	400	0.01	0	0	0	0
461	Dummy_1337	1347	D_1340	400	0.01	0	0	0	0
462	Dummy_134	134	D_EURV_134	400	.01	0	0	0	0

463	Dummy_1341	1341	D_1340	400	0.01	0	0	0	0
464	Dummy_1348	1348	1347	400	0.01	0	0	0	0
465	Dummy_1349	1349	D_1340	400	0.01	0	0	0	0
466	Dummy_1352	1352	1351	400	0.01	0	0	0	0
467	Dummy_1354	1354	1353	400	0.01	0	0	0	0
468	Dummy_1356	1356	1355	400	0.01	0	0	0	0
469	Dummy_1358	1358	1357	400	0.01	0	0	0	0
470	Dummy_1362	1362	1361	400	0.01	0	0	0	0
471	Dummy_1364	1364	1363	400	0.01	0	0	0	0
472	Dummy_1368	1368	1367	400	0.01	0	0	0	0
473	Dummy_1372	1372	1371	400	0.01	0	0	0	0
474	Dummy_1382	1382	D_EURV_1382	400	0.01	0	0	0	0
475	Dummy_1386	1386	D_1340	400	0.01	0	0	0	0
476	Dummy_1388	1388	1387	400	0.01	0	0	0	0
477	Dummy_1392	1392	D_EURV_1392	400	0.01	0	0	0	0
478	Dummy_1394	1394	1393	400	0.01	0	0	0	0
479	Dummy_1396	1396	D_EURV_1395	400	0.01	0	0	0	0
480	Dummy_1398	1398	D_EURV_1395	400	0.01	0	0	0	0
481	Dummy_142	142	139	400	0.01	0	0	0	0
482	Dummy_150	150	D_EURV_150	400	0.01	0	0	0	0
483	Dummy_210	210	1002_Drop	400	0.035	0	0	0	0
484	Dummy_219	O_220	1004	400	0.035	0	0	0	0
485	Dummy_220	220	O_220	400	0.01	0	0	0	0
486	Dummy_223	223	221	400	0.01	0	0	0	0
487	Dummy_224	224	223	400	0.01	0	0	0	0
488	Dummy_226	226	D_EURV_225	400	0.01	0	0	0	0
489	Dummy_231	231	221	400	0.01	0	0	0	0
490	Dummy_232	232	231	400	0.01	0	0	0	0
491	Dummy_236	236	D_EURV_236	400	0.01	0	0	0	0
492	Dummy_237	237	235	400	0.01	0	0	0	0
493	Dummy_240	240	237	400	0.01	0	0	0	0
494	Dummy_243	243	241	400	0.01	0	0	0	0
495	Dummy_244	244	D_EURV_244	400	0.01	0	0	0	0
496	Dummy_247	247	D_EURV_245	400	0.01	0	0	0	0
497	Dummy_248	248	247	400	0.01	0	0	0	0
498	Dummy_252	252	D_EURV_245	400	0.01	0	0	0	0
499	Dummy_256	256	D_EURV_256	400	0.01	0	0	0	0
500	Dummy_259	259	241	400	0.01	0	0	0	0
501	Dummy_260	260	259	400	0.01	0	0	0	0
502	Dummy_264	264	D_EURV_263	400	0.01	0	0	0	0
503	Dummy_300	O_300	1010	400	0.01	0	0	0	0
504	Dummy_310	310	O_300	400	0.035	0	0	0	0
505	Dummy_410	410	1014	400	0.01	0	0	0	0
506	Dummy_414	414	1018	400	0.01	0	0	0	0
507	Dummy_418	418	1020	400	0.01	0	0	0	0
508	Dummy_422	422	1022	400	0.01	0	0	0	0
509	Dummy_426	426	1026	400	0.01	0	0	0	0
510	Dummy_500	O_500	1028	400	0.01	0	0	0	0
511	Dummy_510	510	O_500	400	0.01	0	0	0	0
512	Dummy_514	514	513	400	0.01	0	0	0	0
513	Dummy_515	513	D_EURV_510	400	0.01	0	0	0	0
514	Dummy_518	518	513	400	0.01	0	0	0	0
515	Dummy_600	O_600	1030	400	0.01	0	0	0	0
516	Dummy_610	610	O_600	400	0.01	0	0	0	0
517	Dummy_614	614	D_EURV_614	400	0.01	0	0	0	0
518	Dummy_617	617	D_EURV_618	400	0.01	0	0	0	0
519	Dummy_618	618	617	400	0.01	0	0	0	0
520	Dummy_620	620	1036	400	0.01	0	0	0	0
521	Dummy_708	O_708	1040	400	0.01	0	0	0	0
522	Dummy_714	714	1042	400	0.01	0	0	0	0
523	Dummy_803	O_803	D_FC_1050	400	0.01	0	0	0	0
524	Dummy_804	804	O_803	400	0.01	0	0	0	0
525	Dummy_810	810	809	400	0.01	0	0	0	0
526	Dummy_820	820	D_EURV_820	400	0.01	0	0	0	0
527	Dummy_830	830	D_EURV_830	400	0.01	0	0	0	0
528	Dummy_840	840	D_EURV_840	400	0.01	0	0	0	0

529	Dummy_842	842	D_EURV_842	400	0.01	0	0	0	0
530	Dummy_844	844	D_EURV_844	400	0.01	0	0	0	0
531	Dummy_909	O_909	D_FC_1050	400	0.01	0	0	0	0
532	Dummy_910	910	O_909	400	0.035	0	0	0	0
533	Dummy_929	929	912	75	0.013	0	0	0	0
534	Dummy_930	930	929	400	0.01	0	0	0	0
535	Dummy_940	940	931	400	0.035	0	0	0	0
536	Dummy_950	950	931	400	0.035	0	0	0	0
537	Dummy_960	960	931	400	0.035	0	0	0	0
538	L_1004	1004	1002_Drop	1497	0.075	0	0	0	0
539	L_1006	1006_RR	1006_Drop	461	0.055	0	0	0	0
540	L_1008	1008	1006_RR	473	0.044	0	0	0	0
541	L_1010	1010	1008	378	0.04	0	0	0	0
542	L_1012	1012	1010	896	0.075	0	0	0	0
543	L_1014	1014	1012	536	0.075	0	0	0	0
544	L_1016	1016	1014	319	0.055	0	0	0	0
545	L_1018	1018	1016	433	0.044	0	0	0	0
546	L_1020	1020	1018	373	0.044	0	0	0	0
547	L_1022	1022	1020	784	0.055	0	0	0	0
548	L_1024	1024	1022	543	0.055	0	0	0	0
549	L_1026	1026	1024	134	0.055	0	0	0	0
550	L_1028	1028	1026	1068	0.055	0	0	0	0
551	L_1030	1030	Drop_1030	474	0.055	0	0	0	0
552	L_1034	1034	1030	510	0.055	0	0	0	0
553	L_1036	1036	1034	372	0.055	0	0	0	0
554	L_1038	1038	1036	567	0.055	0	0	0	0
555	L_1040	1040	1038	743	0.055	0	0	0	0
556	L_1042	1042	Drop_1042	601	0.055	0	0	0	0
557	L_1044	1044	1042	477	0.055	0	0	0	0
558	L_1046	1046	Drop_1046	402	0.044	0	0	0	0
559	L_1048	1048	Drop_1048	359	0.044	0	0	0	0
560	L_1115	1115	Drop_1115	432	0.055	0	0	0	0
561	L_1123	1123	1115	1593	0.055	0	0	0	0
562	L_1125	1125	1127	105	0.044	0	0	0	0
563	L_1127	1127	1123	873	0.055	0	0	0	0
564	L_1130	1130	1127	640	0.075	0	0	0	0
565	L_114	113	109	144	.035	0	0	0	0
566	L_1147	1147	Drop_1147	973	0.044	0	0	0	0
567	L_115	115	113	3260	.035	0	0	0	0
568	L_1151	1151	Drop_1151	2508	0.044	0	0	0	0
569	L_117	117	115	86	.035	0	0	0	0
570	L_119	119	117	1087	.035	0	0	0	0
571	L_1209	1209	1217	930	0.044	0	0	0	0
572	L_1217	1217	1215	1800	0.044	0	0	0	0
573	L_1223	1223	1217	1649	0.044	0	0	0	0
574	L_1231	1231	1223	4880	0.044	0	0	0	0
575	L_1233	CulvertOut_1233	1233_Lake	315	0.044	0	0	0	0
576	L_1235	1235	1233	960	0.044	0	0	0	0
577	L_1237	1237	1249	920	0.020	0	0	0	0
578	L_1239	1239	Drop_1239	560	0.035	0	0	0	0
579	L_1247	1247	1233	1640	0.044	1	0	0	0
580	L_1255	1255	1273	650	0.055	0	0	0	0
581	L_1257	1257	1255	1580	.044	0	0	0	0
582	L_1259	1259	1257	2600	0.020	0	0	0	0
583	L_126	126	D_EURV_121	5178	.035	0	0	0	0
584	L_1273	1273	1239	795	0.075	0	0	0	0
585	L_1315	1315	O_1307	2154	0.055	0	0	0	0
586	L_1316	1316	1315	1157	0.055	0	0	0	0
587	L_1319	1319	D_EURV_1316	1841	0.044	0	0	0	0
588	L_1321	1321	D_EURV_1316	1813	0.044	0	0	0	0
589	L_1323	1323	1341	568	0.044	0	0	0	0
590	L_1327	1327	1349	2582	.020	0	0	0	0
591	L_133	133	129	2743	.035	0	0	0	0
592	L_1340	1339	1316	2275	.044	0	0	0	0
593	L_1351	1351	1349	2108.97	.044	0	0	0	0
594	L_1353	1353	1351	1021.71	.044	0	0	0	0

595	L_1355	1355	1349	957.73	0.044	0	0	0	0
596	L_1357	1357	1355	1049.12	0.044	0	0	0	0
597	L_1361	1361	1357	3566	0.044	0	0	0	0
598	L_1363	1363	1361	1016.32	0.020	0	0	0	0
599	L_1367	1367	1353	2810.21	0.044	0	0	0	0
600	L_1371	1371	1347	1116.44	0.044	0	0	0	0
601	L_138	138	D_EURV_134	2426	.035	0	0	0	0
602	L_1387	1387	D_EURV_1392	2272	.044	0	0	0	0
603	L_139	139	115	73	.035	0	0	0	0
604	L_1393	1393	D_EURV_1392	2179	.044	0	0	0	0
605	L_1395	1395	D_EURV_1392	3616	0.044	0	0	0	0
606	L_141	141	139	542	.035	0	0	0	0
607	L_146	146	D_EURV_146	165	.035	0	0	0	0
608	L_149	149	141	1479	.035	0	0	0	0
609	L_154	154	D_EURV_150	1625	.035	0	0	0	0
610	L_221	221	O_220	2511	.035	0	0	0	0
611	L_225	225	223	1810	.035	0	0	0	0
612	L_228	228	D_EURV_225	847	.035	0	0	0	0
613	L_235	235	231	3274	.035	0	0	0	0
614	L_239	239	237	288	.035	0	0	0	0
615	L_241	241	239	1092	.035	0	0	0	0
616	L_245	245	243	4101	.035	0	0	0	0
617	L_250	250	247	2063	.035	0	0	0	0
618	L_263	263	259	2459	.035	0	0	0	0
619	L_268	268	D_EURV_263	1464	.035	0	0	0	0
620	L_314	314	O_300	2623	.035	0	0	0	0
621	L_513	515	O_500	3358	.035	0	0	0	0
622	L_613	613	O_600	3854	.035	0	0	0	0
623	L_617	616	613	2214	.035	0	0	0	0
624	L_622	622	617	1661	.035	0	0	0	0
625	L_708	708	O_708	202	0.035	0	0	0	0
626	L_709	709	708	560.2	.03	0	0	0	0
627	L_710	710	709	154.3	.04	0	0	0	0
628	L_711	711	D_EURV_711	615.3	.04	0	0	0	0
629	L_712	712	713	485.4	.04	0	0	0	0
630	L_713	713	711	338.1	.07	0	0	0	0
631	L_808	808	O_803	1197	.07	0	0	0	0
632	L_809	809	808	90	.013	0	0	0	0
633	L_811	811	809	183	.045	0	0	0	0
634	L_819	819	811	761	0.07	0	0	0	0
635	L_822	822	D_FC_823	671	0.04	0	0	0	0
636	L_823	823	D_FC_823	943	0.04	0	0	0	0
637	L_824	824	822	1270	0.035	0	0	0	0
638	L_829	829	823	290	0.035	0	0	0	0
639	L_831	831	829	105	0.04	0	0	0	0
640	L_834	834	831	1040	.04	0	0	0	0
641	L_836	836	834	442	0.013	0	0	0	0
642	L_838	838	D_FC_838	314.88	.048	0	0	0	0
643	L_839	839	843	541	.048	0	0	0	0
644	L_841	841	839	190	.044	0	0	0	0
645	L_843	843	838	304	0.035	0	0	0	0
646	L_850	850	D_EURV_842	1740	.044	0	0	0	0
647	L_911	911	O_909	2561	0.055	0	0	0	0
648	L_912	912	911	522	0.044	0	0	0	0
649	L_931	931	929	2763	0.044	0	0	0	0
650	Overflow_836	836	834	442	0.035	0	0	0	0
651	Dummy_Drop_1006	1006_Drop	1004	400	0.01	0	0	0	0
652									
653	[OUTLETS]								
654	;;Name	From Node	To Node	Offset	Type	QTable/Qcoeff	Qexpon	Gated	
655	;;--------------	----------	----------	----------	----------	----------	----------	--------	
656	D_EURV_614	D_EURV_614	613	0	TABULAR/HEAD	O_EURV_614		NO	
657	D_FC_150	D_EURV_150	D_FC_150	0	TABULAR/HEAD	O_EURV_150		NO	
658	O_EURV_1172	D_EURV_1172	1008	0	TABULAR/DEPTH	O_EURV_1172		NO	
659	O_EURV_1208	D_EURV_1208	1024	0	TABULAR/DEPTH	O_EURV_1208		NO	
660	O_EURV_121	D_EURV_121	121	0	TABULAR/HEAD	O_EURV_121		NO	

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O_EURV_134      D_EURV_134      D_FC_134        0       TABULAR/HEAD    O_EURV_134              NO
O_EURV_1364     D_EURV_1264     O_1263          0       TABULAR/DEPTH   O_EURV_1364             NO
O_EURV_1382     D_EURV_1382     1044            0       TABULAR/DEPTH   O_EURV_1382             NO
O_EURV_1392     D_EURV_1392     1315            0       TABULAR/DEPTH   O_EURV_1392             NO
O_EURV_1395     D_EURV_1395     1395            0       TABULAR/DEPTH   O_EURV_1395             NO
O_EURV_146      D_EURV_146      141             0       TABULAR/HEAD    O_EURV_146              NO
O_EURV_225      D_EURV_225      225             0       TABULAR/HEAD    O_EURV_225              NO
O_EURV_236      D_EURV_236      235             0       TABULAR/HEAD    O_EURV_236              NO
O_EURV_244      D_EURV_244      243             0       TABULAR/HEAD    O_EURV_244              NO
O_EURV_245      D_EURV_245      D_FC_245        0       TABULAR/HEAD    O_EURV_245              NO
O_EURV_256      D_EURV_256      239             0       TABULAR/HEAD    O_EURV_256              NO
O_EURV_263      D_EURV_263      D_FC_263        0       TABULAR/HEAD    O_EURV_263              NO
O_EURV_510      D_EURV_510      D_FC_510        0       TABULAR/HEAD    O_EURV_510              NO
O_EURV_618      D_EURV_618      D_FC_618        0       TABULAR/HEAD    O_EURV_618              NO
O_EURV_711      D_EURV_711      D_FC_711        0       TABULAR/DEPTH   O_EURV_711              NO
O_EURV_820      D_EURV_820      D_FC_823        0       TABULAR/DEPTH   O_EURV_820              NO
O_EURV_830      D_EURV_830      831             0       TABULAR/DEPTH   O_EURV_830              NO
O_EURV_840      D_EURV_840      839             0       TABULAR/DEPTH   O_EURV_840              NO
O_EURV_842      D_EURV_842      D_FC__842       0       TABULAR/DEPTH   O_EURV_842              NO
O_EURV_844      D_EURV_844      839             0       TABULAR/DEPTH   O_EURV_844              NO
O_FC_1050       D_FC_1050       1048            0       TABULAR/DEPTH   O_FC_1050               NO
O_FC_134        D_FC_134        133             0       TABULAR/HEAD    O_FC_134                NO
O_FC_150        D_FC_150        149             0       TABULAR/HEAD    O_FC_150                NO
O_FC_245        D_FC_245        245             0       TABULAR/DEPTH   O_FC_245                NO
O_FC_263        D_FC_263        263             0       TABULAR/HEAD    O_FC_263                NO
O_FC_510        D_FC_510        515             0       TABULAR/HEAD    O_FC_510                NO
O_FC_618        D_FC_618        616             0       TABULAR/HEAD    O_FC_618                NO
O_FC_711        D_FC_711        710             0       TABULAR/DEPTH   O_FC_711                NO
O_FC_823        D_FC_823        819             0       TABULAR/DEPTH   O_FC_823                NO
O_FC_838        D_FC_838        836             0       TABULAR/DEPTH   O_FC_838                NO
O_FC_842        D_FC__842       841             0       TABULAR/DEPTH   O_FC_842                NO
;South Hill Pond A, see South Hill 2nd FDR.
Outlet_1141     D_1141          1139            0       TABULAR/DEPTH   Outlet_1141             NO
;South Hill Pond B, see South Hill 2nd FDR.
Outlet_1155     D_1155          1147            0       TABULAR/DEPTH   Outlet_1155             NO
;Raindance Pond F
Outlet_1163     D_1163          1153            0       TABULAR/DEPTH   Outlet_1163             NO
;Hilltop Pond, see South Hill 2nd FDR.
Outlet_1170     D_1170          D_1155          1       TABULAR/DEPTH   Outlet_1170             NO
;Raindance Pond A / Reservoir 2, see Smith Farm (Raindance Reservoir) plans and Raindance Filing 1 FDR and Trautman Hydrology memo (Table 3).
Outlet_1233     D_1233          1231            0       TABULAR/DEPTH   Outlet_1233             NO
Outlet_1316     D_EURV_1316     1316            0       TABULAR/DEPTH   O_EURV_1316             NO
Outlet_1340     D_1340          1339            0       TABULAR/DEPTH   Outlet_1340             NO

[XSECTIONS]
;;Link           Shape        Geom1           Geom2     Geom3     Geom4     Barrels    Culvert
;;-------------- ------------ --------------- --------- --------- --------- ---------- ----------
Dummy_1002      DUMMY        0               0         0         0         1
Dummy_1030      DUMMY        0               0         0         0         1
Dummy_1032      DUMMY        0               0         0         0         1
Dummy_1042      DUMMY        0               0         0         0         1
Dummy_1046      DUMMY        0               0         0         0         1
Dummy_1048      DUMMY        0               0         0         0         1
Dummy_109       DUMMY        0               0         0         0         1
Dummy_110       DUMMY        0               0         0         0         1
Dummy_1107      DUMMY        0               0         0         0         1
Dummy_1108      DUMMY        0               0         0         0         1
Dummy_1110      DUMMY        0               0         0         0         1
Dummy_1115      DUMMY        0               0         0         0         1
Dummy_1116      DUMMY        0               0         0         0         1
Dummy_1124      DUMMY        0               0         0         0         1
Dummy_1126      DUMMY        0               0         0         0         1
Dummy_1132      DUMMY        0               0         0         0         1
Dummy_1139      DUMMY        0               0         0         0         1
Dummy_114       DUMMY        0               0         0         0         1
Dummy_1140      DUMMY        0               0         0         0         1
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727	Dummy_1141	DUMMY	0	0	0	0	1
728	Dummy_1142	DUMMY	0	0	0	0	1
729	Dummy_1144	DUMMY	0	0	0	0	1
730	Dummy_1147	DUMMY	0	0	0	0	1
731	Dummy_1148	DUMMY	0	0	0	0	1
732	Dummy_1150	DUMMY	0	0	0	0	1
733	Dummy_1151	DUMMY	0	0	0	0	1
734	Dummy_1152	DUMMY	0	0	0	0	1
735	Dummy_1153	DUMMY	0	0	0	0	1
736	Dummy_1154	DUMMY	0	0	0	0	1
737	Dummy_1156	DUMMY	0	0	0	0	1
738	Dummy_1164	DUMMY	0	0	0	0	1
739	Dummy_1172	DUMMY	0	0	0	0	1
740	Dummy_118	DUMMY	0	0	0	0	1
741	Dummy_1180	DUMMY	0	0	0	0	1
742	Dummy_1208	DUMMY	0	0	0	0	1
743	Dummy_121	DUMMY	0	0	0	0	1
744	Dummy_1210	DUMMY	0	0	0	0	1
745	Dummy_1215	DUMMY	0	0	0	0	1
746	Dummy_1216	DUMMY	0	0	0	0	1
747	Dummy_122	DUMMY	0	0	0	0	1
748	Dummy_1224	DUMMY	0	0	0	0	1
749	Dummy_1226	DUMMY	0	0	0	0	1
750	Dummy_1228	DUMMY	0	0	0	0	1
751	Dummy_1230	DUMMY	0	0	0	0	1
752	Dummy_1232	DUMMY	0	0	0	0	1
753	Dummy_1233	DUMMY	0	0	0	0	1
754	Dummy_1233_Lake	DUMMY	0	0	0	0	1
755	Dummy_1234	DUMMY	0	0	0	0	1
756	Dummy_1236	DUMMY	0	0	0	0	1
757	Dummy_1238	DUMMY	0	0	0	0	1
758	Dummy_1239	DUMMY	0	0	0	0	1
759	Dummy_1239_Lake	DUMMY	0	0	0	0	1
760	Dummy_1240	DUMMY	0	0	0	0	1
761	Dummy_1248	DUMMY	0	0	0	0	1
762	Dummy_1249	DUMMY	0	0	0	0	1
763	Dummy_1256	DUMMY	0	0	0	0	1
764	Dummy_1258	DUMMY	0	0	0	0	1
765	Dummy_1260	DUMMY	0	0	0	0	1
766	Dummy_1263	DUMMY	0	0	0	0	1
767	Dummy_1264	DUMMY	0	0	0	0	1
768	Dummy_1272	DUMMY	0	0	0	0	1
769	Dummy_1274	DUMMY	0	0	0	0	1
770	Dummy_129	DUMMY	0	0	0	0	1
771	Dummy_130	DUMMY	0	0	0	0	1
772	Dummy_1307	DUMMY	0	0	0	0	1
773	Dummy_1308	DUMMY	0	0	0	0	1
774	Dummy_1310	DUMMY	0	0	0	0	1
775	Dummy_1318	DUMMY	0	0	0	0	1
776	Dummy_1320	DUMMY	0	0	0	0	1
777	Dummy_1322	DUMMY	0	0	0	0	1
778	Dummy_1324	DUMMY	0	0	0	0	1
779	Dummy_1328	DUMMY	0	0	0	0	1
780	Dummy_1337	DUMMY	0	0	0	0	1
781	Dummy_134	DUMMY	0	0	0	0	1
782	Dummy_1341	DUMMY	0	0	0	0	1
783	Dummy_1348	DUMMY	0	0	0	0	1
784	Dummy_1349	DUMMY	0	0	0	0	1
785	Dummy_1352	DUMMY	0	0	0	0	1
786	Dummy_1354	DUMMY	0	0	0	0	1
787	Dummy_1356	DUMMY	0	0	0	0	1
788	Dummy_1358	DUMMY	0	0	0	0	1
789	Dummy_1362	DUMMY	0	0	0	0	1
790	Dummy_1364	DUMMY	0	0	0	0	1
791	Dummy_1368	DUMMY	0	0	0	0	1
792	Dummy_1372	DUMMY	0	0	0	0	1

793	Dummy_1382	DUMMY	0	0	0	0	1
794	Dummy_1386	DUMMY	0	0	0	0	1
795	Dummy_1388	DUMMY	0	0	0	0	1
796	Dummy_1392	DUMMY	0	0	0	0	1
797	Dummy_1394	DUMMY	0	0	0	0	1
798	Dummy_1396	DUMMY	0	0	0	0	1
799	Dummy_1398	DUMMY	0	0	0	0	1
800	Dummy_142	DUMMY	0	0	0	0	1
801	Dummy_150	DUMMY	0	0	0	0	1
802	Dummy_210	DUMMY	0	0	0	0	1
803	Dummy_219	DUMMY	0	0	0	0	1
804	Dummy_220	DUMMY	0	0	0	0	1
805	Dummy_223	DUMMY	0	0	0	0	1
806	Dummy_224	DUMMY	0	0	0	0	1
807	Dummy_226	DUMMY	0	0	0	0	1
808	Dummy_231	DUMMY	0	0	0	0	1
809	Dummy_232	DUMMY	0	0	0	0	1
810	Dummy_236	DUMMY	0	0	0	0	1
811	Dummy_237	DUMMY	0	0	0	0	1
812	Dummy_240	DUMMY	0	0	0	0	1
813	Dummy_243	DUMMY	0	0	0	0	1
814	Dummy_244	DUMMY	0	0	0	0	1
815	Dummy_247	DUMMY	0	0	0	0	1
816	Dummy_248	DUMMY	0	0	0	0	1
817	Dummy_252	DUMMY	0	0	0	0	1
818	Dummy_256	DUMMY	0	0	0	0	1
819	Dummy_259	DUMMY	0	0	0	0	1
820	Dummy_260	DUMMY	0	0	0	0	1
821	Dummy_264	DUMMY	0	0	0	0	1
822	Dummy_300	DUMMY	0	0	0	0	1
823	Dummy_310	DUMMY	0	0	0	0	1
824	Dummy_410	DUMMY	0	0	0	0	1
825	Dummy_414	DUMMY	0	0	0	0	1
826	Dummy_418	DUMMY	0	0	0	0	1
827	Dummy_422	DUMMY	0	0	0	0	1
828	Dummy_426	DUMMY	0	0	0	0	1
829	Dummy_500	DUMMY	0	0	0	0	1
830	Dummy_510	DUMMY	0	0	0	0	1
831	Dummy_514	DUMMY	0	0	0	0	1
832	Dummy_515	DUMMY	0	0	0	0	1
833	Dummy_518	DUMMY	0	0	0	0	1
834	Dummy_600	DUMMY	0	0	0	0	1
835	Dummy_610	DUMMY	0	0	0	0	1
836	Dummy_614	DUMMY	0	0	0	0	1
837	Dummy_617	DUMMY	0	0	0	0	1
838	Dummy_618	DUMMY	0	0	0	0	1
839	Dummy_620	DUMMY	0	0	0	0	1
840	Dummy_708	DUMMY	0	0	0	0	1
841	Dummy_714	DUMMY	0	0	0	0	1
842	Dummy_803	DUMMY	0	0	0	0	1
843	Dummy_804	DUMMY	0	0	0	0	1
844	Dummy_810	DUMMY	0	0	0	0	1
845	Dummy_820	DUMMY	0	0	0	0	1
846	Dummy_830	DUMMY	0	0	0	0	1
847	Dummy_840	DUMMY	0	0	0	0	1
848	Dummy_842	DUMMY	0	0	0	0	1
849	Dummy_844	DUMMY	0	0	0	0	1
850	Dummy_909	DUMMY	0	0	0	0	1
851	Dummy_910	DUMMY	0	0	0	0	1
852	Dummy_929	DUMMY	0	0	0	0	1
853	Dummy_930	DUMMY	0	0	0	0	1
854	Dummy_940	DUMMY	0	0	0	0	1
855	Dummy_950	DUMMY	0	0	0	0	1
856	Dummy_960	DUMMY	0	0	0	0	1
857	L_1004	TRAPEZOIDAL	20	100	5	5	1
858	L_1006	TRAPEZOIDAL	30	100	5	5	1

859	L_1008	TRAPEZOIDAL	20	200	5	5	1
860	L_1010	TRAPEZOIDAL	20	200	5	5	1
861	L_1012	TRAPEZOIDAL	30	200	5	5	1
862	L_1014	TRAPEZOIDAL	30	200	5	5	1
863	L_1016	TRAPEZOIDAL	20	135	5	5	1
864	L_1018	TRAPEZOIDAL	20	200	5	5	1
865	L_1020	TRAPEZOIDAL	20	200	5	5	1
866	L_1022	TRAPEZOIDAL	20	200	5	5	1
867	L_1024	TRAPEZOIDAL	20	200	5	5	1
868	L_1026	TRAPEZOIDAL	20	200	5	5	1
869	L_1028	TRAPEZOIDAL	20	200	5	5	1
870	L_1030	TRAPEZOIDAL	20	160	5	5	1
871	L_1034	TRAPEZOIDAL	20	150	5	5	1
872	L_1036	TRAPEZOIDAL	20	150	5	5	1
873	L_1038	TRAPEZOIDAL	20	150	5	5	1
874	L_1040	TRAPEZOIDAL	20	150	5	5	1
875	L_1042	TRAPEZOIDAL	20	150	5	5	1
876	L_1044	TRAPEZOIDAL	20	150	5	5	1
877	L_1046	TRAPEZOIDAL	20	40	5	5	1
878	L_1048	TRAPEZOIDAL	20	35	5	5	1
879	L_1115	TRAPEZOIDAL	10	85	5	5	1
880	L_1123	TRAPEZOIDAL	10	75	3	3	1
881	L_1125	TRAPEZOIDAL	10	15	3.5	3.5	1
882	L_1127	TRAPEZOIDAL	10	90	2.5	2.5	1
883	L_1130	TRAPEZOIDAL	10	90	2.5	2.5	1
884	L_114	TRIANGULAR	10	200	0	0	1
885	L_1147	TRAPEZOIDAL	10	25	5	5	1
886	L_115	TRAPEZOIDAL	10	118	5	5	1
887	L_1151	TRAPEZOIDAL	10	10	3	3	1
888	L_117	TRAPEZOIDAL	10	10	2	2	1
889	L_119	TRAPEZOIDAL	10	89	5	5	1
890	L_1209	TRAPEZOIDAL	10	.001	15	15	1
891	L_1217	TRAPEZOIDAL	10	20	3	3	1
892	L_1223	TRAPEZOIDAL	10	.001	15	15	1
893	L_1231	TRAPEZOIDAL	10	.001	15	15	1
894	L_1233	TRAPEZOIDAL	10	20	4	4	1
895	L_1235	TRAPEZOIDAL	10	25	5	5	1
896	L_1237	TRAPEZOIDAL	10	6	0	0	1
897	L_1239	TRAPEZOIDAL	10	.001	4	4	1
898	L_1247	TRAPEZOIDAL	10	5	4	4	1
899	L_1255	TRAPEZOIDAL	10	.001	4	4	1
900	L_1257	TRAPEZOIDAL	10	4	2	2	1
901	L_1259	TRAPEZOIDAL	10	40	15	15	1
902	L_126	TRAPEZOIDAL	10	30	2	2	1
903	L_1273	TRAPEZOIDAL	10	.001	4	4	1
904	L_1315	TRAPEZOIDAL	10	90	3	3	1
905	L_1316	TRAPEZOIDAL	10	.001	15	15	1
906	L_1319	TRAPEZOIDAL	10	.001	15	15	1
907	L_1321	TRAPEZOIDAL	10	.001	15	15	1
908	L_1323	TRAPEZOIDAL	10	.001	15	15	1
909	L_1327	TRAPEZOIDAL	1	40	2	2	1
910	L_133	TRAPEZOIDAL	10	75	8	8	1
911	L_1340	TRAPEZOIDAL	10	.001	15	15	1
912	L_1351	TRAPEZOIDAL	10	.001	15	15	1
913	L_1353	TRAPEZOIDAL	10	0.001	15	15	1
914	L_1355	TRAPEZOIDAL	10	.001	15	15	1
915	L_1357	TRAPEZOIDAL	10	.001	15	15	1
916	L_1361	TRAPEZOIDAL	10	.001	15	15	1
917	L_1363	TRAPEZOIDAL	10	40	2	2	1
918	L_1367	TRAPEZOIDAL	10	.001	15	15	1
919	L_1371	TRAPEZOIDAL	10	.001	15	15	1
920	L_138	TRAPEZOIDAL	10	50	8	8	1
921	L_1387	TRAPEZOIDAL	10	30	5	5	1
922	L_139	TRAPEZOIDAL	10	20	2	2	1
923	L_1393	TRAPEZOIDAL	10	.001	15	15	1
924	L_1395	TRAPEZOIDAL	10	25	15	15	1

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L_141            TRAPEZOIDAL  10              30         2          2          1
L_146            TRAPEZOIDAL  10              20         10         10         1
L_149            TRAPEZOIDAL  10              80         5          5          1
L_154            TRAPEZOIDAL  10              79         5          5          1
L_221            TRAPEZOIDAL  10              140        5          5          1
L_225            TRAPEZOIDAL  10              90         5          5          1
L_228            TRAPEZOIDAL  10              20         2          2          1
L_235            TRAPEZOIDAL  10              190        5          5          1
L_239            TRAPEZOIDAL  10              140        5          5          1
L_241            TRAPEZOIDAL  10              100        5          5          1
L_245            TRAPEZOIDAL  10              110        5          5          1
L_250            TRAPEZOIDAL  10              10         50         50         1
L_263            TRAPEZOIDAL  10              40         5          5          1
L_268            TRAPEZOIDAL  10              20         2          2          1
L_314            TRAPEZOIDAL  10              50         2          2          1
L_513            TRAPEZOIDAL  10              50         2          2          1
L_613            TRAPEZOIDAL  10              100        3          3          1
L_617            TRAPEZOIDAL  10              80         2          2          1
L_622            TRAPEZOIDAL  10              101        5          5          1
L_708            TRAPEZOIDAL  10              22         2          2          1
L_709            TRAPEZOIDAL  10              50         4          4          1
L_710            TRAPEZOIDAL  10              70         2          2          1
L_711            TRAPEZOIDAL  10              73         4          4          1
L_712            TRAPEZOIDAL  10              106        15         15         1
L_713            TRAPEZOIDAL  10              55         10         10         1
L_808            TRAPEZOIDAL  10              65         3          3          1
L_809            RECT_CLOSED  15              5          0          0          1
L_811            TRAPEZOIDAL  10              107        6          6          1
L_819            TRAPEZOIDAL  10              115        3          3          1
L_822            TRAPEZOIDAL  10              235        5          5          1
L_823            TRAPEZOIDAL  10              235        5          5          1
L_824            TRAPEZOIDAL  10              657        30         30         1
L_829            TRAPEZOIDAL  10              75         3.5        6.5        1
L_831            TRAPEZOIDAL  15              65         6          6          1
L_834            TRAPEZOIDAL  15              64         6          6          1
L_836            CIRCULAR     4               0          0          0          1
L_838            TRAPEZOIDAL  15              24         15         15         1
L_839            TRAPEZOIDAL  15              100        27         10         1
L_841            TRIANGULAR   10              200        0          0          1
L_843            CIRCULAR     15              0          0          0          1
L_850            TRAPEZOIDAL  10              20         12         12         1
L_911            TRAPEZOIDAL  10              85         4          4          1
L_912            TRAPEZOIDAL  10              .001       15         15         1
L_931            TRAPEZOIDAL  10              .001       15         15         1
Overflow_836     TRAPEZOIDAL  15              40         15         15         1
Dummy_Drop_1006  DUMMY        0               0          0          0          1

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
O_EURV_1116      Rating     0          0
O_EURV_1116                 1          0.11
O_EURV_1116                 2          0.25
O_EURV_1116                 3          0.43
O_EURV_1116                 4          0.56
O_EURV_1116                 5          0.57
O_EURV_1116                 6          0.58
O_EURV_1116                 7          59.2
O_EURV_1116                 8          206
O_EURV_1116                 9          434
O_EURV_1116                 10         751
;
O_EURV_1127      Rating     0          0
O_EURV_1127                 1          1.27
O_EURV_1127                 2          2.7
O_EURV_1127                 3          3.76
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O_EURV_1127               4          6.12
O_EURV_1127               5          9.4
O_EURV_1127               6          11.4
O_EURV_1127               7          57
O_EURV_1127               8          261
O_EURV_1127               9          585
O_EURV_1127               10         1023
;
O_EURV_1172      Rating   0          0
O_EURV_1172               1          0.03
O_EURV_1172               2          0.05
O_EURV_1172               3          0.08
O_EURV_1172               4          0.11
O_EURV_1172               5          0.14
O_EURV_1172               6          0.56
O_EURV_1172               7          59
O_EURV_1172               8          206
O_EURV_1172               9          434
O_EURV_1172               10         751
;
O_EURV_1208      Rating   0          0
O_EURV_1208               1          0.1
O_EURV_1208               2          0.23
O_EURV_1208               3          0.38
O_EURV_1208               4          0.49
O_EURV_1208               5          0.52
O_EURV_1208               6          0.56
O_EURV_1208               7          70.2
O_EURV_1208               8          225
O_EURV_1208               9          462
O_EURV_1208               10         788
;
O_EURV_121       Rating   0          0
O_EURV_121                0.5        0.12
O_EURV_121                0.75       0.15
O_EURV_121                1          0.17
O_EURV_121                1.25       0.19
O_EURV_121                1.5        0.29
O_EURV_121                1.75       0.34
O_EURV_121                2          0.39
O_EURV_121                2.25       0.43
O_EURV_121                2.5        0.46
O_EURV_121                2.75       0.56
O_EURV_121                3          0.63
O_EURV_121                3.25       0.69
O_EURV_121                3.5        0.74
O_EURV_121                3.75       0.79
O_EURV_121                4          1.31
O_EURV_121                4.25       1.95
O_EURV_121                4.37       1.97
O_EURV_121                4.5        1.99
O_EURV_121                4.75       2.02
O_EURV_121                5          2.06
O_EURV_121                5.25       57.66
O_EURV_121                5.5        545.74
O_EURV_121                5.75       1295.54
O_EURV_121                5.8        1469.64
O_EURV_121                6          2235.66
O_EURV_121                6.25       3334.04
O_EURV_121                6.5        4571.17
O_EURV_121                6.75       5933.55
O_EURV_121                7          7411.16
O_EURV_121                7.25       8996.17
O_EURV_121                7.34       9591.8
O_EURV_121                7.5        10682.24
O_EURV_121                7.75       12464.13
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O_EURV_121                 8          14337.4
O_EURV_121                 8.25       16298.23
O_EURV_121                 8.5        18343.29
O_EURV_121                 8.75       20469.65
O_EURV_121                 9          22674.72
O_EURV_121                 9.25       24956.15
O_EURV_121                 9.5        27311.84
O_EURV_121                 9.75       29739.88
O_EURV_121                 10         32238.52
;
O_EURV_1316      Rating    0          0
O_EURV_1316                1          0.08
O_EURV_1316                2          0.18
O_EURV_1316                3          0.25
O_EURV_1316                4          0.38
O_EURV_1316                5          0.52
O_EURV_1316                6          0.56
O_EURV_1316                7          55.3
O_EURV_1316                8          303
O_EURV_1316                9          688
O_EURV_1316                10         1203
;
;60% WQCV, 100% EURV
O_EURV_134       Rating    0          0
O_EURV_134                 0.5        0.11
O_EURV_134                 0.75       0.13
O_EURV_134                 1          0.15
O_EURV_134                 1.25       0.23
O_EURV_134                 1.5        0.28
O_EURV_134                 1.75       0.32
O_EURV_134                 2          0.36
O_EURV_134                 2.25       0.42
O_EURV_134                 2.5        0.5
O_EURV_134                 2.75       0.56
O_EURV_134                 3          0.61
O_EURV_134                 3.25       0.65
O_EURV_134                 3.31       0.66
O_EURV_134                 3.5        2.83
O_EURV_134                 3.75       4.4
O_EURV_134                 4          4.49
O_EURV_134                 4.25       4.58
O_EURV_134                 4.5        4.67
O_EURV_134                 4.75       4.75
O_EURV_134                 5          4.84
O_EURV_134                 5.07       4.86
O_EURV_134                 5.25       4.92
O_EURV_134                 5.29       4.93
O_EURV_134                 5.5        273.5
O_EURV_134                 5.75       911.99
O_EURV_134                 6          1766.08
O_EURV_134                 6.25       2791.52
O_EURV_134                 6.5        3964.06
O_EURV_134                 6.75       5267.79
O_EURV_134                 7          6691.22
O_EURV_134                 7.25       8225.59
O_EURV_134                 7.5        9863.91
O_EURV_134                 7.75       11600.45
O_EURV_134                 8          13430.4
O_EURV_134                 8.25       15349.69
O_EURV_134                 8.5        17354.74
O_EURV_134                 8.75       19442.47
O_EURV_134                 9          21610.1
O_EURV_134                 9.25       23855.19
O_EURV_134                 9.5        26175.53
O_EURV_134                 9.75       28569.1
O_EURV_134                 10         31034.1
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;
O_EURV_1364      Rating     0          0
O_EURV_1364                 1          0.02
O_EURV_1364                 2          0.04
O_EURV_1364                 3          0.06
O_EURV_1364                 4          0.09
O_EURV_1364                 5          0.14
O_EURV_1364                 6          0.2
O_EURV_1364                 7          59
O_EURV_1364                 8          205
O_EURV_1364                 9          434
O_EURV_1364                 10         751
;
O_EURV_1382      Rating     0          0
O_EURV_1382                 1          0.06
O_EURV_1382                 2          0.13
O_EURV_1382                 3          0.19
O_EURV_1382                 4          0.28
O_EURV_1382                 5          0.52
O_EURV_1382                 6          0.56
O_EURV_1382                 7          70.2
O_EURV_1382                 8          225
O_EURV_1382                 9          464
O_EURV_1382                 10         788
;
O_EURV_1392      Rating     0          0
O_EURV_1392                 1          0.62
O_EURV_1392                 2          1.43
O_EURV_1392                 3          2.4
O_EURV_1392                 4          3.04
O_EURV_1392                 5          3.26
O_EURV_1392                 6          3.46
O_EURV_1392                 7          155.84
O_EURV_1392                 8          471
O_EURV_1392                 9          918
O_EURV_1392                 10         1492
;
O_EURV_1395      Rating     0          0
O_EURV_1395                 1          0.33
O_EURV_1395                 2          0.81
O_EURV_1395                 3          1.39
O_EURV_1395                 4          2.25
O_EURV_1395                 5          2.8
O_EURV_1395                 6          3.24
O_EURV_1395                 7          133
O_EURV_1395                 8          398
O_EURV_1395                 9          777
O_EURV_1395                 10         1272
;
;60% WQCV, 100% EURV
O_EURV_146       Rating     0          0
O_EURV_146                  0.5        0.02
O_EURV_146                  0.75       0.02
O_EURV_146                  1          0.03
O_EURV_146                  1.25       0.05
O_EURV_146                  1.5        0.05
O_EURV_146                  1.75       0.06
O_EURV_146                  2          0.08
O_EURV_146                  2.25       0.09
O_EURV_146                  2.5        0.1
O_EURV_146                  2.75       0.11
O_EURV_146                  2.82       0.11
O_EURV_146                  2.93       0.38
O_EURV_146                  3          0.38
O_EURV_146                  3.25       0.39
O_EURV_146                  3.5        0.4
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O_EURV_146                3.75       0.41
O_EURV_146                4          0.42
O_EURV_146                4.17       0.42
O_EURV_146                4.25       56
O_EURV_146                4.5        544.05
O_EURV_146                4.75       1293.82
O_EURV_146                5          2233.92
O_EURV_146                5.25       3332.28
O_EURV_146                5.5        4569.37
O_EURV_146                5.75       5931.73
O_EURV_146                6          7409.32
O_EURV_146                6.25       8994.3
O_EURV_146                6.5        10680.35
O_EURV_146                6.75       12462.22
O_EURV_146                7          14335.46
O_EURV_146                7.25       16296.27
O_EURV_146                7.5        18341.31
O_EURV_146                7.75       20467.65
O_EURV_146                8          22672.69
O_EURV_146                8.25       24954.1
O_EURV_146                8.5        27309.77
O_EURV_146                8.75       29737.79
O_EURV_146                9          32236.41
O_EURV_146                9.25       34804.04
O_EURV_146                9.5        37439.19
O_EURV_146                9.75       40140.52
O_EURV_146                10         42906.74
;
;301'x599'
O_EURV_150        Rating  0          0
O_EURV_150                0.5        0.08
O_EURV_150                0.75       0.1
O_EURV_150                1          0.12
O_EURV_150                1.25       0.18
O_EURV_150                1.5        0.22
O_EURV_150                1.75       0.25
O_EURV_150                2          0.28
O_EURV_150                2.25       0.32
O_EURV_150                2.5        0.39
O_EURV_150                2.75       0.44
O_EURV_150                3          0.47
O_EURV_150                3.25       0.51
O_EURV_150                3.5        1.89
O_EURV_150                3.75       2.78
O_EURV_150                3.95       2.82
O_EURV_150                4          2.83
O_EURV_150                4.25       2.89
O_EURV_150                4.5        2.94
O_EURV_150                4.75       3
O_EURV_150                5          3.05
O_EURV_150                5.25       195.2
O_EURV_150                5.5        791.77
O_EURV_150                5.75       1615.16
O_EURV_150                6          2615.09
O_EURV_150                6.12       3149.62
O_EURV_150                6.25       3765.28
O_EURV_150                6.5        5048.85
O_EURV_150                6.75       6453.76
O_EURV_150                7          7970.86
O_EURV_150                7.25       9592.93
O_EURV_150                7.5        11314.07
O_EURV_150                7.65       12392.22
O_EURV_150                7.75       13129.34
O_EURV_150                8          15034.56
O_EURV_150                8.25       17026.09
O_EURV_150                8.5        19100.75
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O_EURV_150                 8.75       21255.75
O_EURV_150                 9          23488.57
O_EURV_150                 9.25       25796.98
O_EURV_150                 9.5        28178.95
O_EURV_150                 9.75       30632.61
O_EURV_150                 10         33156.28
;
;60% WQCV, 100% EURV
O_EURV_225       Rating    0          0
O_EURV_225                 0.5        0.07
O_EURV_225                 0.75       0.09
O_EURV_225                 1          0.11
O_EURV_225                 1.25       0.15
O_EURV_225                 1.5        0.19
O_EURV_225                 1.75       0.22
O_EURV_225                 2          0.25
O_EURV_225                 2.25       0.27
O_EURV_225                 2.5        0.33
O_EURV_225                 2.75       0.38
O_EURV_225                 3          0.41
O_EURV_225                 3.25       0.44
O_EURV_225                 3.5        0.61
O_EURV_225                 3.75       2.3
O_EURV_225                 3.84       2.32
O_EURV_225                 4          2.35
O_EURV_225                 4.25       2.4
O_EURV_225                 4.5        2.44
O_EURV_225                 4.75       2.48
O_EURV_225                 5          2.53
O_EURV_225                 5.25       2.57
O_EURV_225                 5.5        355.61
O_EURV_225                 5.75       1033.27
O_EURV_225                 5.9        1541.82
O_EURV_225                 6          1916.93
O_EURV_225                 6.25       2967.21
O_EURV_225                 6.5        4161.63
O_EURV_225                 6.75       5485.16
O_EURV_225                 7          6926.84
O_EURV_225                 7.25       8478.24
O_EURV_225                 7.46       9861.22
O_EURV_225                 7.5        10132.59
O_EURV_225                 7.75       11884.35
O_EURV_225                 8          13728.82
O_EURV_225                 8.25       15662.02
O_EURV_225                 8.5        17680.47
O_EURV_225                 8.75       19781.12
O_EURV_225                 9          21961.27
O_EURV_225                 9.25       24218.51
O_EURV_225                 9.5        26550.67
O_EURV_225                 9.75       28955.76
O_EURV_225                 10         31432
;
;60% WQCV, 100% EURV
O_EURV_236       Rating    0          0
O_EURV_236                 0.5        0.03
O_EURV_236                 0.75       0.04
O_EURV_236                 1          0.04
O_EURV_236                 1.25       0.07
O_EURV_236                 1.5        0.08
O_EURV_236                 1.75       0.09
O_EURV_236                 2          0.1
O_EURV_236                 2.25       0.13
O_EURV_236                 2.5        0.15
O_EURV_236                 2.75       0.16
O_EURV_236                 3          0.18
O_EURV_236                 3.11       0.18
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O_EURV_236                3.25        0.78
O_EURV_236                3.5         0.79
O_EURV_236                3.75        0.81
O_EURV_236                3.88        0.82
O_EURV_236                4           0.83
O_EURV_236                4.25        0.84
O_EURV_236                4.5         0.86
O_EURV_236                4.59        0.86
O_EURV_236                4.75        175.24
O_EURV_236                5           760.81
O_EURV_236                5.25        1576.31
O_EURV_236                5.5         2569.74
O_EURV_236                5.75        3714.26
O_EURV_236                6           4992.72
O_EURV_236                6.25        6392.92
O_EURV_236                6.5         7905.65
O_EURV_236                6.75        9523.61
O_EURV_236                7           11240.86
O_EURV_236                7.25        13052.42
O_EURV_236                7.5         14954.08
O_EURV_236                7.75        16942.19
O_EURV_236                8           19013.55
O_EURV_236                8.25        21165.35
O_EURV_236                8.5         23395.08
O_EURV_236                8.75        25700.48
O_EURV_236                9           28079.51
O_EURV_236                9.25        30530.31
O_EURV_236                9.5         33051.19
O_EURV_236                9.75        35640.58
O_EURV_236                10          38297.06
;
;60% WQCV, 100% EURV
O_EURV_244       Rating   0           0
O_EURV_244                0.5         0.06
O_EURV_244                0.75        0.08
O_EURV_244                1           0.09
O_EURV_244                1.25        0.13
O_EURV_244                1.5         0.16
O_EURV_244                1.75        0.19
O_EURV_244                2           0.21
O_EURV_244                2.25        0.24
O_EURV_244                2.5         0.29
O_EURV_244                2.75        0.32
O_EURV_244                3           0.35
O_EURV_244                3.25        0.38
O_EURV_244                3.5         2.21
O_EURV_244                3.68        2.29
O_EURV_244                3.75        2.3
O_EURV_244                4           2.35
O_EURV_244                4.25        2.4
O_EURV_244                4.5         2.44
O_EURV_244                4.75        2.48
O_EURV_244                5           2.53
O_EURV_244                5.25        11.06
O_EURV_244                5.5         423.86
O_EURV_244                5.75        1129.46
O_EURV_244                5.86        1505.84
O_EURV_244                6           2034.71
O_EURV_244                6.25        3103.27
O_EURV_244                6.5         4313.87
O_EURV_244                6.75        5652.1
O_EURV_244                7           7107.36
O_EURV_244                7.09        7658.26
O_EURV_244                7.25        8671.44
O_EURV_244                7.5         10337.76
O_EURV_244                7.75        12100.87
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O_EURV_244                  8           13956.19
O_EURV_244                  8.25        15899.79
O_EURV_244                  8.5         17928.26
O_EURV_244                  8.75        20038.59
O_EURV_244                  9           22228.11
O_EURV_244                  9.25        24494.45
O_EURV_244                  9.5         26835.46
O_EURV_244                  9.75        29249.18
O_EURV_244                  10          31733.84
;
;60% WQCV, 100% EURV
O_EURV_245       Rating     0           0
O_EURV_245                  0.5         0.18
O_EURV_245                  0.75        0.22
O_EURV_245                  1           0.25
O_EURV_245                  1.25        0.37
O_EURV_245                  1.5         0.46
O_EURV_245                  1.75        0.53
O_EURV_245                  2           0.59
O_EURV_245                  2.25        0.65
O_EURV_245                  2.5         0.81
O_EURV_245                  2.75        0.91
O_EURV_245                  3           1
O_EURV_245                  3.25        1.07
O_EURV_245                  3.5         1.62
O_EURV_245                  3.75        5.87
O_EURV_245                  4           7.6
O_EURV_245                  4.25        7.75
O_EURV_245                  4.5         7.9
O_EURV_245                  4.75        8.05
O_EURV_245                  5           8.19
O_EURV_245                  5.25        8.33
O_EURV_245                  5.5         89.49
O_EURV_245                  5.75        604.01
O_EURV_245                  6           1370.87
O_EURV_245                  6.25        2324.7
O_EURV_245                  6.5         3434.89
O_EURV_245                  6.75        4682.58
O_EURV_245                  7           6054.61
O_EURV_245                  7.25        7541.17
O_EURV_245                  7.5         9134.57
O_EURV_245                  7.75        10828.58
O_EURV_245                  8           12618.03
O_EURV_245                  8.14        13660.14
O_EURV_245                  8.25        14498.52
O_EURV_245                  8.5         16466.29
O_EURV_245                  8.75        18518.05
O_EURV_245                  9           20650.89
O_EURV_245                  9.25        22862.23
O_EURV_245                  9.5         25149.76
O_EURV_245                  9.75        27511.39
O_EURV_245                  10          29945.23
;
;60% WQCV, 100% EURV
O_EURV_256       Rating     0           0
O_EURV_256                  0.5         0.06
O_EURV_256                  0.75        0.07
O_EURV_256                  1           0.08
O_EURV_256                  1.25        0.11
O_EURV_256                  1.5         0.14
O_EURV_256                  1.75        0.17
O_EURV_256                  2           0.19
O_EURV_256                  2.25        0.2
O_EURV_256                  2.5         0.25
O_EURV_256                  2.75        0.29
O_EURV_256                  3           0.31
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O_EURV_256                  3.25        0.34
O_EURV_256                  3.43        0.35
O_EURV_256                  3.5         0.83
O_EURV_256                  3.75        1.85
O_EURV_256                  4           1.89
O_EURV_256                  4.25        1.93
O_EURV_256                  4.5         1.96
O_EURV_256                  4.75        2
O_EURV_256                  5           2.03
O_EURV_256                  5.25        2.07
O_EURV_256                  5.28        2.07
O_EURV_256                  5.5         270.6
O_EURV_256                  5.75        909.05
O_EURV_256                  5.8         1064.5
O_EURV_256                  6           1763.09
O_EURV_256                  6.25        2788.48
O_EURV_256                  6.5         3960.98
O_EURV_256                  6.75        5264.66
O_EURV_256                  7           6688.05
O_EURV_256                  7.25        8222.38
O_EURV_256                  7.5         9860.65
O_EURV_256                  7.75        11597.15
O_EURV_256                  8           13427.07
O_EURV_256                  8.25        15346.31
O_EURV_256                  8.5         17351.32
O_EURV_256                  8.75        19439.01
O_EURV_256                  9           21606.6
O_EURV_256                  9.25        23851.65
O_EURV_256                  9.5         26171.95
O_EURV_256                  9.75        28565.49
O_EURV_256                  10          31030.45
;
;60% WQCV, 100% EURV
O_EURV_263        Rating    0           0
O_EURV_263                  0.5         0.1
O_EURV_263                  0.75        0.12
O_EURV_263                  1           0.14
O_EURV_263                  1.25        0.21
O_EURV_263                  1.5         0.26
O_EURV_263                  1.75        0.3
O_EURV_263                  2           0.33
O_EURV_263                  2.25        0.4
O_EURV_263                  2.5         0.47
O_EURV_263                  2.75        0.52
O_EURV_263                  3           0.56
O_EURV_263                  3.25        0.6
O_EURV_263                  3.5         3.86
O_EURV_263                  3.75        4.08
O_EURV_263                  4           4.17
O_EURV_263                  4.25        4.25
O_EURV_263                  4.5         4.33
O_EURV_263                  4.7         4.39
O_EURV_263                  4.75        4.41
O_EURV_263                  5           4.49
O_EURV_263                  5.15        4.53
O_EURV_263                  5.25        85.59
O_EURV_263                  5.5         600.04
O_EURV_263                  5.75        1366.84
O_EURV_263                  6           2320.61
O_EURV_263                  6.25        3430.75
O_EURV_263                  6.5         4678.37
O_EURV_263                  6.75        6050.34
O_EURV_263                  7           7536.85
O_EURV_263                  7.25        9130.19
O_EURV_263                  7.5         10824.15
O_EURV_263                  7.75        12613.54
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O_EURV_263                  8           14493.98
O_EURV_263                  8.25        16461.7
O_EURV_263                  8.5         18513.4
O_EURV_263                  8.75        20646.19
O_EURV_263                  9           22857.48
O_EURV_263                  9.25        25144.96
O_EURV_263                  9.5         27506.54
O_EURV_263                  9.75        29940.32
O_EURV_263                  10          32444.58
;
;60% WQCV, 100% EURV
O_EURV_510       Rating     0           0
O_EURV_510                  0.5         0.12
O_EURV_510                  0.75        0.15
O_EURV_510                  1           0.17
O_EURV_510                  1.25        0.25
O_EURV_510                  1.5         0.31
O_EURV_510                  1.75        0.36
O_EURV_510                  2           0.4
O_EURV_510                  2.25        0.43
O_EURV_510                  2.5         0.55
O_EURV_510                  2.75        0.61
O_EURV_510                  3           0.67
O_EURV_510                  3.25        0.72
O_EURV_510                  3.4         0.75
O_EURV_510                  3.5         1.58
O_EURV_510                  3.75        4.73
O_EURV_510                  4           4.82
O_EURV_510                  4.25        4.92
O_EURV_510                  4.5         5.01
O_EURV_510                  4.75        5.1
O_EURV_510                  5           5.19
O_EURV_510                  5.25        5.28
O_EURV_510                  5.36        5.32
O_EURV_510                  5.5         146.05
O_EURV_510                  5.66        474.37
O_EURV_510                  5.75        709.05
O_EURV_510                  6           1508.71
O_EURV_510                  6.25        2489.14
O_EURV_510                  6.5         3622.36
O_EURV_510                  6.75        4890.66
O_EURV_510                  7           6281.57
O_EURV_510                  7.25        7785.65
O_EURV_510                  7.5         9395.49
O_EURV_510                  7.75        11105.05
O_EURV_510                  8           12909.29
O_EURV_510                  8.25        14803.95
O_EURV_510                  8.5         16785.32
O_EURV_510                  8.75        18850.19
O_EURV_510                  9           20995.72
O_EURV_510                  9.25        23219.36
O_EURV_510                  9.5         25518.84
O_EURV_510                  9.75        27892.1
O_EURV_510                  10          30337.29
;
;60% WQCV, 100% EURV
O_EURV_614       Rating     0           0
O_EURV_614                  0.5         0.07
O_EURV_614                  0.75        0.08
O_EURV_614                  1           0.1
O_EURV_614                  1.25        0.14
O_EURV_614                  1.5         0.17
O_EURV_614                  1.75        0.2
O_EURV_614                  2           0.22
O_EURV_614                  2.25        0.24
O_EURV_614                  2.5         0.31
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O_EURV_614              2.75        0.35
O_EURV_614              3           0.38
O_EURV_614              3.25        0.41
O_EURV_614              3.5         1.37
O_EURV_614              3.75        2.53
O_EURV_614              4           2.58
O_EURV_614              4.25        2.63
O_EURV_614              4.5         2.68
O_EURV_614              4.75        2.72
O_EURV_614              5           2.77
O_EURV_614              5.25        2.82
O_EURV_614              5.5         143.54
O_EURV_614              5.75        706.51
O_EURV_614              6           1506.12
O_EURV_614              6.03        1614.92
O_EURV_614              6.25        2486.51
O_EURV_614              6.5         3619.69
O_EURV_614              6.75        4887.96
O_EURV_614              7           6278.83
O_EURV_614              7.25        7782.87
O_EURV_614              7.29        8033.5
O_EURV_614              7.5         9392.67
O_EURV_614              7.75        11102.2
O_EURV_614              8           12906.41
O_EURV_614              8.25        14801.03
O_EURV_614              8.5         16782.37
O_EURV_614              8.75        18847.2
O_EURV_614              9           20992.69
O_EURV_614              9.25        23216.3
O_EURV_614              9.5         25515.75
O_EURV_614              9.75        27888.98
O_EURV_614              10          30334.13
;
;60% WQCV, 100% EURV
O_EURV_618       Rating     0           0
O_EURV_618                  0.5         0.15
O_EURV_618                  0.75        0.18
O_EURV_618                  1           0.21
O_EURV_618                  1.25        0.32
O_EURV_618                  1.5         0.39
O_EURV_618                  1.75        0.45
O_EURV_618                  2           0.5
O_EURV_618                  2.25        0.6
O_EURV_618                  2.5         0.71
O_EURV_618                  2.75        0.78
O_EURV_618                  3           0.85
O_EURV_618                  3.25        0.91
O_EURV_618                  3.5         3.45
O_EURV_618                  3.75        6.06
O_EURV_618                  4           6.19
O_EURV_618                  4.25        6.31
O_EURV_618                  4.5         6.43
O_EURV_618                  4.53        6.44
O_EURV_618                  4.75        6.55
O_EURV_618                  5           6.67
O_EURV_618                  5.25        50.88
O_EURV_618                  5.5         525.21
O_EURV_618                  5.75        1266.45
O_EURV_618                  6           2199.78
O_EURV_618                  6.25        3292.34
O_EURV_618                  6.5         4524.27
O_EURV_618                  6.75        5881.93
O_EURV_618                  7           7355.16
O_EURV_618                  7.25        8936.07
O_EURV_618                  7.5         10618.28
O_EURV_618                  7.55        10966.4
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O_EURV_618                  7.75        12396.5
O_EURV_618                  8           14266.26
O_EURV_618                  8.25        16223.71
O_EURV_618                  8.5         18265.53
O_EURV_618                  8.75        20388.76
O_EURV_618                  9           22590.79
O_EURV_618                  9.25        24869.27
O_EURV_618                  9.5         27222.1
O_EURV_618                  9.67        28863.49
O_EURV_618                  9.75        29647.34
O_EURV_618                  10          32143.25
;
O_EURV_711        Rating    0           0
O_EURV_711                  0.5         0.1
O_EURV_711                  1           0.15
O_EURV_711                  1.5         0.26
O_EURV_711                  2           0.34
O_EURV_711                  2.5         0.44
O_EURV_711                  3           0.57
O_EURV_711                  3.5         0.65
O_EURV_711                  3.57        0.73
O_EURV_711                  4           6.43
O_EURV_711                  4.5         6.67
O_EURV_711                  4.9         6.89
O_EURV_711                  5           7.11
O_EURV_711                  5.5         7.33
O_EURV_711                  5.61        7.53
O_EURV_711                  6           7.74
O_EURV_711                  6.5         7.93
O_EURV_711                  7           8.12
O_EURV_711                  7.5         8.31
O_EURV_711                  8           72.77
O_EURV_711                  8.5         195.27
O_EURV_711                  9           368.27
O_EURV_711                  9.5         382.18
O_EURV_711                  10          395.59
;
O_EURV_820        Rating    0           0
O_EURV_820                  0.5         0.2
O_EURV_820                  1           0.2
O_EURV_820                  1.5         0.4
O_EURV_820                  2           0.6
O_EURV_820                  2.5         0.7
O_EURV_820                  3           0.9
O_EURV_820                  3.5         6.2
O_EURV_820                  4           6.4
O_EURV_820                  4.5         6.7
O_EURV_820                  5           6.9
O_EURV_820                  5.5         7.1
O_EURV_820                  6           7.3
O_EURV_820                  6.5         85.6
O_EURV_820                  7           233.3
O_EURV_820                  7.5         431.2
O_EURV_820                  8           673.4
O_EURV_820                  8.5         957
O_EURV_820                  9           1280.5
O_EURV_820                  9.5         1643
O_EURV_820                  10          2044.1
;
O_EURV_830        Rating    0           0
O_EURV_830                  0.5         0.2
O_EURV_830                  1           0.2
O_EURV_830                  1.5         0.4
O_EURV_830                  2           0.6
O_EURV_830                  2.5         0.8
O_EURV_830                  3           1
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O_EURV_830                  3.5         5.5
O_EURV_830                  4           5.7
O_EURV_830                  4.5         6
O_EURV_830                  5           6.2
O_EURV_830                  5.5         6.4
O_EURV_830                  6           6.6
O_EURV_830                  6.5         96.6
O_EURV_830                  7           314.1
O_EURV_830                  7.5         610.9
O_EURV_830                  8           974.4
O_EURV_830                  8.5         1398.2
O_EURV_830                  9           1878.6
O_EURV_830                  9.5         2413
O_EURV_830                  10          2999.8
;
;60% WQCV, 100% EURV
O_EURV_840       Rating     0           0
O_EURV_840                  0.5         0.06
O_EURV_840                  0.75        0.08
O_EURV_840                  1           0.09
O_EURV_840                  1.25        0.13
O_EURV_840                  1.5         0.16
O_EURV_840                  1.75        0.19
O_EURV_840                  2           0.21
O_EURV_840                  2.25        0.24
O_EURV_840                  2.5         0.29
O_EURV_840                  2.75        0.32
O_EURV_840                  3           0.35
O_EURV_840                  3.25        0.38
O_EURV_840                  3.33        0.39
O_EURV_840                  3.5         2.21
O_EURV_840                  3.75        2.41
O_EURV_840                  4           2.46
O_EURV_840                  4.25        2.51
O_EURV_840                  4.5         2.56
O_EURV_840                  4.75        2.6
O_EURV_840                  4.83        2.62
O_EURV_840                  5           2.65
O_EURV_840                  5.25        2.69
O_EURV_840                  5.28        2.7
O_EURV_840                  5.5         291.63
O_EURV_840                  5.75        940.12
O_EURV_840                  6           1801.67
O_EURV_840                  6.25        2833.35
O_EURV_840                  6.5         4011.37
O_EURV_840                  6.75        5320.05
O_EURV_840                  7           6748.04
O_EURV_840                  7.25        8286.66
O_EURV_840                  7.5         9928.97
O_EURV_840                  7.75        11669.3
O_EURV_840                  8           13502.88
O_EURV_840                  8.25        15425.62
O_EURV_840                  8.5         17434.01
O_EURV_840                  8.75        19524.95
O_EURV_840                  9           21695.7
O_EURV_840                  9.25        23943.81
O_EURV_840                  9.5         26267.08
O_EURV_840                  9.75        28663.52
O_EURV_840                  10          31131.31
;
;60% WQCV, 100% EURV
O_EURV_842       Rating     0           0
O_EURV_842                  0.5         0.17
O_EURV_842                  0.75        0.21
O_EURV_842                  1           0.24
O_EURV_842                  1.25        0.35
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O_EURV_842              1.5         0.43
O_EURV_842              1.75        0.5
O_EURV_842              2           0.56
O_EURV_842              2.25        0.61
O_EURV_842              2.5         0.77
O_EURV_842              2.75        0.86
O_EURV_842              3           0.94
O_EURV_842              3.25        1.01
O_EURV_842              3.38        1.04
O_EURV_842              3.5         2.14
O_EURV_842              3.75        6.75
O_EURV_842              4           6.89
O_EURV_842              4.25        7.02
O_EURV_842              4.5         7.16
O_EURV_842              4.75        7.29
O_EURV_842              5           7.42
O_EURV_842              5.25        7.55
O_EURV_842              5.31        7.58
O_EURV_842              5.37        7.61
O_EURV_842              5.5         7.68
O_EURV_842              5.75        7.8
O_EURV_842              6           7.92
O_EURV_842              6.25        8.04
O_EURV_842              6.5         8.16
O_EURV_842              6.75        361.27
O_EURV_842              7           1039.01
O_EURV_842              7.25        1922.74
O_EURV_842              7.5         2973.09
O_EURV_842              7.75        4167.58
O_EURV_842              8           5491.18
O_EURV_842              8.25        6932.94
O_EURV_842              8.5         8484.4
O_EURV_842              8.75        10138.82
O_EURV_842              9           11890.64
O_EURV_842              9.25        13735.19
O_EURV_842              9.5         15668.45
O_EURV_842              9.75        17686.96
O_EURV_842              10          19787.68
;
O_EURV_844      Rating  0           0
O_EURV_844              0.5         0.3
O_EURV_844              1           0.4
O_EURV_844              1.5         0.7
O_EURV_844              2           0.9
O_EURV_844              2.5         1.2
O_EURV_844              3           1.5
O_EURV_844              3.5         6.2
O_EURV_844              4           6.4
O_EURV_844              4.5         6.7
O_EURV_844              5           6.9
O_EURV_844              5.5         7.1
O_EURV_844              6           7.3
O_EURV_844              6.5         147.4
O_EURV_844              7           483.9
O_EURV_844              7.5         939.6
O_EURV_844              8           1493.7
O_EURV_844              8.5         2135.2
O_EURV_844              9           2857.2
O_EURV_844              9.5         3655.1
O_EURV_844              10          4525.5
;
O_EURV_909      Rating  0           0
O_EURV_909              1           0.89
O_EURV_909              2           2.07
O_EURV_909              3           3.5
O_EURV_909              4           7.9
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O_EURV_909                  5          8.47
O_EURV_909                  6          9.01
O_EURV_909                  7          164.16
O_EURV_909                  8          480.87
O_EURV_909                  9          929.26
O_EURV_909                  10         1505.28
;
O_FC_1050         Rating    0          0.00
O_FC_1050                   1          7.27
O_FC_1050                   2          25.48
O_FC_1050                   3          53.07
O_FC_1050                   4          68.52
O_FC_1050                   5          81.07
O_FC_1050                   6          137.57
O_FC_1050                   7          400.50
O_FC_1050                   8          781.30
O_FC_1050                   9          1249
O_FC_1050                   10         1898
;
;60"x48", 100-YR Flood Control Only (overdetention)
O_FC_134          Rating    0          0
O_FC_134                    0.25       0.9
O_FC_134                    0.5        3.16
O_FC_134                    0.75       6.58
O_FC_134                    1          11.08
O_FC_134                    1.25       16.59
O_FC_134                    1.5        23.07
O_FC_134                    1.75       30.5
O_FC_134                    2          38.84
O_FC_134                    2.25       48.07
O_FC_134                    2.5        58.17
O_FC_134                    2.75       69.12
O_FC_134                    3          80.91
O_FC_134                    3.25       93.52
O_FC_134                    3.5        106.95
O_FC_134                    3.75       121.17
O_FC_134                    4          136.19
O_FC_134                    4.25       144.45
O_FC_134                    4.5        152.26
O_FC_134                    4.75       159.69
O_FC_134                    5          166.8
O_FC_134                    5.25       173.61
O_FC_134                    5.5        180.16
O_FC_134                    5.75       186.48
O_FC_134                    6          192.6
O_FC_134                    6.25       198.53
O_FC_134                    6.5        204.28
O_FC_134                    6.75       209.88
O_FC_134                    7          215.33
O_FC_134                    7.25       220.65
O_FC_134                    7.5        225.84
O_FC_134                    7.75       230.92
O_FC_134                    8          235.88
O_FC_134                    8.25       240.75
O_FC_134                    8.5        245.52
O_FC_134                    8.75       250.19
O_FC_134                    9          254.78
O_FC_134                    9.25       259.29
O_FC_134                    9.5        263.73
O_FC_134                    9.75       268.09
O_FC_134                    10         272.38
;
;60"x50" , 100-yr Flood Control (overdetention)
O_FC_150          Rating    0          0
O_FC_150                    0.25       0.86
O_FC_150                    0.5        3.01
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O_FC_150                    0.75        6.27
O_FC_150                    1           10.56
O_FC_150                    1.25        15.81
O_FC_150                    1.5         22
O_FC_150                    1.75        29.08
O_FC_150                    2           37.03
O_FC_150                    2.25        45.83
O_FC_150                    2.5         55.45
O_FC_150                    2.75        65.89
O_FC_150                    3           77.13
O_FC_150                    3.25        89.16
O_FC_150                    3.5         101.96
O_FC_150                    3.75        115.52
O_FC_150                    4           129.83
O_FC_150                    4.25        144.89
O_FC_150                    4.5         160.68
O_FC_150                    4.75        174.65
O_FC_150                    5           183.47
O_FC_150                    5.25        191.87
O_FC_150                    5.5         199.93
O_FC_150                    5.75        207.67
O_FC_150                    6           215.13
O_FC_150                    6.25        222.35
O_FC_150                    6.5         229.33
O_FC_150                    6.75        236.11
O_FC_150                    7           242.7
O_FC_150                    7.25        249.12
O_FC_150                    7.5         255.37
O_FC_150                    7.75        261.48
O_FC_150                    8           267.45
O_FC_150                    8.25        273.28
O_FC_150                    8.5         278.99
O_FC_150                    8.75        284.59
O_FC_150                    9           290.09
O_FC_150                    9.25        295.47
O_FC_150                    9.5         300.77
O_FC_150                    9.75        305.97
O_FC_150                    10          311.08
;
;60"x60" 100-yr Detention Only (overdetention)
O_FC_245         Rating     0           0
O_FC_245                    0.25        0.84
O_FC_245                    0.5         2.95
O_FC_245                    0.75        6.14
O_FC_245                    1           10.34
O_FC_245                    1.25        15.48
O_FC_245                    1.5         21.53
O_FC_245                    1.75        28.46
O_FC_245                    2           36.24
O_FC_245                    2.25        44.86
O_FC_245                    2.5         54.28
O_FC_245                    2.75        64.5
O_FC_245                    3           75.5
O_FC_245                    3.25        87.27
O_FC_245                    3.5         99.8
O_FC_245                    3.75        113.07
O_FC_245                    4           127.09
O_FC_245                    4.25        141.82
O_FC_245                    4.5         157.28
O_FC_245                    4.75        173.45
O_FC_245                    5           190.33
O_FC_245                    5.25        199.62
O_FC_245                    5.5         208.49
O_FC_245                    5.75        217.01
O_FC_245                    6           225.2
O_FC_245                    6.25        233.1
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O_FC_245                    6.5         240.75
O_FC_245                    6.75        248.16
O_FC_245                    7           255.35
O_FC_245                    7.25        262.35
O_FC_245                    7.5         269.17
O_FC_245                    7.75        275.81
O_FC_245                    8           282.3
O_FC_245                    8.25        288.65
O_FC_245                    8.5         294.86
O_FC_245                    8.75        300.94
O_FC_245                    9           306.9
O_FC_245                    9.25        312.74
O_FC_245                    9.5         318.48
O_FC_245                    9.75        324.12
O_FC_245                    10          329.66
;
;60"x25" 100-yr Detention Only (overdetention)
O_FC_263         Rating     0           0
O_FC_263                    0.25        1.1
O_FC_263                    0.5         3.87
O_FC_263                    0.75        8.06
O_FC_263                    1           13.56
O_FC_263                    1.25        20.31
O_FC_263                    1.5         28.25
O_FC_263                    1.75        37.34
O_FC_263                    2           47.54
O_FC_263                    2.25        55.13
O_FC_263                    2.5         60.57
O_FC_263                    2.75        65.56
O_FC_263                    3           70.19
O_FC_263                    3.25        74.53
O_FC_263                    3.5         78.64
O_FC_263                    3.75        82.54
O_FC_263                    4           86.27
O_FC_263                    4.25        89.84
O_FC_263                    4.5         93.27
O_FC_263                    4.75        96.59
O_FC_263                    5           99.79
O_FC_263                    5.25        102.89
O_FC_263                    5.5         105.9
O_FC_263                    5.75        108.83
O_FC_263                    6           111.68
O_FC_263                    6.25        114.46
O_FC_263                    6.5         117.18
O_FC_263                    6.75        119.83
O_FC_263                    7           122.43
O_FC_263                    7.25        124.97
O_FC_263                    7.5         127.46
O_FC_263                    7.75        129.91
O_FC_263                    8           132.3
O_FC_263                    8.25        134.66
O_FC_263                    8.5         136.98
O_FC_263                    8.75        139.25
O_FC_263                    9           141.49
O_FC_263                    9.25        143.7
O_FC_263                    9.5         145.87
O_FC_263                    9.75        148.01
O_FC_263                    10          150.12
;
;60"x42" 100-yr Flood Control Only
O_FC_510         Rating     0           0
O_FC_510                    0.25        0.94
O_FC_510                    0.5         3.29
O_FC_510                    0.75        6.86
O_FC_510                    1           11.54
O_FC_510                    1.25        17.29
```

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O_FC_510                    1.5         24.05
O_FC_510                    1.75        31.79
O_FC_510                    2           40.48
O_FC_510                    2.25        50.1
O_FC_510                    2.5         60.63
O_FC_510                    2.75        72.04
O_FC_510                    3           84.33
O_FC_510                    3.25        97.48
O_FC_510                    3.5         111.47
O_FC_510                    3.75        119.16
O_FC_510                    4           126.39
O_FC_510                    4.25        133.23
O_FC_510                    4.5         139.73
O_FC_510                    4.75        145.95
O_FC_510                    5           151.91
O_FC_510                    5.25        157.64
O_FC_510                    5.5         163.17
O_FC_510                    5.75        168.52
O_FC_510                    6           173.71
O_FC_510                    6.25        178.75
O_FC_510                    6.5         183.64
O_FC_510                    6.75        188.42
O_FC_510                    7           193.07
O_FC_510                    7.25        197.61
O_FC_510                    7.5         202.05
O_FC_510                    7.75        206.4
O_FC_510                    8           210.66
O_FC_510                    8.25        214.83
O_FC_510                    8.5         218.92
O_FC_510                    8.75        222.94
O_FC_510                    9           226.88
O_FC_510                    9.25        230.76
O_FC_510                    9.5         234.58
O_FC_510                    9.75        238.33
O_FC_510                    10          242.02
;
;60"x58", 100-yr Flood Control Only
O_FC_618            Rating  0           0
O_FC_618                    0.25        0.85
O_FC_618                    0.5         2.98
O_FC_618                    0.75        6.21
O_FC_618                    1           10.45
O_FC_618                    1.25        15.64
O_FC_618                    1.5         21.76
O_FC_618                    1.75        28.76
O_FC_618                    2           36.63
O_FC_618                    2.25        45.33
O_FC_618                    2.5         54.85
O_FC_618                    2.75        65.18
O_FC_618                    3           76.3
O_FC_618                    3.25        88.19
O_FC_618                    3.5         100.85
O_FC_618                    3.75        114.27
O_FC_618                    4           128.43
O_FC_618                    4.25        143.32
O_FC_618                    4.5         158.95
O_FC_618                    4.75        175.29
O_FC_618                    5           187.03
O_FC_618                    5.25        195.87
O_FC_618                    5.5         204.32
O_FC_618                    5.75        212.45
O_FC_618                    6           220.27
O_FC_618                    6.25        227.82
O_FC_618                    6.5         235.14
O_FC_618                    6.75        242.23
O_FC_618                    7           249.12
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O_FC_618                    7.25        255.82
O_FC_618                    7.5         262.35
O_FC_618                    7.75        268.73
O_FC_618                    8           274.95
O_FC_618                    8.25        281.04
O_FC_618                    8.5         287
O_FC_618                    8.75        292.84
O_FC_618                    9           298.56
O_FC_618                    9.25        304.18
O_FC_618                    9.5         309.69
O_FC_618                    9.75        315.11
O_FC_618                    10          320.44
;
O_FC_711          Rating    0           0
O_FC_711                    0.5         3.54
O_FC_711                    1           12.4
O_FC_711                    1.5         25.84
O_FC_711                    2           43.49
O_FC_711                    2.5         65.14
O_FC_711                    3           90.6
O_FC_711                    3.5         119.76
O_FC_711                    3.57        124.13
O_FC_711                    4           152.5
O_FC_711                    4.5         188.74
O_FC_711                    4.9         220.19
O_FC_711                    5           228.39
O_FC_711                    5.5         250.19
O_FC_711                    5.61        254.74
O_FC_711                    6           270.24
O_FC_711                    6.5         288.9
O_FC_711                    7           306.42
O_FC_711                    7.5         323
O_FC_711                    8           338.76
O_FC_711                    8.5         353.83
O_FC_711                    9           368.27
O_FC_711                    9.5         382.18
O_FC_711                    10          395.59
;
O_FC_823          Rating    0           0
O_FC_823                    0.5         3.44
O_FC_823                    1           12.06
O_FC_823                    1.5         25.12
O_FC_823                    2           42.28
O_FC_823                    2.5         63.33
O_FC_823                    3           88.09
O_FC_823                    3.5         116.43
O_FC_823                    3.57        120.68
O_FC_823                    4           148.27
O_FC_823                    4.5         183.5
O_FC_823                    4.9         214.08
O_FC_823                    5           222.05
O_FC_823                    5.5         243.24
O_FC_823                    5.61        247.66
O_FC_823                    6           262.73
O_FC_823                    6.5         280.87
O_FC_823                    7           297.91
O_FC_823                    7.5         314.03
O_FC_823                    8           329.35
O_FC_823                    8.5         344
O_FC_823                    9           358.05
O_FC_823                    9.5         371.56
O_FC_823                    10          384.6
;
O_FC_838          Rating    0           0
O_FC_838                    0.5         3.44
O_FC_838                    1           12.06
```

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O_FC_838                    1.5         25.12
O_FC_838                    2           42.28
O_FC_838                    2.5         63.33
O_FC_838                    3           88.09
O_FC_838                    3.5         116.43
O_FC_838                    3.57        120.68
O_FC_838                    4           148.27
O_FC_838                    4.5         183.5
O_FC_838                    4.9         214.08
O_FC_838                    5           222.05
O_FC_838                    5.5         243.24
O_FC_838                    5.61        247.66
O_FC_838                    6           262.73
O_FC_838                    6.5         280.87
O_FC_838                    7           297.91
O_FC_838                    7.5         314.03
O_FC_838                    8           329.35
O_FC_838                    8.5         344
O_FC_838                    9           358.05
O_FC_838                    9.5         371.56
O_FC_838                    10          384.6
;
;72"x60" 100-yr Flood Control Only
O_FC_842         Rating     0           0
O_FC_842                    0.25        1.01
O_FC_842                    0.5         3.54
O_FC_842                    0.75        7.37
O_FC_842                    1           12.4
O_FC_842                    1.25        18.58
O_FC_842                    1.5         25.84
O_FC_842                    1.75        34.15
O_FC_842                    2           43.49
O_FC_842                    2.25        53.83
O_FC_842                    2.5         65.14
O_FC_842                    2.75        77.4
O_FC_842                    3           90.6
O_FC_842                    3.25        104.73
O_FC_842                    3.5         119.76
O_FC_842                    3.75        135.69
O_FC_842                    4           152.5
O_FC_842                    4.25        170.19
O_FC_842                    4.5         188.74
O_FC_842                    4.75        208.14
O_FC_842                    5           228.39
O_FC_842                    5.25        239.54
O_FC_842                    5.5         250.19
O_FC_842                    5.75        260.41
O_FC_842                    6           270.24
O_FC_842                    6.25        279.72
O_FC_842                    6.5         288.9
O_FC_842                    6.75        297.79
O_FC_842                    7           306.42
O_FC_842                    7.25        314.82
O_FC_842                    7.5         323
O_FC_842                    7.75        330.97
O_FC_842                    8           338.76
O_FC_842                    8.25        346.38
O_FC_842                    8.5         353.83
O_FC_842                    8.75        361.12
O_FC_842                    9           368.27
O_FC_842                    9.25        375.29
O_FC_842                    9.5         382.18
O_FC_842                    9.75        388.94
O_FC_842                    10          395.59
;
Outlet_1034      Rating     0           0
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```
Outlet_1034                 3.1         100.4
Outlet_1034                 4.1         149.8
Outlet_1034                 5.1         199.1
Outlet_1034                 6.1         248.5
Outlet_1034                 7.1         310.2
Outlet_1034                 8.1         372.3
Outlet_1034                 9.1         434.2
Outlet_1034                 10.1        496.3
Outlet_1034                 11.1        544.3
Outlet_1034                 12.1        591.5
Outlet_1034                 13.1        638.7
Outlet_1034                 14.1        685.8
Outlet_1034                 15.1        733
Outlet_1034                 16.1        771.1
Outlet_1034                 17.1        804.2
Outlet_1034                 18.1        837.2
Outlet_1034                 19.1        870.2
Outlet_1034                 20.1        903.2
Outlet_1034                 21.1        936.3
Outlet_1034                 22.1        969.3
Outlet_1034                 23.1        1001.7
Outlet_1034                 24.1        1026.1
Outlet_1034                 25.1        1050.4
Outlet_1034                 26.1        1074.8
Outlet_1034                 27.1        1099.2
Outlet_1034                 28.1        1123.6
Outlet_1034                 29.1        1147.9
Outlet_1034                 30.1        1172.3
Outlet_1034                 31.1        1196.7
Outlet_1034                 32.1        1221
Outlet_1034                 32.7        1236
Outlet_1034                 33          1236
Outlet_1034                 34          1236
Outlet_1034                 35          1236
;
Outlet_1141       Rating    0           0
Outlet_1141                 0.52        0.02
Outlet_1141                 1.52        0.03
Outlet_1141                 2.52        0.06
Outlet_1141                 3.52        0.08
Outlet_1141                 3.9         0.11
Outlet_1141                 4           0.13
Outlet_1141                 4.52        0.17
Outlet_1141                 5.02        54.7
Outlet_1141                 5.52        154.41
Outlet_1141                 6.52        261.46
Outlet_1141                 7.52        292.18
Outlet_1141                 8.52        319.96
Outlet_1141                 9.33        340.89
Outlet_1141                 9.52        345.54
Outlet_1141                 10.52       369.3
;
Outlet_1155       Rating    0           0
Outlet_1155                 1           14.75
Outlet_1155                 1.84        36.94
Outlet_1155                 2           41.73
Outlet_1155                 2.5         51.11
Outlet_1155                 2.72        54.73
Outlet_1155                 3           59.01
Outlet_1155                 4           72.28
Outlet_1155                 4.67        79.91
Outlet_1155                 5           118.37
Outlet_1155                 6           195.17
Outlet_1155                 7           221.31
Outlet_1155                 8           244.66
Outlet_1155                 9           265.98
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Outlet_1155               9.67        279.28
Outlet_1155               10          285.7
;
Outlet_1163     Rating    0           0
Outlet_1163               1           0.26
Outlet_1163               2           0.55
Outlet_1163               3           0.71
Outlet_1163               4           3.33
Outlet_1163               5           56.22
Outlet_1163               6           122.09
Outlet_1163               7           159
Outlet_1163               8           182
Outlet_1163               9           203
;
Outlet_1170     Rating    0           0
Outlet_1170               0.9         26.71
Outlet_1170               1.38        50.72
Outlet_1170               1.9         81.94
Outlet_1170               2.43        118.49
Outlet_1170               2.9         142.09
Outlet_1170               3.45        164.07
Outlet_1170               3.9         180.07
Outlet_1170               4.66        204.12
Outlet_1170               4.9         211.33
Outlet_1170               5.9         238.53
;
Outlet_1217     Rating    0           0
Outlet_1217               1           0.01
Outlet_1217               2           0.03
Outlet_1217               3           0.04
Outlet_1217               4           0.06
Outlet_1217               5           0.07
Outlet_1217               6           22.09
Outlet_1217               7           43.58
Outlet_1217               8           53.83
Outlet_1217               9           65.99
;
Outlet_1233     Rating    0           0
Outlet_1233               0.2         0.22
Outlet_1233               0.4         0.44
Outlet_1233               0.6         0.64
Outlet_1233               0.8         0.96
Outlet_1233               1           1.18
Outlet_1233               1.2         1.58
Outlet_1233               1.4         1.96
Outlet_1233               1.6         2.29
Outlet_1233               1.8         2.74
Outlet_1233               2           3.08
Outlet_1233               2.2         3.59
Outlet_1233               2.4         4.08
Outlet_1233               2.6         4.51
Outlet_1233               2.8         5.06
Outlet_1233               3           5.49
Outlet_1233               3.2         5.87
Outlet_1233               3.4         6.22
Outlet_1233               3.6         6.55
Outlet_1233               3.8         6.85
Outlet_1233               4           43.69
Outlet_1233               7.5         73.69
Outlet_1233               8           380
Outlet_1233               9           1750
;
Outlet_1340     Rating    0           0
Outlet_1340               1           2.67
Outlet_1340               2           4.63
Outlet_1340               3           5.98
```

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Outlet_1340               4          7.07
Outlet_1340               5          8.02
Outlet_1340               6          8.87
Outlet_1340               7          67.63
Outlet_1340               8          123.3
Outlet_1340               9          149.35
Outlet_1340               10         150
Outlet_1340               11         150
Outlet_1340               12         150
Outlet_1340               12.33      150
Outlet_1340               13         1000
Outlet_1340               14         1000
Outlet_1340               15         1000
Outlet_1340               16         1000
Outlet_1340               17         1000
;
Outlet_1127      Rating   0          0
Outlet_1127               1          5.5
Outlet_1127               2          19
Outlet_1127               3          27
Outlet_1127               4          33
Outlet_1127               5          39
Outlet_1127               6          43
Outlet_1127               7          47
Outlet_1127               8          97
Outlet_1127               9          291
Outlet_1127               10         565
;
;88'x175'
88'x175'         Storage  0          15359
88'x175'                  0.25       15888
88'x175'                  0.5        16426
88'x175'                  0.75       16972
88'x175'                  1          17526
88'x175'                  1.25       18088
88'x175'                  1.5        18657
88'x175'                  1.75       19235
88'x175'                  2          19821
88'x175'                  2.25       20415
88'x175'                  2.5        21017
88'x175'                  2.75       21626
88'x175'                  3          22244
88'x175'                  3.25       22870
88'x175'                  3.5        23504
88'x175'                  3.75       24146
88'x175'                  4          24795
88'x175'                  4.25       25453
88'x175'                  4.5        26119
88'x175'                  4.75       26793
88'x175'                  5          27475
88'x175'                  5.25       28164
88'x175'                  5.5        28862
88'x175'                  5.75       29568
88'x175'                  6          30282
88'x175'                  6.25       31003
88'x175'                  6.5        31733
88'x175'                  6.75       32471
88'x175'                  7          33217
88'x175'                  7.25       33971
88'x175'                  7.5        34732
88'x175'                  7.75       35502
88'x175'                  8          36280
88'x175'                  8.25       37066
88'x175'                  8.5        37860
88'x175'                  8.75       38661
88'x175'                  9          39471
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```
88'x175'                    9.25        40289
88'x175'                    9.5         41115
88'x175'                    9.75        41949
88'x175'                    10          42790
;
D_1163          Storage     0           3300
D_1163                      1           32700
D_1163                      2           71400
D_1163                      6.9         252000
D_1163                      9           260000
;
;From Trautman 5th FDR, Pond B
D_1217          Storage     0           41
D_1217                      1           286
D_1217                      2           749
D_1217                      3           1428
D_1217                      4           2325
D_1217                      5           3640
D_1217                      6           5092
D_1217                      7           6470
D_1217                      8           8048
D_1217                      9           9922
;
D_1233          Storage     0           0
D_1233                      1           24986
D_1233                      2           159071
D_1233                      3           337177
D_1233                      4           434437
D_1233                      5           489611
D_1233                      6           510666
D_1233                      7           528134
D_1233                      7.5         537370
D_1233                      8           546606
;
D_EURV_1116     Storage     0           360
D_EURV_1116                 1           3610
D_EURV_1116                 2           18219
D_EURV_1116                 3           20532
D_EURV_1116                 4           22973
D_EURV_1116                 5           25543
D_EURV_1116                 6           28240
D_EURV_1116                 7           31065
D_EURV_1116                 8           34018
D_EURV_1116                 9           37099
D_EURV_1116                 10          40308
;
;Built off of existing contours.
D_EURV_1127     Storage     0           1752
D_EURV_1127                 1           6962
D_EURV_1127                 2           103393
D_EURV_1127                 3           312268
D_EURV_1127                 4           446084
D_EURV_1127                 5           457413
D_EURV_1127                 6           468869
D_EURV_1127                 7           480454
D_EURV_1127                 8           492167
D_EURV_1127                 9           504008
D_EURV_1127                 10          515977
;
D_EURV_1172     Storage     0           107
D_EURV_1172                 1           1073
D_EURV_1172                 2           1676
D_EURV_1172                 3           2406
D_EURV_1172                 4           3264
D_EURV_1172                 5           4251
D_EURV_1172                 6           5365
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D_EURV_1172                7          6607
D_EURV_1172                8          7978
D_EURV_1172                9          9476
D_EURV_1172                10         11101
;
D_EURV_1208      Storage   0          326
D_EURV_1208                1          3499
D_EURV_1208                2          14467
D_EURV_1208                3          16531
D_EURV_1208                4          18724
D_EURV_1208                5          21044
D_EURV_1208                6          23493
D_EURV_1208                7          26069
D_EURV_1208                8          28773
D_EURV_1208                9          31606
D_EURV_1208                10         34566
;
;322'x640'
D_EURV_121       Storage   0          530
D_EURV_121                 0.5        530
D_EURV_121                 0.75       530
D_EURV_121                 1          530
D_EURV_121                 1.25       2135
D_EURV_121                 1.5        4749
D_EURV_121                 1.75       8370
D_EURV_121                 2          13000
D_EURV_121                 2.25       18637
D_EURV_121                 2.5        25281
D_EURV_121                 2.75       32934
D_EURV_121                 3          41595
D_EURV_121                 3.25       51263
D_EURV_121                 3.5        61939
D_EURV_121                 3.75       73623
D_EURV_121                 4          86315
D_EURV_121                 4.25       100014
D_EURV_121                 4.37       106948
D_EURV_121                 4.5        114721
D_EURV_121                 4.75       130437
D_EURV_121                 5          147159
D_EURV_121                 5.25       164890
D_EURV_121                 5.5        183629
D_EURV_121                 5.75       203375
D_EURV_121                 5.8        205966
D_EURV_121                 6          207508
D_EURV_121                 6.25       209441
D_EURV_121                 6.5        211383
D_EURV_121                 6.75       213333
D_EURV_121                 7          215291
D_EURV_121                 7.25       217257
D_EURV_121                 7.34       217967
D_EURV_121                 7.5        219231
D_EURV_121                 7.75       221213
D_EURV_121                 8          223202
D_EURV_121                 8.25       225200
D_EURV_121                 8.5        227206
D_EURV_121                 8.75       229220
D_EURV_121                 9          231242
D_EURV_121                 9.25       233272
D_EURV_121                 9.5        235309
D_EURV_121                 9.75       237355
D_EURV_121                 10         239409
;
D_EURV_1316      Storage   0          296
D_EURV_1316                1          3393
D_EURV_1316                2          8013
D_EURV_1316                3          9556
```

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D_EURV_1316                4          11226
D_EURV_1316                5          13025
D_EURV_1316                6          14952
D_EURV_1316                7          17007
D_EURV_1316                8          19190
D_EURV_1316                9          21501
D_EURV_1316                10         23940
;
;360'x716'
D_EURV_134       Storage   0          442
D_EURV_134                 0.5        442
D_EURV_134                 0.75       442
D_EURV_134                 1          442
D_EURV_134                 1.25       2667
D_EURV_134                 1.5        6670
D_EURV_134                 1.75       12450
D_EURV_134                 2          20008
D_EURV_134                 2.25       29343
D_EURV_134                 2.5        40457
D_EURV_134                 2.75       53348
D_EURV_134                 3          68017
D_EURV_134                 3.25       84464
D_EURV_134                 3.31       88676
D_EURV_134                 3.5        102689
D_EURV_134                 3.75       122691
D_EURV_134                 4          144471
D_EURV_134                 4.25       168029
D_EURV_134                 4.5        193365
D_EURV_134                 4.75       220479
D_EURV_134                 5          249370
D_EURV_134                 5.07       257778
D_EURV_134                 5.25       259329
D_EURV_134                 5.29       259675
D_EURV_134                 5.5        261491
D_EURV_134                 5.75       263660
D_EURV_134                 6          265838
D_EURV_134                 6.25       268023
D_EURV_134                 6.5        270217
D_EURV_134                 6.75       272418
D_EURV_134                 7          274628
D_EURV_134                 7.25       276845
D_EURV_134                 7.5        279070
D_EURV_134                 7.75       281304
D_EURV_134                 8          283545
D_EURV_134                 8.25       285795
D_EURV_134                 8.5        288052
D_EURV_134                 8.75       290318
D_EURV_134                 9          292591
D_EURV_134                 9.25       294873
D_EURV_134                 9.5        297162
D_EURV_134                 9.75       299460
D_EURV_134                 10         301765
;
D_EURV_1364      Storage   0          88
D_EURV_1364                1          1012
D_EURV_1364                2          1599
D_EURV_1364                3          2315
D_EURV_1364                4          3158
D_EURV_1364                5          4130
D_EURV_1364                6          5229
D_EURV_1364                7          6457
D_EURV_1364                8          7812
D_EURV_1364                9          9296
D_EURV_1364                10         10907
;
D_EURV_1382      Storage   0          209
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D_EURV_1382                 1          3074
D_EURV_1382                 2          5655
D_EURV_1382                 3          6959
D_EURV_1382                 4          8391
D_EURV_1382                 5          9951
D_EURV_1382                 6          11639
D_EURV_1382                 7          13455
D_EURV_1382                 8          15399
D_EURV_1382                 9          17471
D_EURV_1382                 10         19672
;
D_EURV_1392       Storage   0          2411
D_EURV_1392                 1          8243
D_EURV_1392                 2          108330
D_EURV_1392                 3          141708
D_EURV_1392                 4          148067
D_EURV_1392                 5          154553
D_EURV_1392                 6          161168
D_EURV_1392                 7          167911
D_EURV_1392                 8          174782
D_EURV_1392                 9          181780
D_EURV_1392                 10         188907
;
D_EURV_1395       Storage   0          1752
D_EURV_1395                 1          6962
D_EURV_1395                 2          82479
D_EURV_1395                 3          87344
D_EURV_1395                 4          92338
D_EURV_1395                 5          97459
D_EURV_1395                 6          102709
D_EURV_1395                 7          108086
D_EURV_1395                 8          113591
D_EURV_1395                 9          119225
D_EURV_1395                 10         124986
;
D_EURV_1395A      Storage   0          1752
D_EURV_1395A                1          6962
D_EURV_1395A                2          82479
D_EURV_1395A                3          87344
D_EURV_1395A                4          92338
D_EURV_1395A                5          97459
D_EURV_1395A                6          102709
D_EURV_1395A                7          108086
D_EURV_1395A                8          113591
D_EURV_1395A                9          119225
D_EURV_1395A                10         124986
;
;105'x209'
D_EURV_146        Storage   0          76
D_EURV_146                  0.5        76
D_EURV_146                  0.75       76
D_EURV_146                  1          76
D_EURV_146                  1.25       738
D_EURV_146                  1.5        2049
D_EURV_146                  1.75       4010
D_EURV_146                  2          6622
D_EURV_146                  2.25       9883
D_EURV_146                  2.5        13794
D_EURV_146                  2.75       18356
D_EURV_146                  2.82       19749
D_EURV_146                  2.93       22042
D_EURV_146                  3          22219
D_EURV_146                  3.25       22854
D_EURV_146                  3.5        23498
D_EURV_146                  3.75       24150
D_EURV_146                  4          24809
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D_EURV_146                 4.17       25262
D_EURV_146                 4.25       25477
D_EURV_146                 4.5        26153
D_EURV_146                 4.75       26836
D_EURV_146                 5          27528
D_EURV_146                 5.25       28227
D_EURV_146                 5.5        28935
D_EURV_146                 5.75       29651
D_EURV_146                 6          30374
D_EURV_146                 6.25       31106
D_EURV_146                 6.5        31846
D_EURV_146                 6.75       32593
D_EURV_146                 7          33349
D_EURV_146                 7.25       34112
D_EURV_146                 7.5        34884
D_EURV_146                 7.75       35664
D_EURV_146                 8          36451
D_EURV_146                 8.25       37247
D_EURV_146                 8.5        38051
D_EURV_146                 8.75       38862
D_EURV_146                 9          39682
D_EURV_146                 9.25       40509
D_EURV_146                 9.5        41345
D_EURV_146                 9.75       42189
D_EURV_146                 10         43040
;
;301'x599'
D_EURV_150       Storage   0          349
D_EURV_150                 0.5        349
D_EURV_150                 0.75       349
D_EURV_150                 1          349
D_EURV_150                 1.25       2023
D_EURV_150                 1.5        5009
D_EURV_150                 1.75       9306
D_EURV_150                 2          14914
D_EURV_150                 2.25       21834
D_EURV_150                 2.5        30065
D_EURV_150                 2.75       39606
D_EURV_150                 3          50460
D_EURV_150                 3.25       62624
D_EURV_150                 3.5        76100
D_EURV_150                 3.75       90886
D_EURV_150                 3.95       103660
D_EURV_150                 4          106984
D_EURV_150                 4.25       124394
D_EURV_150                 4.5        143114
D_EURV_150                 4.75       163146
D_EURV_150                 5          180475
D_EURV_150                 5.25       182280
D_EURV_150                 5.5        184093
D_EURV_150                 5.75       185914
D_EURV_150                 6          187742
D_EURV_150                 6.12       188623
D_EURV_150                 6.25       189579
D_EURV_150                 6.5        191424
D_EURV_150                 6.75       193277
D_EURV_150                 7          195137
D_EURV_150                 7.25       197006
D_EURV_150                 7.5        198883
D_EURV_150                 7.65       200013
D_EURV_150                 7.75       200768
D_EURV_150                 8          202660
D_EURV_150                 8.25       204561
D_EURV_150                 8.5        206470
D_EURV_150                 8.75       208387
D_EURV_150                 9          210311
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D_EURV_150                  9.25        212244
D_EURV_150                  9.5         214185
D_EURV_150                  9.75        216134
D_EURV_150                  10          218090
;
;354'x713'
D_EURV_225        Storage   0           311
D_EURV_225                  0.5         311
D_EURV_225                  0.75        311
D_EURV_225                  1           311
D_EURV_225                  1.25        1659
D_EURV_225                  1.5         4014
D_EURV_225                  1.75        7378
D_EURV_225                  2           11749
D_EURV_225                  2.25        17128
D_EURV_225                  2.5         23515
D_EURV_225                  2.75        30910
D_EURV_225                  3           39312
D_EURV_225                  3.25        48723
D_EURV_225                  3.5         59141
D_EURV_225                  3.75        70567
D_EURV_225                  3.84        74927
D_EURV_225                  4           83001
D_EURV_225                  4.25        96442
D_EURV_225                  4.5         110892
D_EURV_225                  4.75        126349
D_EURV_225                  5           142814
D_EURV_225                  5.25        160287
D_EURV_225                  5.5         178768
D_EURV_225                  5.75        198256
D_EURV_225                  5.9         210433
D_EURV_225                  6           218752
D_EURV_225                  6.25        240256
D_EURV_225                  6.5         253679
D_EURV_225                  6.75        255822
D_EURV_225                  7           257972
D_EURV_225                  7.25        260130
D_EURV_225                  7.46        261950
D_EURV_225                  7.5         262297
D_EURV_225                  7.75        264471
D_EURV_225                  8           266654
D_EURV_225                  8.25        268844
D_EURV_225                  8.5         271042
D_EURV_225                  8.75        273249
D_EURV_225                  9           275463
D_EURV_225                  9.25        277686
D_EURV_225                  9.5         279916
D_EURV_225                  9.75        282154
D_EURV_225                  10          284401
;
;155'x311'
D_EURV_236        Storage   0           122
D_EURV_236                  0.5         122
D_EURV_236                  0.75        122
D_EURV_236                  1           122
D_EURV_236                  1.25        873
D_EURV_236                  1.5         2274
D_EURV_236                  1.75        4325
D_EURV_236                  2           7026
D_EURV_236                  2.25        10376
D_EURV_236                  2.5         14377
D_EURV_236                  2.75        19028
D_EURV_236                  3           24329
D_EURV_236                  3.11        26867
D_EURV_236                  3.25        30279
D_EURV_236                  3.5         36880
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D_EURV_236                3.75       44131
D_EURV_236                3.88       48158
D_EURV_236                4          48606
D_EURV_236                4.25       49545
D_EURV_236                4.5        50493
D_EURV_236                4.59       50835
D_EURV_236                4.75       51448
D_EURV_236                5          52411
D_EURV_236                5.25       53382
D_EURV_236                5.5        54361
D_EURV_236                5.75       55348
D_EURV_236                6          56343
D_EURV_236                6.25       57346
D_EURV_236                6.5        58358
D_EURV_236                6.75       59377
D_EURV_236                7          60404
D_EURV_236                7.25       61439
D_EURV_236                7.5        62482
D_EURV_236                7.75       63533
D_EURV_236                8          64592
D_EURV_236                8.25       65659
D_EURV_236                8.5        66734
D_EURV_236                8.75       67818
D_EURV_236                9          68909
D_EURV_236                9.25       70008
D_EURV_236                9.5        71115
D_EURV_236                9.75       72230
D_EURV_236                10         73353
;
;274'x549'
D_EURV_244       Storage  0          256
D_EURV_244                0.5        256
D_EURV_244                0.75       256
D_EURV_244                1          256
D_EURV_244                1.25       1527
D_EURV_244                1.5        3805
D_EURV_244                1.75       7091
D_EURV_244                2          11385
D_EURV_244                2.25       16687
D_EURV_244                2.5        22997
D_EURV_244                2.75       30314
D_EURV_244                3          38639
D_EURV_244                3.25       47972
D_EURV_244                3.5        58313
D_EURV_244                3.68       66382
D_EURV_244                3.75       69662
D_EURV_244                4          82018
D_EURV_244                4.25       95382
D_EURV_244                4.5        109754
D_EURV_244                4.75       125134
D_EURV_244                5          141522
D_EURV_244                5.25       151233
D_EURV_244                5.5        152886
D_EURV_244                5.75       154548
D_EURV_244                5.86       155282
D_EURV_244                6          156218
D_EURV_244                6.25       157895
D_EURV_244                6.5        159581
D_EURV_244                6.75       161275
D_EURV_244                7          162976
D_EURV_244                7.09       163591
D_EURV_244                7.25       164686
D_EURV_244                7.5        166404
D_EURV_244                7.75       168129
D_EURV_244                8          169863
D_EURV_244                8.25       171605
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D_EURV_244                 8.5         173354
D_EURV_244                 8.75        175112
D_EURV_244                 9           176878
D_EURV_244                 9.25        178652
D_EURV_244                 9.5         180433
D_EURV_244                 9.75        182223
D_EURV_244                 10          184021
;
;488'x968'
D_EURV_245       Storage   0           747
D_EURV_245                 0.5         747
D_EURV_245                 0.75        747
D_EURV_245                 1           747
D_EURV_245                 1.25        4098
D_EURV_245                 1.5         10000
D_EURV_245                 1.75        18452
D_EURV_245                 2           29454
D_EURV_245                 2.25        43006
D_EURV_245                 2.5         59107
D_EURV_245                 2.75        77759
D_EURV_245                 3           98961
D_EURV_245                 3.25        122713
D_EURV_245                 3.5         149014
D_EURV_245                 3.75        177866
D_EURV_245                 4           209268
D_EURV_245                 4.25        243220
D_EURV_245                 4.5         279721
D_EURV_245                 4.75        318773
D_EURV_245                 5           360375
D_EURV_245                 5.25        404527
D_EURV_245                 5.5         451229
D_EURV_245                 5.75        474217
D_EURV_245                 6           477138
D_EURV_245                 6.25        480067
D_EURV_245                 6.5         483003
D_EURV_245                 6.75        485948
D_EURV_245                 7           488901
D_EURV_245                 7.25        491861
D_EURV_245                 7.5         494830
D_EURV_245                 7.75        497807
D_EURV_245                 8           500791
D_EURV_245                 8.14        502466
D_EURV_245                 8.25        503784
D_EURV_245                 8.5         506785
D_EURV_245                 8.75        509793
D_EURV_245                 9           512810
D_EURV_245                 9.25        515835
D_EURV_245                 9.5         518867
D_EURV_245                 9.75        521908
D_EURV_245                 10          524957
;
;282'x567'
D_EURV_256       Storage   0           232
D_EURV_256                 0.5         232
D_EURV_256                 0.75        232
D_EURV_256                 1           232
D_EURV_256                 1.25        1282
D_EURV_256                 1.5         3132
D_EURV_256                 1.75        5781
D_EURV_256                 2           9229
D_EURV_256                 2.25        13476
D_EURV_256                 2.5         18523
D_EURV_256                 2.75        24370
D_EURV_256                 3           31016
D_EURV_256                 3.25        38461
D_EURV_256                 3.43        44316
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D_EURV_256                  3.5         46705
D_EURV_256                  3.75        55749
D_EURV_256                  4           65592
D_EURV_256                  4.25        76235
D_EURV_256                  4.5         87677
D_EURV_256                  4.75        99918
D_EURV_256                  5           112959
D_EURV_256                  5.25        126799
D_EURV_256                  5.28        128514
D_EURV_256                  5.5         141439
D_EURV_256                  5.75        156878
D_EURV_256                  5.8         160062
D_EURV_256                  6           161424
D_EURV_256                  6.25        163133
D_EURV_256                  6.5         164851
D_EURV_256                  6.75        166577
D_EURV_256                  7           168311
D_EURV_256                  7.25        170053
D_EURV_256                  7.5         171802
D_EURV_256                  7.75        173560
D_EURV_256                  8           175326
D_EURV_256                  8.25        177100
D_EURV_256                  8.5         178881
D_EURV_256                  8.75        180671
D_EURV_256                  9           182469
D_EURV_256                  9.25        184275
D_EURV_256                  9.5         186089
D_EURV_256                  9.75        187910
D_EURV_256                  10          189740
;
;329'x652'
D_EURV_263        Storage   0           405
D_EURV_263                  0.5         405
D_EURV_263                  0.75        405
D_EURV_263                  1           405
D_EURV_263                  1.25        2571
D_EURV_263                  1.5         6515
D_EURV_263                  1.75        12236
D_EURV_263                  2           19736
D_EURV_263                  2.25        29013
D_EURV_263                  2.5         40068
D_EURV_263                  2.75        52901
D_EURV_263                  3           67512
D_EURV_263                  3.25        83900
D_EURV_263                  3.5         102066
D_EURV_263                  3.75        122010
D_EURV_263                  4           143732
D_EURV_263                  4.25        167231
D_EURV_263                  4.5         192508
D_EURV_263                  4.7         214010
D_EURV_263                  4.75        214402
D_EURV_263                  5           216368
D_EURV_263                  5.15        217551
D_EURV_263                  5.25        218342
D_EURV_263                  5.5         220323
D_EURV_263                  5.75        222313
D_EURV_263                  6           224311
D_EURV_263                  6.25        226316
D_EURV_263                  6.5         228330
D_EURV_263                  6.75        230352
D_EURV_263                  7           232381
D_EURV_263                  7.25        234419
D_EURV_263                  7.5         236465
D_EURV_263                  7.75        238518
D_EURV_263                  8           240580
D_EURV_263                  8.25        242650
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D_EURV_263                 8.5         244727
D_EURV_263                 8.75        246813
D_EURV_263                 9           248907
D_EURV_263                 9.25        251008
D_EURV_263                 9.5         253118
D_EURV_263                 9.75        255236
D_EURV_263                 10          257361
;
;411'x818'
D_EURV_510       Storage   0           495
D_EURV_510                 0.5         495
D_EURV_510                 0.75        495
D_EURV_510                 1           495
D_EURV_510                 1.25        2797
D_EURV_510                 1.5         6877
D_EURV_510                 1.75        12735
D_EURV_510                 2           20370
D_EURV_510                 2.25        29783
D_EURV_510                 2.5         40974
D_EURV_510                 2.75        53943
D_EURV_510                 3           68690
D_EURV_510                 3.25        85214
D_EURV_510                 3.4         95982
D_EURV_510                 3.5         103516
D_EURV_510                 3.75        123596
D_EURV_510                 4           145453
D_EURV_510                 4.25        169089
D_EURV_510                 4.5         194502
D_EURV_510                 4.75        221693
D_EURV_510                 5           250662
D_EURV_510                 5.25        281408
D_EURV_510                 5.36        295500
D_EURV_510                 5.5         313933
D_EURV_510                 5.66        335681
D_EURV_510                 5.75        336566
D_EURV_510                 6           339029
D_EURV_510                 6.25        341500
D_EURV_510                 6.5         343979
D_EURV_510                 6.75        346467
D_EURV_510                 7           348962
D_EURV_510                 7.25        351465
D_EURV_510                 7.5         353976
D_EURV_510                 7.75        356495
D_EURV_510                 8           359022
D_EURV_510                 8.25        361558
D_EURV_510                 8.5         364101
D_EURV_510                 8.75        366652
D_EURV_510                 9           369211
D_EURV_510                 9.25        371778
D_EURV_510                 9.5         374354
D_EURV_510                 9.75        376937
D_EURV_510                 10          379528
;
;304'x610'
D_EURV_614       Storage   0           279
D_EURV_614                 0.5         279
D_EURV_614                 0.75        279
D_EURV_614                 1           279
D_EURV_614                 1.25        1583
D_EURV_614                 1.5         3894
D_EURV_614                 1.75        7214
D_EURV_614                 2           11541
D_EURV_614                 2.25        16876
D_EURV_614                 2.5         23219
D_EURV_614                 2.75        30570
D_EURV_614                 3           38928
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D_EURV_614                 3.25       48294
D_EURV_614                 3.5        58668
D_EURV_614                 3.75       70050
D_EURV_614                 4          82440
D_EURV_614                 4.25       95837
D_EURV_614                 4.5        110243
D_EURV_614                 4.75       125656
D_EURV_614                 5          142077
D_EURV_614                 5.25       159506
D_EURV_614                 5.5        177942
D_EURV_614                 5.75       186698
D_EURV_614                 6          188535
D_EURV_614                 6.03       188756
D_EURV_614                 6.25       190381
D_EURV_614                 6.5        192234
D_EURV_614                 6.75       194095
D_EURV_614                 7          195965
D_EURV_614                 7.25       197842
D_EURV_614                 7.29       198143
D_EURV_614                 7.5        199728
D_EURV_614                 7.75       201621
D_EURV_614                 8          203523
D_EURV_614                 8.25       205432
D_EURV_614                 8.5        207349
D_EURV_614                 8.75       209275
D_EURV_614                 9          211208
D_EURV_614                 9.25       213150
D_EURV_614                 9.5        215099
D_EURV_614                 9.75       217057
D_EURV_614                 10         219022
;
;405'x784'
D_EURV_618       Storage   0          616
D_EURV_618                 0.5        616
D_EURV_618                 0.75       616
D_EURV_618                 1          616
D_EURV_618                 1.25       3778
D_EURV_618                 1.5        9490
D_EURV_618                 1.75       17751
D_EURV_618                 2          28563
D_EURV_618                 2.25       41925
D_EURV_618                 2.5        57837
D_EURV_618                 2.75       76298
D_EURV_618                 3          97310
D_EURV_618                 3.25       120872
D_EURV_618                 3.5        146983
D_EURV_618                 3.75       175645
D_EURV_618                 4          206857
D_EURV_618                 4.25       240619
D_EURV_618                 4.5        276930
D_EURV_618                 4.53       281459
D_EURV_618                 4.75       300869
D_EURV_618                 5          303195
D_EURV_618                 5.25       305529
D_EURV_618                 5.5        307870
D_EURV_618                 5.75       310220
D_EURV_618                 6          312578
D_EURV_618                 6.25       314943
D_EURV_618                 6.5        317317
D_EURV_618                 6.75       319699
D_EURV_618                 7          322089
D_EURV_618                 7.25       324486
D_EURV_618                 7.5        326892
D_EURV_618                 7.55       327374
D_EURV_618                 7.75       329306
D_EURV_618                 8          331727
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D_EURV_618                  8.25        334157
D_EURV_618                  8.5         336595
D_EURV_618                  8.75        339040
D_EURV_618                  9           341494
D_EURV_618                  9.25        343956
D_EURV_618                  9.5         346426
D_EURV_618                  9.67        348110
D_EURV_618                  9.75        348903
D_EURV_618                  10          351389
;
D_EURV_711        Storage   0           1752
D_EURV_711                  0.33        1752
D_EURV_711                  0.5         1752
D_EURV_711                  1           6962
D_EURV_711                  1.18        16021
D_EURV_711                  1.5         16694
D_EURV_711                  2           17771
D_EURV_711                  2.5         18879
D_EURV_711                  3           20020
D_EURV_711                  3.5         21193
D_EURV_711                  3.62        21479
D_EURV_711                  4           22398
D_EURV_711                  4.5         23635
D_EURV_711                  5           24904
D_EURV_711                  5.5         26205
D_EURV_711                  5.99        27511
D_EURV_711                  6           27538
D_EURV_711                  6.5         28903
D_EURV_711                  7           30299
D_EURV_711                  7.5         31728
D_EURV_711                  8           33189
D_EURV_711                  8.5         34682
D_EURV_711                  9           36207
D_EURV_711                  9.5         37764
D_EURV_711                  10          39353
;
D_EURV_820        Storage   0           1752
D_EURV_820                  0.33        1752
D_EURV_820                  0.5         1752
D_EURV_820                  1           6962
D_EURV_820                  1.15        41122
D_EURV_820                  1.5         42092
D_EURV_820                  2           43779
D_EURV_820                  2.5         45532
D_EURV_820                  3           47317
D_EURV_820                  3.5         47389
D_EURV_820                  3.6         49134
D_EURV_820                  4           50983
D_EURV_820                  4.5         52864
D_EURV_820                  5           54777
D_EURV_820                  5.5         56722
D_EURV_820                  5.94        58699
D_EURV_820                  6           58739
D_EURV_820                  6.5         60708
D_EURV_820                  7           62749
D_EURV_820                  7.5         64822
D_EURV_820                  8           66927
D_EURV_820                  8.5         69064
D_EURV_820                  9           71234
D_EURV_820                  9.5         73435
D_EURV_820                  10          75668
;
D_EURV_830        Storage   0           1752
D_EURV_830                  0.33        1752
D_EURV_830                  0.5         1752
D_EURV_830                  1           6962
```

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D_EURV_830                1.18       41122
D_EURV_830                1.5        46084
D_EURV_830                2          47705
D_EURV_830                2.5        49536
D_EURV_830                3          51399
D_EURV_830                3.5        51474
D_EURV_830                3.62       53294
D_EURV_830                4          55221
D_EURV_830                4.5        57180
D_EURV_830                5          59171
D_EURV_830                5.5        61195
D_EURV_830                5.99       63250
D_EURV_830                6          63291
D_EURV_830                6.5        65337
D_EURV_830                7          67456
D_EURV_830                7.5        69607
D_EURV_830                8          71790
D_EURV_830                8.5        74005
D_EURV_830                9          76253
D_EURV_830                9.5        78532
D_EURV_830                10         80843
;
;255'x510'
D_EURV_840       Storage  0          258
D_EURV_840                0.5        258
D_EURV_840                0.75       258
D_EURV_840                1          258
D_EURV_840                1.25       1530
D_EURV_840                1.5        3810
D_EURV_840                1.75       7098
D_EURV_840                2          11394
D_EURV_840                2.25       16698
D_EURV_840                2.5        23010
D_EURV_840                2.75       30329
D_EURV_840                3          38656
D_EURV_840                3.25       47991
D_EURV_840                3.33       51191
D_EURV_840                3.5        58334
D_EURV_840                3.75       69684
D_EURV_840                4          82043
D_EURV_840                4.25       95409
D_EURV_840                4.5        109783
D_EURV_840                4.75       125165
D_EURV_840                4.83       130300
D_EURV_840                5          131343
D_EURV_840                5.25       132883
D_EURV_840                5.28       133069
D_EURV_840                5.5        134432
D_EURV_840                5.75       135988
D_EURV_840                6          137553
D_EURV_840                6.25       139125
D_EURV_840                6.5        140706
D_EURV_840                6.75       142295
D_EURV_840                7          143891
D_EURV_840                7.25       145496
D_EURV_840                7.5        147108
D_EURV_840                7.75       148729
D_EURV_840                8          150357
D_EURV_840                8.25       151994
D_EURV_840                8.5        153638
D_EURV_840                8.75       155291
D_EURV_840                9          156951
D_EURV_840                9.25       158620
D_EURV_840                9.5        160297
D_EURV_840                9.75       161981
D_EURV_840                10         163674
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;
;60% WQCV, 100% EURV
D_EURV_842       Storage    0          694
D_EURV_842                  0.5        694
D_EURV_842                  0.75       694
D_EURV_842                  1          694
D_EURV_842                  1.25       3972
D_EURV_842                  1.5        9799
D_EURV_842                  1.75       18176
D_EURV_842                  2          29104
D_EURV_842                  2.25       42581
D_EURV_842                  2.5        58608
D_EURV_842                  2.75       77186
D_EURV_842                  3          98313
D_EURV_842                  3.25       121991
D_EURV_842                  3.38       135311
D_EURV_842                  3.5        148218
D_EURV_842                  3.75       176995
D_EURV_842                  4          208323
D_EURV_842                  4.25       242200
D_EURV_842                  4.5        278628
D_EURV_842                  4.75       317605
D_EURV_842                  5          359132
D_EURV_842                  5.25       403210
D_EURV_842                  5.31       414168
D_EURV_842                  5.37       425273
D_EURV_842                  5.5        426710
D_EURV_842                  5.75       429481
D_EURV_842                  6          432259
D_EURV_842                  6.25       435046
D_EURV_842                  6.5        437840
D_EURV_842                  6.75       440643
D_EURV_842                  7          443453
D_EURV_842                  7.25       446272
D_EURV_842                  7.5        449098
D_EURV_842                  7.75       451933
D_EURV_842                  8          454775
D_EURV_842                  8.25       457626
D_EURV_842                  8.5        460484
D_EURV_842                  8.75       463351
D_EURV_842                  9          466225
D_EURV_842                  9.25       469108
D_EURV_842                  9.5        471998
D_EURV_842                  9.75       474897
D_EURV_842                  10         477803
;
D_EURV_844       Storage    0          1752
D_EURV_844                  0.33       1752
D_EURV_844                  0.5        1752
D_EURV_844                  1          6962
D_EURV_844                  1.3        41122
D_EURV_844                  1.5        80408
D_EURV_844                  2          81168
D_EURV_844                  2.5        83565
D_EURV_844                  3          85994
D_EURV_844                  3.5        86631
D_EURV_844                  3.63       88456
D_EURV_844                  4          90949
D_EURV_844                  4.5        93474
D_EURV_844                  5          96031
D_EURV_844                  5.5        98621
D_EURV_844                  6          101242
D_EURV_844                  6.03       101294
D_EURV_844                  6.5        103895
D_EURV_844                  7          106580
D_EURV_844                  7.5        109297
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D_EURV_844              8       112047
D_EURV_844              8.5     114828
D_EURV_844              9       117641
D_EURV_844              9.5     120486
D_EURV_844              10      123363
;
D_EURV_909      Storage 0       3728
D_EURV_909              1       10584
D_EURV_909              2       116694
D_EURV_909              3       329968
D_EURV_909              4       339680
D_EURV_909              5       349520
D_EURV_909              6       359489
D_EURV_909              7       369585
D_EURV_909              8       379809
D_EURV_909              9       390161
D_EURV_909              10      400642
;
D_FC_1050       Storage 0       310783.811
D_FC_1050               1       317915.3714
D_FC_1050               2       325118.9318
D_FC_1050               3       332394.4922
D_FC_1050               4       339742.0526
D_FC_1050               5       347161.613
D_FC_1050               6       354653.1734
D_FC_1050               7       362216.7338
D_FC_1050               8       369852.2942
D_FC_1050               9       377559.8546
D_FC_1050               10      385339.415
;
;111'x223'
D_FC_134        Storage 0       24808
D_FC_134                0.25    25480
D_FC_134                0.5     26160
D_FC_134                0.75    26849
D_FC_134                1       27545
D_FC_134                1.25    28249
D_FC_134                1.5     28961
D_FC_134                1.75    29682
D_FC_134                2       30410
D_FC_134                2.25    31146
D_FC_134                2.5     31890
D_FC_134                2.75    32643
D_FC_134                3       33403
D_FC_134                3.25    34171
D_FC_134                3.5     34947
D_FC_134                3.75    35731
D_FC_134                4       36524
D_FC_134                4.25    37324
D_FC_134                4.5     38132
D_FC_134                4.75    38948
D_FC_134                5       39773
D_FC_134                5.25    40605
D_FC_134                5.5     41445
D_FC_134                5.75    42293
D_FC_134                6       43150
D_FC_134                6.25    44014
D_FC_134                6.5     44886
D_FC_134                6.75    45766
D_FC_134                7       46655
D_FC_134                7.25    47551
D_FC_134                7.5     48455
D_FC_134                7.75    49367
D_FC_134                8       50288
D_FC_134                8.25    51216
D_FC_134                8.5     52152
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D_FC_134                    8.75        53096
D_FC_134                    9           54048
D_FC_134                    9.25        55009
D_FC_134                    9.5         55977
D_FC_134                    9.75        56953
D_FC_134                    10          57937
;
;Peak Shaving
D_FC_245          Storage   0           46690
D_FC_245                    0.25        47611
D_FC_245                    0.5         48539
D_FC_245                    0.75        49476
D_FC_245                    1           50421
D_FC_245                    1.25        51374
D_FC_245                    1.5         52334
D_FC_245                    1.75        53303
D_FC_245                    2           54280
D_FC_245                    2.25        55264
D_FC_245                    2.5         56257
D_FC_245                    2.75        57258
D_FC_245                    3           58267
D_FC_245                    3.25        59283
D_FC_245                    3.5         60308
D_FC_245                    3.75        61341
D_FC_245                    4           62382
D_FC_245                    4.25        63430
D_FC_245                    4.5         64487
D_FC_245                    4.75        65552
D_FC_245                    5           66625
D_FC_245                    5.25        67705
D_FC_245                    5.5         68794
D_FC_245                    5.75        69891
D_FC_245                    6           70996
D_FC_245                    6.25        72108
D_FC_245                    6.5         73229
D_FC_245                    6.75        74358
D_FC_245                    7           75495
D_FC_245                    7.25        76639
D_FC_245                    7.5         77792
D_FC_245                    7.75        78953
D_FC_245                    8           80122
D_FC_245                    8.25        81298
D_FC_245                    8.5         82483
D_FC_245                    8.75        83676
D_FC_245                    9           84877
D_FC_245                    9.25        86085
D_FC_245                    9.5         87302
D_FC_245                    9.75        88527
D_FC_245                    10          89760
;
;Peak Shaving
D_FC_263          Storage   0           21608
D_FC_263                    0.25        22236
D_FC_263                    0.5         22871
D_FC_263                    0.75        23515
D_FC_263                    1           24166
D_FC_263                    1.25        24826
D_FC_263                    1.5         25494
D_FC_263                    1.75        26169
D_FC_263                    2           26853
D_FC_263                    2.25        27545
D_FC_263                    2.5         28244
D_FC_263                    2.75        28952
D_FC_263                    3           29668
D_FC_263                    3.25        30391
D_FC_263                    3.5         31123
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D_FC_263                    3.75        31863
D_FC_263                    4           32610
D_FC_263                    4.25        33366
D_FC_263                    4.5         34130
D_FC_263                    4.75        34901
D_FC_263                    5           35681
D_FC_263                    5.25        36469
D_FC_263                    5.5         37264
D_FC_263                    5.75        38068
D_FC_263                    6           38879
D_FC_263                    6.25        39699
D_FC_263                    6.5         40527
D_FC_263                    6.75        41362
D_FC_263                    7           42206
D_FC_263                    7.25        43058
D_FC_263                    7.5         43917
D_FC_263                    7.75        44785
D_FC_263                    8           45661
D_FC_263                    8.25        46544
D_FC_263                    8.5         47436
D_FC_263                    8.75        48336
D_FC_263                    9           49243
D_FC_263                    9.25        50159
D_FC_263                    9.5         51083
D_FC_263                    9.75        52014
D_FC_263                    10          52954
;
;D_FC_510
D_FC_510          Storage   0           28943
D_FC_510                    0.25        29669
D_FC_510                    0.5         30402
D_FC_510                    0.75        31144
D_FC_510                    1           31894
D_FC_510                    1.25        32652
D_FC_510                    1.5         33417
D_FC_510                    1.75        34191
D_FC_510                    2           34973
D_FC_510                    2.25        35763
D_FC_510                    2.5         36561
D_FC_510                    2.75        37366
D_FC_510                    3           38180
D_FC_510                    3.25        39002
D_FC_510                    3.5         39832
D_FC_510                    3.75        40670
D_FC_510                    4           41515
D_FC_510                    4.25        42369
D_FC_510                    4.5         43231
D_FC_510                    4.75        44101
D_FC_510                    5           44978
D_FC_510                    5.25        45864
D_FC_510                    5.5         46758
D_FC_510                    5.75        47660
D_FC_510                    6           48570
D_FC_510                    6.25        49487
D_FC_510                    6.5         50413
D_FC_510                    6.75        51347
D_FC_510                    7           52289
D_FC_510                    7.25        53238
D_FC_510                    7.5         54196
D_FC_510                    7.75        55162
D_FC_510                    8           56136
D_FC_510                    8.25        57118
D_FC_510                    8.5         58107
D_FC_510                    8.75        59105
D_FC_510                    9           60111
D_FC_510                    9.25        61125
```

```
D_FC_510                    9.5         62147
D_FC_510                    9.75        63176
D_FC_510                    10          64214
;
;133'x265'
D_FC_618          Storage   0           35105
D_FC_618                    0.25        35904
D_FC_618                    0.5         36711
D_FC_618                    0.75        37526
D_FC_618                    1           38349
D_FC_618                    1.25        39180
D_FC_618                    1.5         40019
D_FC_618                    1.75        40866
D_FC_618                    2           41721
D_FC_618                    2.25        42584
D_FC_618                    2.5         43455
D_FC_618                    2.75        44333
D_FC_618                    3           45220
D_FC_618                    3.25        46115
D_FC_618                    3.5         47018
D_FC_618                    3.75        47929
D_FC_618                    4           48848
D_FC_618                    4.25        49775
D_FC_618                    4.5         50710
D_FC_618                    4.75        51653
D_FC_618                    5           52604
D_FC_618                    5.25        53563
D_FC_618                    5.5         54530
D_FC_618                    5.75        55504
D_FC_618                    6           56487
D_FC_618                    6.25        57478
D_FC_618                    6.5         58477
D_FC_618                    6.75        59484
D_FC_618                    7           60499
D_FC_618                    7.25        61522
D_FC_618                    7.5         62553
D_FC_618                    7.75        63592
D_FC_618                    8           64639
D_FC_618                    8.25        65694
D_FC_618                    8.5         66757
D_FC_618                    8.75        67828
D_FC_618                    9           68906
D_FC_618                    9.25        69993
D_FC_618                    9.5         71088
D_FC_618                    9.75        72191
D_FC_618                    10          73302
;
D_FC_711          Storage   0           36922
D_FC_711                    0.5         38568
D_FC_711                    1           40247
D_FC_711                    1.5         41957
D_FC_711                    2           43700
D_FC_711                    2.5         45474
D_FC_711                    3           47280
D_FC_711                    3.5         49119
D_FC_711                    4           50989
D_FC_711                    4.5         52892
D_FC_711                    5           54826
D_FC_711                    5.5         56793
D_FC_711                    6           58791
D_FC_711                    6.5         60822
D_FC_711                    7           62884
D_FC_711                    7.5         64978
D_FC_711                    8           67105
D_FC_711                    8.5         69263
D_FC_711                    9           71454
```

```
D_FC_711                    9.5         73676
D_FC_711                    10          75931
;
D_FC_811          Storage   0           37664
D_FC_811                    1           77436
D_FC_811                    2           133078
D_FC_811                    3           163864
D_FC_811                    4           190605
D_FC_811                    5           204897
D_FC_811                    6           215528
D_FC_811                    7           226286
D_FC_811                    8           237198
D_FC_811                    8.49        273603
D_FC_811                    9           273603
D_FC_811                    10          273603
;
;100-yr Flood Control
D_FC_814          Storage   0           10528
D_FC_814                    0.25        10967
D_FC_814                    0.5         11415
D_FC_814                    0.75        11870
D_FC_814                    1           12333
D_FC_814                    1.25        12805
D_FC_814                    1.5         13284
D_FC_814                    1.75        13771
D_FC_814                    2           14267
D_FC_814                    2.25        14770
D_FC_814                    2.5         15281
D_FC_814                    2.75        15801
D_FC_814                    3           16328
D_FC_814                    3.25        16863
D_FC_814                    3.5         17407
D_FC_814                    3.75        17958
D_FC_814                    4           18517
D_FC_814                    4.25        19085
D_FC_814                    4.5         19660
D_FC_814                    4.75        20243
D_FC_814                    5           20835
D_FC_814                    5.25        21434
D_FC_814                    5.5         22041
D_FC_814                    5.75        22657
D_FC_814                    6           23280
D_FC_814                    6.25        23911
D_FC_814                    6.5         24551
D_FC_814                    6.75        25198
D_FC_814                    7           25853
D_FC_814                    7.25        26517
D_FC_814                    7.5         27188
D_FC_814                    7.75        27867
D_FC_814                    8           28554
D_FC_814                    8.25        29250
D_FC_814                    8.5         29953
D_FC_814                    8.75        30664
D_FC_814                    9           31384
D_FC_814                    9.25        32111
D_FC_814                    9.5         32846
D_FC_814                    9.75        33590
D_FC_814                    10          34341
;
D_FC_838          Storage   0           107813
D_FC_838                    0.5         110615
D_FC_838                    1           113449
D_FC_838                    1.5         116315
D_FC_838                    2           119214
D_FC_838                    2.5         122144
D_FC_838                    3           125106
```

```
D_FC_838                    3.5         128100
D_FC_838                    4           131126
D_FC_838                    4.5         134184
D_FC_838                    5           137274
D_FC_838                    5.5         140397
D_FC_838                    6           143551
D_FC_838                    6.5         146737
D_FC_838                    7           149955
D_FC_838                    7.5         153205
D_FC_838                    8           156487
D_FC_838                    8.5         159801
D_FC_838                    9           163147
D_FC_838                    9.5         166526
D_FC_838                    10          169936
;
;From the 2023 Trautman Hydrology Memo pg 51
Detention_1034   Storage    0           0
Detention_1034              3.1         424
Detention_1034              4.1         1831
Detention_1034              5.1         4754
Detention_1034              6.1         8176
Detention_1034              7.1         13522
Detention_1034              8.1         20809
Detention_1034              9.1         29436
Detention_1034              10.1        38612
Detention_1034              11.1        48467
Detention_1034              12.1        59033
Detention_1034              13.1        71277
Detention_1034              14.1        82512
Detention_1034              15.1        93549
Detention_1034              16.1        106174
Detention_1034              17.1        118781
Detention_1034              18.1        133949
Detention_1034              19.1        151789
Detention_1034              20.1        170310
Detention_1034              21.1        188516
Detention_1034              22.1        208040
Detention_1034              23.1        228578
Detention_1034              24.1        251163
Detention_1034              25.1        276144
Detention_1034              26.1        302151
Detention_1034              27.1        330485
Detention_1034              28.1        358109
Detention_1034              29.1        385094
Detention_1034              30.1        412923
Detention_1034              31.1        442194
Detention_1034              32.1        474260
Detention_1034              33.1        506539
Detention_1034              34.1        540062
Detention_1034              35.1        574977
Detention_1034              36.1        612480
;
;Water Valley South Hill Fil. 2 Pond A
Detention_1141   Storage    0           0
Detention_1141              0.52        1641
Detention_1141              1.52        25648
Detention_1141              2.52        48028
Detention_1141              3.52        74018
Detention_1141              3.9         86222
Detention_1141              4           89487
Detention_1141              4.52        106245
Detention_1141              5.02        125744
Detention_1141              5.52        145242
Detention_1141              6.52        178397
Detention_1141              7.52        222324
Detention_1141              8.52        262572
```

```
Detention_1141              9.33        298664
Detention_1141              9.52        306947
Detention_1141              10.52       347027
;
;Water Valley South Hill Fil. 2 Pond B
Detention_1155   Storage     0           0
Detention_1155              1           10116
Detention_1155              1.84        30149
Detention_1155              2           33852
Detention_1155              2.5         53923
Detention_1155              2.72        62754
Detention_1155              3           73994
Detention_1155              4           124332
Detention_1155              4.67        162297
Detention_1155              5           181280
Detention_1155              6           237143
Detention_1155              7           275455
Detention_1155              8           296426
Detention_1155              9           311356
Detention_1155              9.67        318905
Detention_1155              10          322679
;
;Hilltop Pond, data from Water Valley South HIll Fil. 2 FDR
Detention_1170   Storage     0           0
Detention_1170              0.9         89535
Detention_1170              1.38        105798
Detention_1170              1.9         123416
Detention_1170              2.43        146189
Detention_1170              2.9         166409
Detention_1170              3.45        179688
Detention_1170              4.66        190553
Detention_1170              4.9         216170
Detention_1170              5.9         228225
;
Detention_1340   Storage     0           137520
Detention_1340              1           171900
Detention_1340              2           309420
Detention_1340              3           450000
Detention_1340              4           500000
Detention_1340              5           856500
Detention_1340              6           1231680
Detention_1340              7           1674620
Detention_1340              8           2285280
Detention_1340              9           2703780
Detention_1340              10          3310000
Detention_1340              11          4235640
Detention_1340              12          4305840
Detention_1340              12.33       5000000
;
Detention_1163   Storage     0           3300
Detention_1163              1           32700
Detention_1163              2           71400
Detention_1163              6.9         252000
Detention_1163              9           260000
;
Detention_1127   Storage     0           200000
Detention_1127              1           210000
Detention_1127              4           220000
Detention_1127              10          240000
Detention_1127              15          250000
Detention_1127              18          260000

[REPORT]
;;Reporting Options
INPUT      YES
SUBCATCHMENTS ALL
```

```
NODES ALL
LINKS ALL

[TAGS]
Link       Dummy_1153       Dummy_1152

[MAP]
DIMENSIONS 3145400.318 1386770.000 3180772.682 1409658.000
Units      Feet

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
1002_Drop        3170619.149        1402564.338
1004             3169675.902        1401645.913
1006_RR          3169428.809        1401411.720
1008             3168851.250        1401189.918
1010             3168674.735        1401006.049
1012             3168039.211        1400554.818
1014             3167753.552        1400053.608
1016             3167742.617        1399994.737
1018             3167464.735        1399744.295
1020             3167206.542        1399579.227
1022             3166642.065        1399209.650
1024             3166345.932        1398969.986
1026             3166243.069        1398915.460
1028             3165721.676        1398175.698
1030             3165182.237        1397849.465
1032             3170291.764        1402598.774
1034             3164962.180        1397698.905
1036             3164804.995        1397379.277
1038             3164160.704        1397264.361
1040             3163543.265        1397159.096
1042             3162998.566        1397043.813
1044             3162506.853        1396951.740
1046             3162186.921        1396850.612
1048             3161914.795        1396591.357
109              3172493.984        1401578.256
110              3173043.879        1401167.292
1108             3168014.254        1400672.563
1110             3167389.060        1401791.532
1115             3167772.078        1400732.774
1116             3167002.137        1400457.093
1123             3166596.488        1401442.931
1124             3165892.228        1401684.092
1125             3166242.512        1402334.051
1126             3166529.823        1402745.717
1127             3166181.400        1402195.122
113              3172464.883        1401459.245
1130             3165627.108        1402465.968
1132             3164987.475        1402037.559
1139             3165354.982        1402701.320
114              3172167.781        1400707.633
1140             3164034.092        1402675.928
1141             3163816.944        1403624.146
1142             3163815.859        1404392.551
1144             3163009.111        1405544.660
1147             3162688.718        1403824.464
1148             3161973.698        1404147.059
115              3173888.360        1398653.630
1150             3161990.346        1402766.892
1151             3159922.833        1404783.678
1152             3159447.152        1404354.176
1153             3159803.781        1404773.403
1154             3159355.340        1405109.370
1156             3160414.028        1404986.553
```

3895	1164	3158849.608	1406407.727
3896	117	3173880.064	1398564.270
3897	1172	3168596.213	1401742.560
3898	118	3173540.426	1397983.668
3899	1180	3167514.718	1400032.040
3900	119	3174325.889	1397711.087
3901	1208	3165728.297	1399170.234
3902	1209	3163919.886	1400320.218
3903	121	3174273.987	1397422.746
3904	1210	3163248.197	1401455.603
3905	1215	3165126.655	1398419.867
3906	1216	3163520.212	1398828.011
3907	1217	3163868.402	1399430.293
3908	122	3173547.646	1396590.755
3909	1223	3162682.114	1399997.622
3910	1224	3161001.796	1399832.688
3911	1226	3161838.560	1400771.304
3912	1228	3162600.045	1401680.060
3913	1230	3162519.789	1399097.998
3914	1231	3160070.878	1401221.136
3915	1232	3159625.895	1400495.298
3916	1233	3159542.835	1402283.661
3917	1233_Lake	3159541.841	1401555.286
3918	1234	3159086.367	1402604.291
3919	1235	3159800.417	1402869.660
3920	1236	3159039.870	1403440.456
3921	1237	3156522.687	1403259.253
3922	1238	3156929.190	1403998.708
3923	1239	3157314.751	1401977.783
3924	1239_Lake	3157905.021	1401981.360
3925	1240	3156538.266	1401366.122
3926	1247	3157771.959	1402312.639
3927	1248	3157266.069	1402966.601
3928	1249	3156883.302	1402547.683
3929	1255	3155898.046	1402075.474
3930	1256	3155685.602	1403011.436
3931	1257	3154852.083	1402712.828
3932	1258	3154316.384	1403685.347
3933	1259	3152796.972	1402652.578
3934	126	3175177.807	1392860.319
3935	1260	3150086.735	1402714.626
3936	1264	3164392.403	1398309.340
3937	1272	3164007.677	1397483.113
3938	1273	3156478.712	1402055.941
3939	1274	3155826.533	1401770.234
3940	129	3174515.175	1397463.621
3941	130	3175024.012	1397213.094
3942	1308	3160804.774	1396052.814
3943	1310	3160242.230	1398705.345
3944	1315	3159934.517	1396941.518
3945	1316	3158833.347	1397434.801
3946	1318	3159775.515	1398648.239
3947	1319	3158330.271	1399075.426
3948	1320	3157936.527	1399775.664
3949	1321	3157712.138	1398616.006
3950	1322	3156641.872	1400097.750
3951	1323	3155503.127	1399922.384
3952	1324	3155148.743	1401513.891
3953	1327	3154755.683	1401616.430
3954	1328	3154478.348	1401747.687
3955	133	3175347.541	1395518.580
3956	1339	3156822.080	1398473.055
3957	134	3176046.522	1395289.067
3958	1341	3155638.438	1399342.483
3959	1347	3154769.311	1398497.495
3960	1348	3153791.786	1398067.739

3961	1349	3154748.653	1399004.318
3962	1351	3152674.464	1399549.808
3963	1352	3150396.734	1400285.906
3964	1353	3151953.756	1398758.487
3965	1354	3150909.875	1398142.369
3966	1355	3154031.417	1399715.290
3967	1356	3154226.809	1400801.017
3968	1357	3153310.143	1400207.459
3969	1358	3152359.903	1400190.039
3970	1361	3150350.361	1402083.521
3971	1362	3149696.145	1401445.978
3972	1363	3149352.158	1402071.015
3973	1364	3147006.365	1402094.061
3974	1367	3149312.708	1399099.909
3975	1368	3148631.549	1400837.606
3976	1371	3153950.443	1397762.773
3977	1372	3153533.264	1396596.735
3978	138	3176551.687	1393911.435
3979	1382	3161448.977	1397769.125
3980	1386	3156582.485	1397690.432
3981	1387	3157599.393	1396856.128
3982	1388	3155482.211	1395998.927
3983	139	3174134.011	1398565.223
3984	1392	3159398.721	1396211.323
3985	1393	3158014.936	1396028.718
3986	1394	3157405.455	1395275.402
3987	1395	3159776.522	1393393.754
3988	1396	3159046.679	1393384.283
3989	1398	3158330.667	1392151.754
3990	141	3174496.025	1398349.144
3991	142	3174297.914	1398269.402
3992	146	3174839.133	1398440.554
3993	149	3175446.704	1397485.654
3994	150	3175725.937	1396655.858
3995	154	3176498.594	1396447.611
3996	210	3170690.309	1401930.818
3997	220	3169872.115	1400747.295
3998	221	3171056.287	1399499.718
3999	223	3171081.746	1399216.439
4000	224	3170483.894	1398942.244
4001	225	3170963.901	1397587.279
4002	226	3170034.862	1396684.770
4003	228	3171214.344	1396795.593
4004	231	3171281.556	1399242.427
4005	232	3171867.669	1398940.478
4006	235	3171942.755	1396376.089
4007	236	3172174.394	1396173.654
4008	237	3171836.304	1396218.308
4009	239	3171819.969	1396012.369
4010	240	3171465.769	1396047.353
4011	241	3171784.721	1395004.299
4012	243	3171603.976	1394740.098
4013	244	3170474.857	1393573.365
4014	245	3170953.011	1391537.235
4015	247	3170946.356	1391350.504
4016	248	3171725.770	1391016.584
4017	250	3171382.685	1389670.473
4018	252	3170076.201	1391227.161
4019	256	3171980.985	1396009.339
4020	259	3171945.493	1394701.859
4021	260	3172640.290	1393627.377
4022	263	3171972.158	1392890.794
4023	264	3172774.124	1392301.135
4024	268	3172567.091	1391586.184
4025	310	3168953.130	1400257.600
4026	314	3169136.183	1398444.247

4027	410	3168089.460	1399719.276
4028	414	3167712.276	1399364.914
4029	418	3167365.375	1399085.796
4030	422	3166914.751	1399053.119
4031	426	3166763.787	1398251.000
4032	510	3166117.900	1398031.442
4033	513	3167650.673	1395533.607
4034	514	3168296.160	1393932.029
4035	515	3167356.285	1395990.663
4036	518	3169362.595	1394367.627
4037	610	3165533.504	1397295.929
4038	613	3166309.616	1394324.797
4039	614	3166347.111	1393268.251
4040	616	3167068.556	1393289.814
4041	617	3167612.119	1392956.618
4042	618	3168448.770	1392819.694
4043	620	3164924.133	1396914.890
4044	622	3168640.880	1391634.472
4045	708	3163545.077	1396945.746
4046	709	3163550.936	1396430.950
4047	710	3163582.859	1396183.238
4048	711	3163849.475	1395585.088
4049	712	3164170.730	1394893.693
4050	713	3164026.296	1395321.455
4051	714	3163045.486	1396594.989
4052	804	3162382.792	1396464.970
4053	808	3162610.739	1395282.210
4054	809	3162680.609	1395190.276
4055	810	3162469.592	1394272.390
4056	811	3162750.666	1395067.439
4057	819	3163126.566	1394286.019
4058	820	3164083.921	1393947.644
4059	822	3163648.877	1393689.740
4060	823	3163178.026	1393090.738
4061	824	3165084.121	1392764.753
4062	829	3163270.454	1392949.290
4063	830	3162895.806	1391990.039
4064	831	3163337.984	1392862.497
4065	834	3164022.935	1391988.122
4066	838	3164695.448	1391590.547
4067	839	3165119.889	1391258.759
4068	840	3168063.403	1389800.546
4069	841	3165119.627	1391026.960
4070	842	3167571.315	1387765.308
4071	843	3164824.235	1391480.680
4072	844	3164911.898	1389234.187
4073	850	3166245.882	1389663.232
4074	910	3161225.348	1395608.156
4075	911	3161117.215	1394387.404
4076	912	3161208.739	1393993.290
4077	929	3161263.900	1393895.839
4078	930	3161635.114	1393474.015
4079	931	3161235.574	1391541.881
4080	940	3161999.589	1390600.274
4081	950	3160517.347	1390605.001
4082	960	3159423.192	1391208.377
4083	CulvertOut_1233	3159523.545	1402209.220
4084	Drop_1030	3165691.722	1398131.004
4085	Drop_1042	3163472.613	1397160.616
4086	Drop_1046	3162458.235	1396955.357
4087	Drop_1048	3162185.125	1396835.539
4088	Drop_1115	3168029.391	1400582.607
4089	Drop_1147	3163773.451	1403634.307
4090	Drop_1151	3162332.136	1404802.293
4091	Drop_1239	3157872.354	1401990.476
4092	O_1107	3168039.352	1400578.156

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O_1263          3165149.591     1397908.586
O_1307          3161737.362     1396517.809
O_220           3169737.387     1401574.286
O_300           3168738.081     1400926.155
O_500           3165794.745     1398081.909
O_600           3165200.073     1397783.747
O_708           3163559.256     1397095.344
O_803           3161952.489     1396183.168
O_909           3161899.167     1396072.847
1006_Drop       3169659.437     1401625.509
O_100           3172504.752     1401653.256
O_1000          3170676.148     1402586.402
836             3164431.711     1391798.762
D_1141          3165103.021     1402952.973
D_1155          3162471.256     1404005.446
D_1163          3159652.335     1405404.018
D_1170          3161865.943     1405110.579
D_1233          3159677.002     1401405.656
D_1340          3156642.822     1398565.551
D_EURV_1172     3168825.491     1401238.491
D_EURV_1208     3166263.822     1399001.121
D_EURV_121      3174260.415     1397325.027
D_EURV_1264     3165115.516     1397920.588
D_EURV_1316     3158785.428     1397523.974
D_EURV_134      3175632.555     1395344.857
D_EURV_1382     3162458.912     1396993.362
D_EURV_1392     3159916.305     1396909.229
D_EURV_1395     3159671.471     1393342.721
D_EURV_146      3174624.148     1398420.296
D_EURV_150      3175560.623     1397383.387
D_EURV_225      3170950.178     1397517.525
D_EURV_236      3172016.267     1396281.106
D_EURV_244      3171210.763     1394459.955
D_EURV_245      3170947.464     1391403.517
D_EURV_256      3171838.473     1396023.236
D_EURV_263      3172000.659     1392755.751
D_EURV_510      3167572.081     1395788.438
D_EURV_614      3166218.264     1393917.524
D_EURV_618      3167399.037     1393096.411
D_EURV_711      3163719.639     1395870.550
D_EURV_820      3163530.986     1394074.960
D_EURV_830      3163169.516     1392657.127
D_EURV_840      3165918.320     1391209.888
D_EURV_842      3165608.876     1390372.489
D_EURV_844      3164949.272     1391006.307
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D_FC_1050       3161880.869     1396326.355
D_FC_134        3175488.691     1395429.004
D_FC_150        3175502.263     1397426.818
D_FC_245        3170956.964     1391476.806
D_FC_263        3171991.159     1392825.648
D_FC_510        3167420.074     1395921.445
D_FC_618        3167161.525     1393264.705
D_FC_711        3163665.350     1396051.059
D_FC_823        3163157.754     1394047.816
D_FC_838        3164615.398     1391754.130

[VERTICES]
;;Link          X-Coord           Y-Coord
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Dummy_1002      3170670.373     1402576.937
Dummy_1048      3162186.255     1396844.043
Dummy_1048      3162187.594     1396850.448
Dummy_1126      3166368.563     1402533.176
Dummy_1141      3164287.888     1403619.025
Dummy_1141      3164526.096     1403406.820
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4159	Dummy_1141	3164893.086	1403098.179
4160	Dummy_1141	3165010.314	1402993.705
4161	Dummy_1144	3162845.753	1405310.421
4162	Dummy_1150	3162663.812	1403066.900
4163	Dummy_118	3173863.043	1398495.625
4164	Dummy_118	3173850.175	1398508.480
4165	Dummy_1260	3150507.799	1402703.262
4166	Dummy_1260	3150626.357	1402655.998
4167	Dummy_1260	3150958.555	1402727.485
4168	Dummy_1260	3151604.985	1402716.380
4169	Dummy_1260	3151776.925	1402675.102
4170	Dummy_1260	3152263.353	1402776.394
4171	Dummy_1318	3159968.641	1398461.736
4172	Dummy_1362	3150103.548	1401744.948
4173	Dummy_1368	3149061.806	1399485.949
4174	Dummy_1368	3149196.742	1399131.969
4175	Dummy_260	3172073.946	1394857.871
4176	Dummy_514	3167617.462	1394642.315
4177	Dummy_514	3167540.795	1395192.423
4178	Dummy_515	3167607.369	1395650.003
4179	Dummy_518	3168439.235	1395151.633
4180	Dummy_518	3168094.922	1395389.332
4181	Dummy_518	3167637.799	1395540.026
4182	Dummy_810	3162504.273	1394740.838
4183	Dummy_830	3163117.037	1392538.598
4184	Dummy_840	3166938.664	1391078.963
4185	Dummy_842	3165872.915	1388959.357
4186	Dummy_844	3164953.929	1390984.328
4187	Dummy_960	3159826.122	1391546.682
4188	Dummy_960	3160354.259	1391540.858
4189	L_1004	3169707.159	1401765.428
4190	L_1004	3169730.143	1401868.394
4191	L_1004	3169784.384	1401984.232
4192	L_1004	3169993.995	1402069.731
4193	L_1004	3170086.848	1402150.633
4194	L_1004	3170197.170	1402210.390
4195	L_1004	3170297.378	1402326.228
4196	L_1004	3170395.748	1402470.565
4197	L_1004	3170529.973	1402526.645
4198	L_1006	3169563.828	1401496.313
4199	L_1008	3168980.391	1401240.823
4200	L_1008	3169131.680	1401257.077
4201	L_1008	3169276.591	1401327.987
4202	L_1008	3169397.337	1401374.754
4203	L_1010	3168770.347	1401090.629
4204	L_1010	3168823.669	1401188.079
4205	L_1012	3168150.449	1400592.206
4206	L_1012	3168308.356	1400688.915
4207	L_1012	3168440.454	1400743.764
4208	L_1012	3168575.446	1400860.793
4209	L_1012	3168597.510	1400943.534
4210	L_1012	3168666.132	1400966.034
4211	L_1014	3167790.326	1400230.122
4212	L_1014	3167880.422	1400316.541
4213	L_1014	3167913.518	1400456.281
4214	L_1018	3167609.008	1399837.991
4215	L_1018	3167645.070	1399893.642
4216	L_1018	3167683.682	1399945.126
4217	L_1020	3167224.929	1399654.613
4218	L_1022	3166702.741	1399301.585
4219	L_1022	3166770.773	1399364.100
4220	L_1022	3166871.065	1399418.864
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4227	L_1028	3166127.232	1398652.527
4228	L_1028	3166191.586	1398818.009
4229	L_1030	3165206.390	1397863.964
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4231	L_1030	3165428.542	1397969.642
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4233	L_1044	3162636.868	1396941.144
4234	L_1044	3162768.843	1396957.591
4235	L_1044	3162902.337	1397006.631
4236	L_1046	3162343.210	1396970.127
4237	L_1046	3162424.112	1396971.966
4238	L_1048	3162069.639	1396691.146
4239	L_1048	3162161.180	1396795.451
4240	L_1115	3167825.332	1400717.314
4241	L_1115	3167909.001	1400662.714
4242	L_1115	3167986.250	1400627.408
4243	L_1115	3168023.069	1400601.098
4244	L_1123	3166763.282	1401314.545
4245	L_1123	3166908.019	1401153.837
4246	L_1123	3166988.376	1401018.794
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4251	L_1125	3166223.364	1402282.042
4252	L_1127	3166271.447	1402085.829
4253	L_1127	3166290.626	1401960.369
4254	L_1127	3166380.592	1401780.292
4255	L_1127	3166518.892	1401622.794
4256	L_1130	3165805.076	1402288.938
4257	L_1130	3166123.806	1402212.085
4258	L_1147	3163104.180	1403853.903
4259	L_1147	3163464.840	1403835.013
4260	L_1147	3163628.956	1403725.806
4261	L_115	3173821.422	1398800.869
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4266	L_115	3173442.037	1399547.335
4267	L_115	3173377.693	1399637.405
4268	L_115	3173268.391	1399862.637
4269	L_115	3173146.127	1400023.465
4270	L_115	3173062.594	1400242.290
4271	L_115	3173062.746	1400377.504
4272	L_115	3172979.105	1400499.748
4273	L_115	3172979.229	1400609.206
4274	L_115	3172734.700	1400930.867
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4276	L_115	3172516.022	1401316.944
4277	L_1151	3160129.658	1404780.849
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4279	L_1217	3165151.343	1399183.367
4280	L_1231	3161513.369	1400293.934
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4282	L_1235	3159861.592	1402296.540
4283	L_1237	3156554.885	1402988.792
4284	L_1237	3156757.731	1402914.737
4285	L_1237	3156822.599	1402727.223
4286	L_1239	3157517.597	1401984.222
4287	L_1239	3157852.454	1401993.882
4288	L_1247	3159548.601	1402287.817
4289	L_1255	3156111.556	1402081.647
4290	L_1257	3154890.017	1402234.294

4291	L_1257	3155886.354	1402223.595
4292	L_1259	3153235.901	1402706.413
4293	L_1259	3153443.472	1402706.653
4294	L_1259	3153751.973	1402801.816
4295	L_1259	3154030.829	1402902.868
4296	L_1259	3154415.900	1402530.015
4297	L_1259	3154576.007	1402512.425
4298	L_126	3175302.256	1393545.390
4299	L_126	3175064.397	1394066.661
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4301	L_126	3174968.444	1394697.554
4302	L_126	3174833.303	1394871.248
4303	L_126	3174788.358	1395019.290
4304	L_126	3174698.281	1395147.961
4305	L_126	3174569.534	1395276.588
4306	L_126	3174518.167	1395443.940
4307	L_126	3174602.202	1395669.395
4308	L_126	3174615.221	1395785.309
4309	L_126	3174589.560	1395888.300
4310	L_126	3174609.133	1396100.804
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4312	L_126	3174557.840	1396332.543
4313	L_126	3174545.083	1396448.427
4314	L_126	3174532.229	1396480.606
4315	L_126	3174461.383	1396519.158
4316	L_126	3174397.024	1396596.349
4317	L_126	3174410.037	1396705.825
4318	L_126	3174403.754	1396847.471
4319	L_126	3174339.453	1396976.175
4320	L_126	3174333.081	1397040.554
4321	L_126	3174320.294	1397130.685
4322	L_1315	3160627.526	1396758.864
4323	L_1315	3161516.105	1396541.100
4324	L_1321	3157866.633	1398461.653
4325	L_1321	3158270.175	1398180.860
4326	L_1327	3154771.683	1401516.644
4327	L_1327	3154794.709	1399082.794
4328	L_133	3175228.455	1395635.817
4329	L_133	3175183.511	1395783.859
4330	L_133	3175119.094	1395809.540
4331	L_133	3174926.456	1396427.445
4332	L_133	3174920.238	1396627.042
4333	L_133	3174868.818	1396749.320
4334	L_133	3174894.728	1396865.249
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4336	L_133	3174701.887	1397302.866
4337	L_133	3174547.289	1397367.076
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4339	L_1357	3153632.497	1400167.769
4340	L_1357	3153677.333	1399945.811
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4342	L_1357	3153963.685	1399714.481
4343	L_1367	3150169.515	1398817.590
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4345	L_1367	3151483.986	1398625.943
4346	L_138	3176361.308	1394407.310
4347	L_138	3176290.585	1394555.322
4348	L_138	3176174.706	1394664.649
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4350	L_138	3175904.268	1394870.378
4351	L_138	3175749.831	1395076.242
4352	L_138	3175659.790	1395237.108
4353	L_1393	3158829.456	1396867.039
4354	L_149	3175323.968	1397591.897
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4361	L_154	3176115.630	1396691.375
4362	L_154	3176044.879	1396813.633
4363	L_154	3175922.533	1396903.635
4364	L_154	3175845.336	1397025.883
4365	L_154	3175742.334	1397122.345
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4368	L_221	3170139.216	1400943.140
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4371	L_228	3171051.264	1397197.878
4372	L_228	3171006.897	1397298.557
4373	L_228	3171045.607	1397440.810
4374	L_235	3171943.934	1396569.466
4375	L_235	3171705.886	1396923.327
4376	L_235	3171609.539	1397206.523
4377	L_235	3171526.168	1397567.003
4378	L_235	3171526.400	1397773.045
4379	L_235	3171513.823	1398049.900
4380	L_235	3171533.610	1398449.130
4381	L_235	3171488.636	1398571.415
4382	L_235	3171482.455	1398803.206
4383	L_241	3171854.499	1395220.900
4384	L_241	3171767.631	1395294.804
4385	L_241	3171767.787	1395433.156
4386	L_241	3171742.104	1395503.913
4387	L_241	3171790.795	1395845.024
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4391	L_245	3170867.706	1393335.583
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4394	L_245	3171203.646	1394063.559
4395	L_245	3171255.423	1394256.784
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4397	L_245	3171423.308	1394546.724
4398	L_245	3171519.917	1394495.326
4399	L_250	3171531.201	1389928.197
4400	L_250	3171454.835	1390784.474
4401	L_263	3171945.763	1392987.527
4402	L_263	3171934.731	1393156.686
4403	L_263	3171975.182	1393296.426
4404	L_263	3171997.246	1393483.973
4405	L_263	3171986.214	1393653.132
4406	L_263	3172008.322	1393814.704
4407	L_263	3172000.924	1393936.290
4408	L_263	3172040.895	1394123.806
4409	L_263	3172063.439	1394329.770
4410	L_263	3171931.905	1394625.909
4411	L_268	3172301.162	1391913.970
4412	L_268	3172121.186	1392332.287
4413	L_314	3169163.326	1398591.530
4414	L_314	3169099.195	1398835.987
4415	L_314	3169105.921	1399086.962
4416	L_314	3169044.877	1399215.592
4417	L_314	3169099.828	1399395.836
4418	L_314	3169141.989	1399656.503
4419	L_314	3169113.183	1399814.129
4420	L_314	3169113.492	1400087.618
4421	L_314	3169039.653	1400290.235
4422	L_314	3168985.012	1400383.481

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L_613              3165304.419        1396481.036
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L_613              3165194.097        1397426.122
L_622              3168553.129        1391881.156
L_622              3168360.127        1392177.121
L_622              3168224.996        1392357.253
L_622              3168077.069        1392621.072
L_622              3167626.199        1392839.473
L_808              3162548.726        1395451.782
L_808              3162358.869        1395580.263
L_808              3162352.645        1395770.088
L_819              3162977.717        1394783.213
L_822              3163291.565        1393821.246
L_823              3163152.532        1393328.805
L_834              3163524.959        1392573.517
L_850              3165906.010        1389732.055
L_911              3161372.649        1394755.073
L_911              3161826.698        1395069.642
L_911              3162053.616        1395504.692
L_911              3161862.393        1395740.044
L_912              3161028.084        1394236.204
L_931              3160738.116        1392175.320
L_931              3161261.052        1393094.358
L_931              3161314.825        1393444.018
Overflow_836       3164268.225        1391934.133
Overflow_836       3164107.375        1391999.868
O_EURV_840         3165120.280        1391264.177
O_FC_1050          3161919.025        1396423.265
Outlet_1170        3162448.292        1404851.295

[Polygons]
;;Storage Node    X-Coord            Y-Coord
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D_1141             3165103.021        1402952.973
D_1155             3162471.256        1404005.446
D_1163             3159652.335        1405404.018
D_1170             3161865.943        1405110.579
D_1233             3159677.002        1401405.656
D_1340             3156642.822        1398565.551
D_EURV_1172        3168825.491        1401238.491
D_EURV_1208        3166263.822        1399001.121
D_EURV_121         3174260.415        1397325.027
D_EURV_1264        3165115.516        1397920.588
D_EURV_1316        3158785.428        1397523.974
D_EURV_134         3175632.555        1395344.857
D_EURV_1382        3162458.912        1396993.362
D_EURV_1392        3159916.305        1396909.229
D_EURV_1395        3159671.471        1393342.721
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D_EURV_146      3174624.148     1398420.296
D_EURV_150      3175560.623     1397383.387
D_EURV_225      3170950.178     1397517.525
D_EURV_236      3172016.267     1396281.106
D_EURV_244      3171210.763     1394459.955
D_EURV_245      3170947.464     1391403.517
D_EURV_256      3171838.473     1396023.236
D_EURV_263      3172000.659     1392755.751
D_EURV_510      3167572.081     1395788.438
D_EURV_614      3166218.264     1393917.524
D_EURV_618      3167399.037     1393096.411
D_EURV_711      3163719.639     1395870.550
D_EURV_820      3163530.986     1394074.960
D_EURV_830      3163176.755     1392655.318
D_EURV_830      3163165.897     1392658.032
D_EURV_830      3163165.897     1392658.032
D_EURV_840      3165918.320     1391209.888
D_EURV_842      3165608.876     1390372.489
D_EURV_844      3164949.272     1391006.307
D_FC__842       3165420.224     1390658.861
D_FC_1050       3161880.869     1396326.355
D_FC_134        3175488.691     1395429.004
D_FC_150        3175502.263     1397426.818
D_FC_245        3170956.964     1391476.806
D_FC_263        3171991.159     1392825.648
D_FC_510        3167420.074     1395921.445
D_FC_618        3167161.525     1393264.705
D_FC_711        3163665.350     1396051.059
D_FC_823        3163157.754     1394047.816
D_FC_838        3164615.398     1391754.130

[BACKDROP]
FILE       "R:\24.906.009 Greeley - Oklahoma Master Basin Study\200 Design\220 Drainage-WR\221 Models\01 CUHP_SWMM\02 SWMM\07 Concept Design\00 Background\2024_10_017 Subbasins.jpg"
DIMENSIONS 3145400.318 1386770.000 3180772.682 1409658.000
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APPENDIX F-4
Master Plan SWMM Output

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EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)
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City of Greeley
Comprehensive Drainage Plan Oklahoma Basins
Concept Design

*************
Element Count
*************
Number of rain gages ...... 0
Number of subcatchments ... 0
Number of nodes ........... 307
Number of links ........... 306
Number of pollutants ...... 0
Number of land uses ....... 0


************
Node Summary
************
                                    Invert      Max.    Ponded    External
Name                 Type            Elev.     Depth      Area    Inflow
-----------------------------------------------------------------------------
1002_Drop            JUNCTION      4759.00     20.00       0.0
1004                 JUNCTION      4769.00     20.00       0.0
1006_RR              JUNCTION      4772.00     30.00       0.0
1008                 JUNCTION      4774.00     20.00       0.0
1010                 JUNCTION      4774.90     30.00       0.0
1012                 JUNCTION      4777.90     30.00       0.0
1014                 JUNCTION      4779.00     30.00       0.0
1016                 JUNCTION      4781.00     20.00       0.0
1018                 JUNCTION      4782.00     20.00       0.0
1020                 JUNCTION      4784.00     20.00       0.0
1022                 JUNCTION      4789.00     20.00       0.0
1024                 JUNCTION      4792.00     20.00       0.0
1026                 JUNCTION      4793.00     20.00       0.0
1028                 JUNCTION      4802.90     20.00       0.0
1030                 JUNCTION      4811.90     20.00       0.0
1032                 JUNCTION      4770.00      0.00       0.0
1034                 JUNCTION      4814.90     20.00       0.0
1036                 JUNCTION      4818.00     20.00       0.0
1038                 JUNCTION      4821.00     20.00       0.0
1040                 JUNCTION      4827.90     20.00       0.0
1042                 JUNCTION      4838.00     20.00       0.0
1044                 JUNCTION      4844.00     20.00       0.0
1046                 JUNCTION      4851.00     20.00       0.0
1048                 JUNCTION      4855.00     20.00       0.0
109                  JUNCTION      4779.00     10.00       0.0
110                  JUNCTION      4794.00      0.00       0.0
1108                 JUNCTION      4816.00      0.00       0.0
1110                 JUNCTION      4855.00      0.00       0.0
1115                 JUNCTION      4790.00     10.00       0.0
1116                 JUNCTION      4850.00      0.00       0.0
1123                 JUNCTION      4825.00     10.00       0.0
1124                 JUNCTION      4864.00      0.00       0.0
1125                 JUNCTION      4852.00     10.00       0.0
1126                 JUNCTION      4864.00      0.00       0.0
1127                 JUNCTION      4841.00     10.00       0.0
113                  JUNCTION      4784.00     10.00       0.0
1130                 JUNCTION      4854.00     10.00       0.0
1132                 JUNCTION      4874.00      0.00       0.0
1139                 JUNCTION      4857.00      0.00       0.0
114                  JUNCTION      4798.00      0.00       0.0
1140                 JUNCTION      4879.00      0.00       0.0
```

67	1141	JUNCTION	4878.00	0.00	0.0
68	1142	JUNCTION	4902.00	0.00	0.0
69	1144	JUNCTION	4925.00	0.00	0.0
70	1147	JUNCTION	4893.00	10.00	0.0
71	1148	JUNCTION	4946.00	10.00	0.0
72	115	JUNCTION	4816.70	10.00	0.0
73	1150	JUNCTION	4955.00	0.00	0.0
74	1151	JUNCTION	4941.00	10.00	0.0
75	1152	JUNCTION	4966.00	0.00	0.0
76	1153	JUNCTION	4943.00	0.00	0.0
77	1154	JUNCTION	4976.00	0.00	0.0
78	1156	JUNCTION	4935.00	0.00	0.0
79	1164	JUNCTION	4958.00	0.00	0.0
80	117	JUNCTION	4818.00	10.00	0.0
81	1172	JUNCTION	4832.00	0.00	0.0
82	118	JUNCTION	4830.00	0.00	0.0
83	1180	JUNCTION	4838.00	0.00	0.0
84	119	JUNCTION	4834.00	10.00	0.0
85	1208	JUNCTION	4868.00	10.00	0.0
86	1209	JUNCTION	4877.00	10.00	0.0
87	121	JUNCTION	4835.00	0.00	0.0
88	1210	JUNCTION	4889.00	0.00	0.0
89	1215	JUNCTION	4868.00	10.00	0.0
90	1216	JUNCTION	4882.00	0.00	0.0
91	1217	JUNCTION	4873.00	10.00	0.0
92	122	JUNCTION	4983.00	10.00	0.0
93	1223	JUNCTION	4880.00	10.00	0.0
94	1224	JUNCTION	4890.00	0.00	0.0
95	1226	JUNCTION	4895.00	10.00	0.0
96	1228	JUNCTION	4903.00	0.00	0.0
97	1230	JUNCTION	4883.00	0.00	0.0
98	1231	JUNCTION	4908.00	10.00	0.0
99	1232	JUNCTION	4955.00	0.00	0.0
100	1233	JUNCTION	4917.00	10.00	0.0
101	1233_Lake	JUNCTION	4911.00	10.00	0.0
102	1234	JUNCTION	4960.00	0.00	0.0
103	1235	JUNCTION	4941.00	10.00	0.0
104	1236	JUNCTION	4998.00	0.00	0.0
105	1237	JUNCTION	4973.00	10.00	0.0
106	1238	JUNCTION	5005.00	0.00	0.0
107	1239	JUNCTION	4954.00	10.00	0.0
108	1239_Lake	JUNCTION	4941.00	0.00	0.0
109	1240	JUNCTION	4981.00	0.00	0.0
110	1247	JUNCTION	4946.00	11.00	0.0
111	1248	JUNCTION	4967.00	0.00	0.0
112	1249	JUNCTION	4957.00	10.00	0.0
113	1255	JUNCTION	4965.00	10.00	0.0
114	1256	JUNCTION	4993.00	0.00	0.0
115	1257	JUNCTION	4970.00	10.00	0.0
116	1258	JUNCTION	4989.00	0.00	0.0
117	1259	JUNCTION	4990.00	10.00	0.0
118	126	JUNCTION	4999.00	10.00	0.0
119	1260	JUNCTION	5019.00	0.00	0.0
120	1264	JUNCTION	4876.00	0.00	0.0
121	1272	JUNCTION	4880.00	0.00	0.0
122	1273	JUNCTION	4959.00	10.00	0.0
123	1274	JUNCTION	4978.00	0.00	0.0
124	129	JUNCTION	4835.00	10.00	0.0
125	130	JUNCTION	4910.00	0.00	0.0
126	1308	JUNCTION	4891.00	0.00	0.0
127	1310	JUNCTION	4912.00	0.00	0.0
128	1315	JUNCTION	4893.00	10.00	0.0
129	1316	JUNCTION	4904.00	10.00	0.0
130	1318	JUNCTION	4923.00	0.00	0.0
131	1319	JUNCTION	4929.00	10.00	0.0
132	1320	JUNCTION	4970.00	0.00	0.0

133	1321	JUNCTION	4931.00	10.00	0.0
134	1322	JUNCTION	4975.00	0.00	0.0
135	1323	JUNCTION	4966.00	10.00	0.0
136	1324	JUNCTION	4975.00	0.00	0.0
137	1327	JUNCTION	4984.00	1.00	0.0
138	1328	JUNCTION	4989.00	0.00	0.0
139	133	JUNCTION	4917.00	10.00	0.0
140	1339	JUNCTION	4933.66	10.00	0.0
141	134	JUNCTION	4945.00	0.00	0.0
142	1341	JUNCTION	4957.00	10.00	0.0
143	1347	JUNCTION	4949.00	10.00	0.0
144	1348	JUNCTION	4981.00	0.00	0.0
145	1349	JUNCTION	4952.00	10.00	0.0
146	1351	JUNCTION	4979.00	10.00	0.0
147	1352	JUNCTION	5019.00	0.00	0.0
148	1353	JUNCTION	4985.00	10.00	0.0
149	1354	JUNCTION	5028.00	0.00	0.0
150	1355	JUNCTION	4971.00	10.00	0.0
151	1356	JUNCTION	4989.00	0.00	0.0
152	1357	JUNCTION	4981.00	10.00	0.0
153	1358	JUNCTION	4993.00	0.00	0.0
154	1361	JUNCTION	5024.00	10.00	0.0
155	1362	JUNCTION	5035.00	0.00	0.0
156	1363	JUNCTION	5038.00	10.00	0.0
157	1364	JUNCTION	5058.00	0.00	0.0
158	1367	JUNCTION	5033.00	10.00	0.0
159	1368	JUNCTION	5059.00	0.00	0.0
160	1371	JUNCTION	4971.00	10.00	0.0
161	1372	JUNCTION	4988.00	0.00	0.0
162	138	JUNCTION	4970.00	10.00	0.0
163	1382	JUNCTION	4921.00	0.00	0.0
164	1386	JUNCTION	4960.00	0.00	0.0
165	1387	JUNCTION	4943.00	10.00	0.0
166	1388	JUNCTION	4995.00	0.00	0.0
167	139	JUNCTION	4817.00	10.00	0.0
168	1392	JUNCTION	4938.00	0.00	0.0
169	1393	JUNCTION	4940.00	10.00	0.0
170	1394	JUNCTION	4997.00	0.00	0.0
171	1395	JUNCTION	4947.00	10.00	0.0
172	1396	JUNCTION	4969.00	0.00	0.0
173	1398	JUNCTION	4972.00	0.00	0.0
174	141	JUNCTION	4827.00	10.00	0.0
175	142	JUNCTION	4820.00	0.00	0.0
176	146	JUNCTION	4849.00	10.00	0.0
177	149	JUNCTION	4869.00	10.00	0.0
178	150	JUNCTION	4890.00	0.00	0.0
179	154	JUNCTION	4904.00	10.00	0.0
180	210	JUNCTION	4770.00	0.00	0.0
181	220	JUNCTION	4777.00	0.00	0.0
182	221	JUNCTION	4790.60	10.00	0.0
183	223	JUNCTION	4793.00	10.00	0.0
184	224	JUNCTION	4810.00	0.00	0.0
185	225	JUNCTION	4840.00	10.00	0.0
186	226	JUNCTION	4850.00	0.00	0.0
187	228	JUNCTION	4864.00	10.00	0.0
188	231	JUNCTION	4790.80	10.00	0.0
189	232	JUNCTION	4810.00	0.00	0.0
190	235	JUNCTION	4845.00	10.00	0.0
191	236	JUNCTION	4847.00	0.00	0.0
192	237	JUNCTION	4846.00	10.00	0.0
193	239	JUNCTION	4850.00	10.00	0.0
194	240	JUNCTION	4849.00	0.00	0.0
195	241	JUNCTION	4862.00	10.00	0.0
196	243	JUNCTION	4863.00	10.00	0.0
197	244	JUNCTION	4894.00	0.00	0.0
198	245	JUNCTION	4980.00	10.00	0.0

199	247	JUNCTION	4981.00	10.00	0.0
200	248	JUNCTION	4986.00	0.00	0.0
201	250	JUNCTION	5015.00	10.00	0.0
202	252	JUNCTION	4990.00	0.00	0.0
203	256	JUNCTION	4851.00	0.00	0.0
204	259	JUNCTION	4863.00	10.00	0.0
205	260	JUNCTION	4905.00	0.00	0.0
206	263	JUNCTION	4922.00	10.00	0.0
207	264	JUNCTION	4991.00	0.00	0.0
208	268	JUNCTION	4991.00	10.00	0.0
209	310	JUNCTION	4778.10	0.00	0.0
210	314	JUNCTION	4839.00	10.00	0.0
211	410	JUNCTION	4793.00	0.00	0.0
212	414	JUNCTION	4796.00	0.00	0.0
213	418	JUNCTION	4802.00	0.00	0.0
214	422	JUNCTION	4800.00	0.00	0.0
215	426	JUNCTION	4810.00	0.00	0.0
216	510	JUNCTION	4856.00	0.00	0.0
217	513	JUNCTION	4880.00	0.00	0.0
218	514	JUNCTION	4931.00	0.00	0.0
219	515	JUNCTION	4879.00	10.00	0.0
220	518	JUNCTION	4940.00	0.00	0.0
221	610	JUNCTION	4858.00	0.00	0.0
222	613	JUNCTION	4888.00	10.00	0.0
223	614	JUNCTION	4899.00	0.00	0.0
224	616	JUNCTION	4941.00	10.00	0.0
225	617	JUNCTION	4942.00	10.00	0.0
226	618	JUNCTION	4950.00	0.00	0.0
227	620	JUNCTION	4920.00	0.00	0.0
228	622	JUNCTION	4981.00	10.00	0.0
229	708	JUNCTION	4851.00	10.00	0.0
230	709	JUNCTION	4866.00	10.00	0.0
231	710	JUNCTION	4871.00	10.00	0.0
232	711	JUNCTION	4889.00	10.00	0.0
233	712	JUNCTION	4915.00	10.00	0.0
234	713	JUNCTION	4898.00	10.00	0.0
235	714	JUNCTION	4864.00	0.00	0.0
236	804	JUNCTION	4882.00	0.00	0.0
237	808	JUNCTION	4885.00	15.00	0.0
238	809	JUNCTION	4890.00	15.00	0.0
239	810	JUNCTION	4925.00	0.00	0.0
240	811	JUNCTION	4893.00	10.00	0.0
241	819	JUNCTION	4901.00	10.00	0.0
242	820	JUNCTION	4945.00	0.00	0.0
243	822	JUNCTION	4932.00	10.00	0.0
244	823	JUNCTION	4908.00	10.00	0.0
245	824	JUNCTION	4961.00	10.00	0.0
246	829	JUNCTION	4918.00	15.00	0.0
247	830	JUNCTION	4972.00	0.00	0.0
248	831	JUNCTION	4928.50	15.00	0.0
249	834	JUNCTION	4932.00	15.00	0.0
250	838	JUNCTION	4949.00	15.00	0.0
251	839	JUNCTION	4965.00	15.00	0.0
252	840	JUNCTION	4990.00	0.00	0.0
253	841	JUNCTION	4967.00	10.00	0.0
254	842	JUNCTION	5000.00	0.00	0.0
255	843	JUNCTION	4959.00	15.00	0.0
256	844	JUNCTION	4995.00	0.00	0.0
257	850	JUNCTION	4990.00	10.00	0.0
258	910	JUNCTION	4916.00	0.00	0.0
259	911	JUNCTION	4913.00	10.00	0.0
260	912	JUNCTION	4920.00	10.00	0.0
261	929	JUNCTION	4922.00	10.00	0.0
262	930	JUNCTION	4927.00	0.00	0.0
263	931	JUNCTION	4954.00	10.00	0.0
264	940	JUNCTION	4986.00	0.00	0.0

265	950	JUNCTION	4977.00	0.00	0.0
266	960	JUNCTION	4970.00	0.00	0.0
267	CulvertOut_1233	JUNCTION	4914.00	10.00	0.0
268	Drop_1030	JUNCTION	4808.00	20.00	0.0
269	Drop_1042	JUNCTION	4830.90	20.00	0.0
270	Drop_1046	JUNCTION	4850.00	20.00	0.0
271	Drop_1048	JUNCTION	4854.00	20.00	0.0
272	Drop_1115	JUNCTION	4786.00	10.00	0.0
273	Drop_1147	JUNCTION	4884.00	10.00	0.0
274	Drop_1151	JUNCTION	4911.00	10.00	0.0
275	Drop_1239	JUNCTION	4951.00	10.00	0.0
276	O_1107	JUNCTION	4778.00	0.00	0.0
277	O_1263	JUNCTION	4858.00	0.00	0.0
278	O_1307	JUNCTION	4865.00	10.00	0.0
279	O_220	JUNCTION	4772.00	10.00	0.0
280	O_300	JUNCTION	4778.00	10.00	0.0
281	O_500	JUNCTION	4826.00	10.00	0.0
282	O_600	JUNCTION	4815.00	10.00	0.0
283	O_708	JUNCTION	4828.00	10.00	0.0
284	O_803	JUNCTION	4865.00	10.00	0.0
285	O_909	JUNCTION	4865.00	10.00	0.0
286	1006_Drop	JUNCTION	4770.00	30.00	0.0
287	O_100	OUTFALL	4778.00	0.00	0.0
288	O_1000	OUTFALL	4756.00	0.00	0.0
289	836	DIVIDER	4945.00	15.00	0.0
290	D_1141	STORAGE	4858.00	10.52	0.0
291	D_1155	STORAGE	4893.00	10.00	0.0
292	D_1163	STORAGE	4943.00	9.00	0.0
293	D_1170	STORAGE	4901.10	5.90	0.0
294	D_1233	STORAGE	4908.00	9.00	0.0
295	D_1340	STORAGE	4933.66	12.33	0.0
296	D_EURV_1172	STORAGE	4775.00	10.00	0.0
297	D_EURV_1208	STORAGE	4793.00	10.00	0.0
298	D_EURV_121	STORAGE	4835.00	10.00	0.0
299	D_EURV_1264	STORAGE	4858.00	10.00	0.0
300	D_EURV_1316	STORAGE	4905.00	10.00	0.0
301	D_EURV_134	STORAGE	4940.00	10.00	0.0
302	D_EURV_1382	STORAGE	4945.00	10.00	0.0
303	D_EURV_1392	STORAGE	4894.00	10.00	0.0
304	D_EURV_1395	STORAGE	4947.00	10.00	0.0
305	D_EURV_146	STORAGE	4827.00	10.00	0.0
306	D_EURV_150	STORAGE	4870.00	10.00	0.0
307	D_EURV_225	STORAGE	4840.00	10.00	0.0
308	D_EURV_236	STORAGE	4846.00	10.00	0.0
309	D_EURV_244	STORAGE	4863.00	10.00	0.0
310	D_EURV_245	STORAGE	4980.00	10.00	0.0
311	D_EURV_256	STORAGE	4851.50	10.00	0.0
312	D_EURV_263	STORAGE	4922.00	10.00	0.0
313	D_EURV_510	STORAGE	4879.00	10.00	0.0
314	D_EURV_614	STORAGE	4889.00	10.00	0.0
315	D_EURV_618	STORAGE	4941.00	10.00	0.0
316	D_EURV_711	STORAGE	4880.00	10.00	0.0
317	D_EURV_820	STORAGE	4931.00	10.00	0.0
318	D_EURV_830	STORAGE	4935.00	10.00	0.0
319	D_EURV_840	STORAGE	4965.00	10.00	0.0
320	D_EURV_842	STORAGE	4967.00	10.00	0.0
321	D_EURV_844	STORAGE	4977.00	10.00	0.0
322	D_FC__842	STORAGE	4967.00	10.00	0.0
323	D_FC_1050	STORAGE	4855.00	10.00	0.0
324	D_FC_134	STORAGE	4939.00	10.00	0.0
325	D_FC_150	STORAGE	4869.00	10.00	0.0
326	D_FC_245	STORAGE	4980.00	10.00	0.0
327	D_FC_263	STORAGE	4922.00	10.00	0.0
328	D_FC_510	STORAGE	4879.00	10.00	0.0
329	D_FC_618	STORAGE	4941.00	10.00	0.0
330	D_FC_711	STORAGE	4875.00	10.00	0.0

D_FC_823	STORAGE	4905.00	10.00	0.0	
D_FC_838	STORAGE	4948.00	10.00	0.0	

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Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
Dummy_1002	1002_Drop	O_1000	CONDUIT	400.0	0.7500	0.0440
Dummy_1030	Drop_1030	1028	CONDUIT	400.0	1.2751	0.0100
Dummy_1032	1032	1002_Drop	CONDUIT	400.0	2.7510	0.0350
Dummy_1042	Drop_1042	1040	CONDUIT	400.0	0.7500	0.0100
Dummy_1046	Drop_1046	1044	CONDUIT	400.0	1.5002	0.0100
Dummy_1048	Drop_1048	1046	CONDUIT	400.0	0.7500	0.0100
Dummy_109	109	O_100	CONDUIT	400.0	0.2500	0.0100
Dummy_110	110	109	CONDUIT	400.0	3.7526	0.0100
Dummy_1107	O_1107	1012	CONDUIT	400.0	0.0250	0.0100
Dummy_1108	1108	O_1107	CONDUIT	400.0	9.5432	0.0350
Dummy_1110	1110	1115	CONDUIT	400.0	16.4689	0.0350
Dummy_1115	Drop_1115	O_1107	CONDUIT	400.0	2.0004	0.0350
Dummy_1116	1116	1115	CONDUIT	400.0	15.1717	0.0350
Dummy_1124	1124	1123	CONDUIT	400.0	9.7967	0.0350
Dummy_1126	1126	1125	CONDUIT	400.0	3.0014	0.0350
Dummy_1132	1132	1130	CONDUIT	400.0	5.0063	0.0350
Dummy_1139	1139	1130	CONDUIT	300.0	1.0001	0.0130
Dummy_114	114	113	CONDUIT	400.0	3.5021	0.0100
Dummy_1140	1140	D_1141	CONDUIT	400.0	5.2573	0.0350
Dummy_1141	1141	D_1141	CONDUIT	1900.0	1.0527	0.0550
Dummy_1142	1142	1141	CONDUIT	400.0	6.0108	0.0350
Dummy_1144	1144	D_1155	CONDUIT	400.0	8.0257	0.0350
Dummy_1147	Drop_1147	1141	CONDUIT	400.0	1.5002	0.0350
Dummy_1148	1148	D_1155	CONDUIT	400.0	13.3679	0.0350
Dummy_1150	1150	1147	CONDUIT	400.0	15.6896	0.0350
Dummy_1151	Drop_1151	D_1155	CONDUIT	400.0	4.5046	0.0350
Dummy_1152	1152	1151	CONDUIT	400.0	6.2622	0.0100
Dummy_1153	1153	1151	CONDUIT	400.0	0.5000	0.0350
Dummy_1154	1154	D_1163	CONDUIT	400.0	8.2782	0.0350
Dummy_1156	1156	D_1170	CONDUIT	400.0	8.5056	0.0350
Dummy_1164	1164	D_1163	CONDUIT	400.0	3.7526	0.0350
Dummy_1172	1172	D_EURV_1172	CONDUIT	400.0	14.3969	0.0350
Dummy_118	118	117	CONDUIT	400.0	3.0014	0.0100
Dummy_1180	1180	1016	CONDUIT	400.0	14.3969	0.0350
Dummy_1208	1208	D_EURV_1208	CONDUIT	400.0	19.0885	0.0350
Dummy_121	121	119	CONDUIT	400.0	0.2500	0.0100
Dummy_1210	1210	1209	CONDUIT	400.0	3.0014	0.0350
Dummy_1215	1215	O_1263	CONDUIT	1937.8	0.5161	0.0100
Dummy_1216	1216	1217	CONDUIT	400.0	2.2506	0.0350
Dummy_122	122	D_EURV_121	CONDUIT	400.0	39.8264	0.0100
Dummy_1224	1224	1223	CONDUIT	400.0	2.5008	0.0350
Dummy_1226	1226	1223	CONDUIT	400.0	3.7526	0.0350
Dummy_1228	1228	1223	CONDUIT	400.0	5.7595	0.0350
Dummy_1230	1230	1223	CONDUIT	400.0	0.7500	0.0350
Dummy_1232	1232	1231	CONDUIT	400.0	11.8320	0.0350
Dummy_1233	1233	CulvertOut_1233	CONDUIT	400.0	0.7500	0.0350
Dummy_1233_Lake	1233_Lake	D_1233	CONDUIT	400.0	0.7500	0.0100
Dummy_1234	1234	1233	CONDUIT	400.0	10.8127	0.0100
Dummy_1236	1236	1235	CONDUIT	400.0	14.3969	0.0100
Dummy_1238	1238	1237	CONDUIT	400.0	8.0257	0.0100
Dummy_1239	Drop_1239	1239_Lake	CONDUIT	400.0	2.5008	0.0350
Dummy_1239_Lake	1239_Lake	D_1233	CONDUIT	400.0	8.2782	0.0100
Dummy_1240	1240	1239	CONDUIT	400.0	6.7654	0.0100
Dummy_1248	1248	1247	CONDUIT	400.0	5.2573	0.0100
Dummy_1249	1249	1247	CONDUIT	400.0	2.7510	0.0100
Dummy_1256	1256	1255	CONDUIT	400.0	7.0172	0.0100
Dummy_1258	1258	1257	CONDUIT	400.0	4.7554	0.0100

397	Dummy_1260	1260	1259	CONDUIT	400.0	7.2691	0.0100
398	Dummy_1263	O_1263	1030	CONDUIT	400.0	11.6023	0.0100
399	Dummy_1264	1264	D_EURV_1264	CONDUIT	400.0	4.5046	0.0350
400	Dummy_1272	1272	1038	CONDUIT	400.0	14.9131	0.0350
401	Dummy_1274	1274	1273	CONDUIT	400.0	4.7554	0.0100
402	Dummy_129	129	119	CONDUIT	400.0	0.2500	0.0100
403	Dummy_130	130	129	CONDUIT	400.0	19.0885	0.0100
404	Dummy_1307	O_1307	D_FC_1050	CONDUIT	400.0	2.5008	0.0100
405	Dummy_1308	1308	O_1307	CONDUIT	400.0	6.5138	0.0100
406	Dummy_1310	1310	1315	CONDUIT	400.0	4.7554	0.0100
407	Dummy_1318	1318	1315	CONDUIT	400.0	7.5212	0.0100
408	Dummy_1320	1320	1319	CONDUIT	400.0	10.3043	0.0100
409	Dummy_1322	1322	1321	CONDUIT	400.0	11.0672	0.0100
410	Dummy_1324	1324	1323	CONDUIT	400.0	2.2506	0.0100
411	Dummy_1328	1328	1327	CONDUIT	400.0	1.2501	0.0100
412	Dummy_1337	1347	D_1340	CONDUIT	400.0	3.8378	0.0100
413	Dummy_134	134	D_EURV_134	CONDUIT	400.0	1.2501	0.0100
414	Dummy_1341	1341	D_1340	CONDUIT	400.0	5.8450	0.0100
415	Dummy_1348	1348	1347	CONDUIT	400.0	8.0257	0.0100
416	Dummy_1349	1349	D_1340	CONDUIT	400.0	4.5898	0.0100
417	Dummy_1352	1352	1351	CONDUIT	400.0	10.0504	0.0100
418	Dummy_1354	1354	1353	CONDUIT	400.0	10.8127	0.0100
419	Dummy_1356	1356	1355	CONDUIT	400.0	4.5046	0.0100
420	Dummy_1358	1358	1357	CONDUIT	400.0	3.0014	0.0100
421	Dummy_1362	1362	1361	CONDUIT	400.0	2.7510	0.0100
422	Dummy_1364	1364	1363	CONDUIT	400.0	5.0063	0.0100
423	Dummy_1368	1368	1367	CONDUIT	400.0	6.5138	0.0100
424	Dummy_1372	1372	1371	CONDUIT	400.0	4.2538	0.0100
425	Dummy_1382	1382	D_EURV_1382	CONDUIT	400.0	-6.0108	0.0100
426	Dummy_1386	1386	D_1340	CONDUIT	400.0	6.5993	0.0100
427	Dummy_1388	1388	1387	CONDUIT	400.0	13.1113	0.0100
428	Dummy_1392	1392	D_EURV_1392	CONDUIT	400.0	11.0672	0.0100
429	Dummy_1394	1394	1393	CONDUIT	400.0	14.3969	0.0100
430	Dummy_1396	1396	D_EURV_1395	CONDUIT	400.0	5.5083	0.0100
431	Dummy_1398	1398	D_EURV_1395	CONDUIT	400.0	6.2622	0.0100
432	Dummy_142	142	139	CONDUIT	400.0	0.7500	0.0100
433	Dummy_150	150	D_EURV_150	CONDUIT	400.0	5.0063	0.0100
434	Dummy_210	210	1002_Drop	CONDUIT	400.0	2.7510	0.0350
435	Dummy_219	O_220	1004	CONDUIT	400.0	0.7500	0.0350
436	Dummy_220	220	O_220	CONDUIT	400.0	1.2501	0.0100
437	Dummy_223	223	221	CONDUIT	400.0	0.6000	0.0100
438	Dummy_224	224	223	CONDUIT	400.0	4.2538	0.0100
439	Dummy_226	226	D_EURV_225	CONDUIT	400.0	2.5008	0.0100
440	Dummy_231	231	221	CONDUIT	400.0	0.0500	0.0100
441	Dummy_232	232	231	CONDUIT	400.0	4.8055	0.0100
442	Dummy_236	236	D_EURV_236	CONDUIT	400.0	0.2500	0.0100
443	Dummy_237	237	235	CONDUIT	400.0	0.2500	0.0100
444	Dummy_240	240	237	CONDUIT	400.0	0.7500	0.0100
445	Dummy_243	243	241	CONDUIT	400.0	0.2500	0.0100
446	Dummy_244	244	D_EURV_244	CONDUIT	400.0	7.7734	0.0100
447	Dummy_247	247	D_EURV_245	CONDUIT	400.0	0.2500	0.0100
448	Dummy_248	248	247	CONDUIT	400.0	1.2501	0.0100
449	Dummy_252	252	D_EURV_245	CONDUIT	400.0	2.5008	0.0100
450	Dummy_256	256	D_EURV_256	CONDUIT	400.0	-0.1250	0.0100
451	Dummy_259	259	241	CONDUIT	400.0	0.2500	0.0100
452	Dummy_260	260	259	CONDUIT	400.0	10.5584	0.0100
453	Dummy_264	264	D_EURV_263	CONDUIT	400.0	17.5125	0.0100
454	Dummy_300	O_300	1010	CONDUIT	400.0	0.7750	0.0100
455	Dummy_310	310	O_300	CONDUIT	400.0	0.0250	0.0350
456	Dummy_410	410	1014	CONDUIT	400.0	3.5021	0.0100
457	Dummy_414	414	1018	CONDUIT	400.0	3.5021	0.0100
458	Dummy_418	418	1020	CONDUIT	400.0	4.5046	0.0100
459	Dummy_422	422	1022	CONDUIT	400.0	2.7510	0.0100
460	Dummy_426	426	1026	CONDUIT	400.0	4.2538	0.0100
461	Dummy_500	O_500	1028	CONDUIT	400.0	5.7847	0.0100
462	Dummy_510	510	O_500	CONDUIT	400.0	7.5212	0.0100

463	Dummy_514	514	513	CONDUIT	400.0	12.8549	0.0100
464	Dummy_515	513	D_EURV_510	CONDUIT	400.0	0.2500	0.0100
465	Dummy_518	518	513	CONDUIT	400.0	15.1717	0.0100
466	Dummy_600	O_600	1030	CONDUIT	400.0	0.7750	0.0100
467	Dummy_610	610	O_600	CONDUIT	400.0	10.8127	0.0100
468	Dummy_614	614	D_EURV_614	CONDUIT	400.0	2.5008	0.0100
469	Dummy_617	617	D_EURV_618	CONDUIT	400.0	0.2500	0.0100
470	Dummy_618	618	617	CONDUIT	400.0	2.0004	0.0100
471	Dummy_620	620	1036	CONDUIT	400.0	26.3718	0.0100
472	Dummy_708	O_708	1040	CONDUIT	400.0	0.0250	0.0100
473	Dummy_714	714	1042	CONDUIT	400.0	6.5138	0.0100
474	Dummy_803	O_803	D_FC_1050	CONDUIT	400.0	2.5008	0.0100
475	Dummy_804	804	O_803	CONDUIT	400.0	4.2538	0.0100
476	Dummy_810	810	809	CONDUIT	400.0	8.7837	0.0100
477	Dummy_820	820	D_EURV_820	CONDUIT	400.0	3.5021	0.0100
478	Dummy_830	830	D_EURV_830	CONDUIT	400.0	9.2898	0.0100
479	Dummy_840	840	D_EURV_840	CONDUIT	400.0	6.2622	0.0100
480	Dummy_842	842	D_EURV_842	CONDUIT	400.0	8.2782	0.0100
481	Dummy_844	844	D_EURV_844	CONDUIT	400.0	4.5046	0.0100
482	Dummy_909	O_909	D_FC_1050	CONDUIT	400.0	2.5008	0.0100
483	Dummy_910	910	O_909	CONDUIT	400.0	12.8549	0.0350
484	Dummy_929	929	912	CONDUIT	75.0	2.6676	0.0130
485	Dummy_930	930	929	CONDUIT	400.0	1.2501	0.0100
486	Dummy_940	940	931	CONDUIT	400.0	8.0257	0.0350
487	Dummy_950	950	931	CONDUIT	400.0	5.7595	0.0350
488	Dummy_960	960	931	CONDUIT	400.0	4.0032	0.0350
489	L_1004	1004	1002_Drop	CONDUIT	1497.0	0.6680	0.0750
490	L_1006	1006_RR	1006_Drop	CONDUIT	461.0	0.4338	0.0550
491	L_1008	1008	1006_RR	CONDUIT	473.0	0.4228	0.0440
492	L_1010	1010	1008	CONDUIT	378.0	0.2381	0.0400
493	L_1012	1012	1010	CONDUIT	896.0	0.3348	0.0750
494	L_1014	1014	1012	CONDUIT	536.0	0.2052	0.0750
495	L_1016	1016	1014	CONDUIT	319.0	0.6270	0.0550
496	L_1018	1018	1016	CONDUIT	433.0	0.2309	0.0440
497	L_1020	1020	1018	CONDUIT	373.0	0.5362	0.0440
498	L_1022	1022	1020	CONDUIT	784.0	0.6378	0.0550
499	L_1024	1024	1022	CONDUIT	543.0	0.5525	0.0550
500	L_1026	1026	1024	CONDUIT	134.0	0.7463	0.0550
501	L_1028	1028	1026	CONDUIT	1068.0	0.9270	0.0550
502	L_1030	1030	Drop_1030	CONDUIT	474.0	0.8228	0.0550
503	L_1034	1034	1030	CONDUIT	510.0	0.5882	0.0550
504	L_1036	1036	1034	CONDUIT	372.0	0.8334	0.0550
505	L_1038	1038	1036	CONDUIT	567.0	0.5291	0.0550
506	L_1040	1040	1038	CONDUIT	743.0	0.9287	0.0550
507	L_1042	1042	Drop_1042	CONDUIT	601.0	1.1814	0.0550
508	L_1044	1044	1042	CONDUIT	477.0	1.2580	0.0550
509	L_1046	1046	Drop_1046	CONDUIT	402.0	0.2488	0.0440
510	L_1048	1048	Drop_1048	CONDUIT	359.0	0.2786	0.0440
511	L_1115	1115	Drop_1115	CONDUIT	432.0	0.9260	0.0550
512	L_1123	1123	1115	CONDUIT	1593.0	2.1976	0.0550
513	L_1125	1125	1127	CONDUIT	105.0	10.5342	0.0440
514	L_1127	1127	1123	CONDUIT	873.0	1.8331	0.0550
515	L_1130	1130	1127	CONDUIT	640.0	2.0317	0.0750
516	L_114	113	109	CONDUIT	144.0	3.4743	0.0350
517	L_1147	1147	Drop_1147	CONDUIT	973.0	0.9250	0.0440
518	L_115	115	113	CONDUIT	3260.0	1.0031	0.0350
519	L_1151	1151	Drop_1151	CONDUIT	2508.0	1.1963	0.0440
520	L_117	117	115	CONDUIT	86.0	1.5118	0.0350
521	L_119	119	117	CONDUIT	1087.0	1.4721	0.0350
522	L_1209	1209	1217	CONDUIT	930.0	0.4301	0.0440
523	L_1217	1217	1215	CONDUIT	1800.0	0.2778	0.0440
524	L_1223	1223	1217	CONDUIT	1649.0	0.4245	0.0440
525	L_1231	1231	1223	CONDUIT	4880.0	0.5738	0.0440
526	L_1233	CulvertOut_1233	1233_Lake	CONDUIT	315.0	0.9524	0.0440
527	L_1235	1235	1233	CONDUIT	960.0	2.5008	0.0440
528	L_1237	1237	1249	CONDUIT	920.0	1.7394	0.0200

529	L_1239	1239	Drop_1239	CONDUIT	560.0	0.5357	0.0350
530	L_1247	1247	1233	CONDUIT	1640.0	1.8296	0.0440
531	L_1255	1255	1273	CONDUIT	650.0	0.9231	0.0550
532	L_1257	1257	1255	CONDUIT	1580.0	0.3165	0.0440
533	L_1259	1259	1257	CONDUIT	2600.0	0.7693	0.0200
534	L_126	126	D_EURV_121	CONDUIT	5178.0	3.1688	0.0350
535	L_1273	1273	1239	CONDUIT	795.0	0.6289	0.0750
536	L_1315	1315	O_1307	CONDUIT	2154.0	1.3000	0.0550
537	L_1316	1316	1315	CONDUIT	1157.0	0.9508	0.0550
538	L_1319	1319	D_EURV_1316	CONDUIT	1841.0	1.3038	0.0440
539	L_1321	1321	D_EURV_1316	CONDUIT	1813.0	1.4342	0.0440
540	L_1323	1323	1341	CONDUIT	568.0	1.5847	0.0440
541	L_1327	1327	1349	CONDUIT	2582.0	1.2394	0.0200
542	L_133	133	129	CONDUIT	2743.0	2.9908	0.0350
543	L_1340	1339	1316	CONDUIT	2275.0	1.3038	0.0440
544	L_1351	1351	1349	CONDUIT	2109.0	1.2804	0.0440
545	L_1353	1353	1351	CONDUIT	1021.7	0.5873	0.0440
546	L_1355	1355	1349	CONDUIT	957.7	1.9842	0.0440
547	L_1357	1357	1355	CONDUIT	1049.1	0.9532	0.0440
548	L_1361	1361	1357	CONDUIT	3566.0	1.2059	0.0440
549	L_1363	1363	1361	CONDUIT	1016.3	1.3776	0.0200
550	L_1367	1367	1353	CONDUIT	2810.2	1.7083	0.0440
551	L_1371	1371	1347	CONDUIT	1116.4	1.9709	0.0440
552	L_138	138	D_EURV_134	CONDUIT	2426.0	1.2367	0.0350
553	L_1387	1387	D_EURV_1392	CONDUIT	2272.0	2.1572	0.0440
554	L_139	139	115	CONDUIT	73.0	0.4110	0.0350
555	L_1393	1393	D_EURV_1392	CONDUIT	2179.0	2.1115	0.0440
556	L_1395	1395	D_EURV_1392	CONDUIT	3616.0	1.4659	0.0440
557	L_141	141	139	CONDUIT	542.0	1.8453	0.0350
558	L_146	146	D_EURV_146	CONDUIT	165.0	13.4535	0.0350
559	L_149	149	141	CONDUIT	1479.0	2.8409	0.0350
560	L_154	154	D_EURV_150	CONDUIT	1625.0	2.0928	0.0350
561	L_221	221	O_220	CONDUIT	2511.0	0.7408	0.0350
562	L_225	225	223	CONDUIT	1810.0	2.5976	0.0350
563	L_228	228	D_EURV_225	CONDUIT	847.0	2.8347	0.0350
564	L_235	235	231	CONDUIT	3274.0	1.6557	0.0350
565	L_239	239	237	CONDUIT	288.0	1.3890	0.0350
566	L_241	241	239	CONDUIT	1092.0	1.0990	0.0350
567	L_245	245	243	CONDUIT	4101.0	2.8541	0.0350
568	L_250	250	247	CONDUIT	2063.0	1.6483	0.0350
569	L_263	263	259	CONDUIT	2459.0	2.4000	0.0350
570	L_268	268	D_EURV_263	CONDUIT	1464.0	4.7184	0.0350
571	L_314	314	O_300	CONDUIT	2623.0	2.3262	0.0350
572	L_513	515	O_500	CONDUIT	3358.0	1.5785	0.0350
573	L_613	613	O_600	CONDUIT	3854.0	1.8945	0.0350
574	L_617	616	613	CONDUIT	2214.0	2.3945	0.0350
575	L_622	622	617	CONDUIT	1661.0	2.3486	0.0350
576	L_708	708	O_708	CONDUIT	202.0	11.4607	0.0350
577	L_709	709	708	CONDUIT	560.2	2.6786	0.0300
578	L_710	710	709	CONDUIT	154.3	3.2421	0.0400
579	L_711	711	D_EURV_711	CONDUIT	615.3	1.4629	0.0400
580	L_712	712	713	CONDUIT	485.4	3.5044	0.0400
581	L_713	713	711	CONDUIT	338.1	2.6629	0.0700
582	L_808	808	O_803	CONDUIT	1197.0	1.6711	0.0700
583	L_809	809	808	CONDUIT	90.0	5.5641	0.0130
584	L_811	811	809	CONDUIT	183.0	1.6396	0.0450
585	L_819	819	811	CONDUIT	761.0	1.0513	0.0700
586	L_822	822	D_FC_823	CONDUIT	671.0	4.0271	0.0400
587	L_823	823	D_FC_823	CONDUIT	943.0	0.3181	0.0400
588	L_824	824	822	CONDUIT	1270.0	2.2841	0.0350
589	L_829	829	823	CONDUIT	290.0	3.4503	0.0350
590	L_831	831	829	CONDUIT	105.0	10.0504	0.0400
591	L_834	834	831	CONDUIT	1040.0	0.3365	0.0400
592	L_836	836	834	CONDUIT	442.0	2.9424	0.0130
593	L_838	838	D_FC_838	CONDUIT	314.9	0.3176	0.0480
594	L_839	839	843	CONDUIT	541.0	1.1091	0.0480

595	L_841	841	839	CONDUIT	190.0	1.0527	0.0440
596	L_843	843	838	CONDUIT	304.0	3.2913	0.0350
597	L_850	850	D_EURV_842	CONDUIT	1740.0	1.3220	0.0440
598	L_911	911	O_909	CONDUIT	2561.0	1.8746	0.0550
599	L_912	912	911	CONDUIT	522.0	1.3411	0.0440
600	L_931	931	929	CONDUIT	2763.0	1.1582	0.0440
601	Overflow_836	836	834	CONDUIT	442.0	2.9424	0.0350
602	Dummy_Drop_1006	1006_Drop	1004	CONDUIT	400.0	0.2500	0.0100
603	D_EURV_614	D_EURV_614	613	OUTLET			
604	D_FC_150	D_EURV_150	D_FC_150	OUTLET			
605	O_EURV_1172	D_EURV_1172	1008	OUTLET			
606	O_EURV_1208	D_EURV_1208	1024	OUTLET			
607	O_EURV_121	D_EURV_121	121	OUTLET			
608	O_EURV_134	D_EURV_134	D_FC_134	OUTLET			
609	O_EURV_1364	D_EURV_1264	O_1263	OUTLET			
610	O_EURV_1382	D_EURV_1382	1044	OUTLET			
611	O_EURV_1392	D_EURV_1392	1315	OUTLET			
612	O_EURV_1395	D_EURV_1395	1395	OUTLET			
613	O_EURV_146	D_EURV_146	141	OUTLET			
614	O_EURV_225	D_EURV_225	225	OUTLET			
615	O_EURV_236	D_EURV_236	235	OUTLET			
616	O_EURV_244	D_EURV_244	243	OUTLET			
617	O_EURV_245	D_EURV_245	D_FC_245	OUTLET			
618	O_EURV_256	D_EURV_256	239	OUTLET			
619	O_EURV_263	D_EURV_263	D_FC_263	OUTLET			
620	O_EURV_510	D_EURV_510	D_FC_510	OUTLET			
621	O_EURV_618	D_EURV_618	D_FC_618	OUTLET			
622	O_EURV_711	D_EURV_711	D_FC_711	OUTLET			
623	O_EURV_820	D_EURV_820	D_FC_823	OUTLET			
624	O_EURV_830	D_EURV_830	831	OUTLET			
625	O_EURV_840	D_EURV_840	839	OUTLET			
626	O_EURV_842	D_EURV_842	D_FC__842	OUTLET			
627	O_EURV_844	D_EURV_844	839	OUTLET			
628	O_FC_1050	D_FC_1050	1048	OUTLET			
629	O_FC_134	D_FC_134	133	OUTLET			
630	O_FC_150	D_FC_150	149	OUTLET			
631	O_FC_245	D_FC_245	245	OUTLET			
632	O_FC_263	D_FC_263	263	OUTLET			
633	O_FC_510	D_FC_510	515	OUTLET			
634	O_FC_618	D_FC_618	616	OUTLET			
635	O_FC_711	D_FC_711	710	OUTLET			
636	O_FC_823	D_FC_823	819	OUTLET			
637	O_FC_838	D_FC_838	836	OUTLET			
638	O_FC_842	D_FC__842	841	OUTLET			
639	Outlet_1141	D_1141	1139	OUTLET			
640	Outlet_1155	D_1155	1147	OUTLET			
641	Outlet_1163	D_1163	1153	OUTLET			
642	Outlet_1170	D_1170	D_1155	OUTLET			
643	Outlet_1233	D_1233	1231	OUTLET			
644	Outlet_1316	D_EURV_1316	1316	OUTLET			
645	Outlet_1340	D_1340	1339	OUTLET			
646							
647							
648	**********						
649	Cross Section Summary						
650	**********						
651			Full	Full	Hyd.	Max.	No. of	Full
652	Conduit	Shape	Depth	Area	Rad.	Width	Barrels	Flow
653	---	---	---	---	---	---	---	---
654	Dummy_1002	DUMMY	0.00	0.00	0.00	0.00	1	0.00
655	Dummy_1030	DUMMY	0.00	0.00	0.00	0.00	1	0.00
656	Dummy_1032	DUMMY	0.00	0.00	0.00	0.00	1	0.00
657	Dummy_1042	DUMMY	0.00	0.00	0.00	0.00	1	0.00
658	Dummy_1046	DUMMY	0.00	0.00	0.00	0.00	1	0.00
659	Dummy_1048	DUMMY	0.00	0.00	0.00	0.00	1	0.00
660	Dummy_109	DUMMY	0.00	0.00	0.00	0.00	1	0.00

661	Dummy_110	DUMMY	0.00	0.00	0.00	0.00	1	0.00
662	Dummy_1107	DUMMY	0.00	0.00	0.00	0.00	1	0.00
663	Dummy_1108	DUMMY	0.00	0.00	0.00	0.00	1	0.00
664	Dummy_1110	DUMMY	0.00	0.00	0.00	0.00	1	0.00
665	Dummy_1115	DUMMY	0.00	0.00	0.00	0.00	1	0.00
666	Dummy_1116	DUMMY	0.00	0.00	0.00	0.00	1	0.00
667	Dummy_1124	DUMMY	0.00	0.00	0.00	0.00	1	0.00
668	Dummy_1126	DUMMY	0.00	0.00	0.00	0.00	1	0.00
669	Dummy_1132	DUMMY	0.00	0.00	0.00	0.00	1	0.00
670	Dummy_1139	DUMMY	0.00	0.00	0.00	0.00	1	0.00
671	Dummy_114	DUMMY	0.00	0.00	0.00	0.00	1	0.00
672	Dummy_1140	DUMMY	0.00	0.00	0.00	0.00	1	0.00
673	Dummy_1141	DUMMY	0.00	0.00	0.00	0.00	1	0.00
674	Dummy_1142	DUMMY	0.00	0.00	0.00	0.00	1	0.00
675	Dummy_1144	DUMMY	0.00	0.00	0.00	0.00	1	0.00
676	Dummy_1147	DUMMY	0.00	0.00	0.00	0.00	1	0.00
677	Dummy_1148	DUMMY	0.00	0.00	0.00	0.00	1	0.00
678	Dummy_1150	DUMMY	0.00	0.00	0.00	0.00	1	0.00
679	Dummy_1151	DUMMY	0.00	0.00	0.00	0.00	1	0.00
680	Dummy_1152	DUMMY	0.00	0.00	0.00	0.00	1	0.00
681	Dummy_1153	DUMMY	0.00	0.00	0.00	0.00	1	0.00
682	Dummy_1154	DUMMY	0.00	0.00	0.00	0.00	1	0.00
683	Dummy_1156	DUMMY	0.00	0.00	0.00	0.00	1	0.00
684	Dummy_1164	DUMMY	0.00	0.00	0.00	0.00	1	0.00
685	Dummy_1172	DUMMY	0.00	0.00	0.00	0.00	1	0.00
686	Dummy_118	DUMMY	0.00	0.00	0.00	0.00	1	0.00
687	Dummy_1180	DUMMY	0.00	0.00	0.00	0.00	1	0.00
688	Dummy_1208	DUMMY	0.00	0.00	0.00	0.00	1	0.00
689	Dummy_121	DUMMY	0.00	0.00	0.00	0.00	1	0.00
690	Dummy_1210	DUMMY	0.00	0.00	0.00	0.00	1	0.00
691	Dummy_1215	DUMMY	0.00	0.00	0.00	0.00	1	0.00
692	Dummy_1216	DUMMY	0.00	0.00	0.00	0.00	1	0.00
693	Dummy_122	DUMMY	0.00	0.00	0.00	0.00	1	0.00
694	Dummy_1224	DUMMY	0.00	0.00	0.00	0.00	1	0.00
695	Dummy_1226	DUMMY	0.00	0.00	0.00	0.00	1	0.00
696	Dummy_1228	DUMMY	0.00	0.00	0.00	0.00	1	0.00
697	Dummy_1230	DUMMY	0.00	0.00	0.00	0.00	1	0.00
698	Dummy_1232	DUMMY	0.00	0.00	0.00	0.00	1	0.00
699	Dummy_1233	DUMMY	0.00	0.00	0.00	0.00	1	0.00
700	Dummy_1233_Lake	DUMMY	0.00	0.00	0.00	0.00	1	0.00
701	Dummy_1234	DUMMY	0.00	0.00	0.00	0.00	1	0.00
702	Dummy_1236	DUMMY	0.00	0.00	0.00	0.00	1	0.00
703	Dummy_1238	DUMMY	0.00	0.00	0.00	0.00	1	0.00
704	Dummy_1239	DUMMY	0.00	0.00	0.00	0.00	1	0.00
705	Dummy_1239_Lake	DUMMY	0.00	0.00	0.00	0.00	1	0.00
706	Dummy_1240	DUMMY	0.00	0.00	0.00	0.00	1	0.00
707	Dummy_1248	DUMMY	0.00	0.00	0.00	0.00	1	0.00
708	Dummy_1249	DUMMY	0.00	0.00	0.00	0.00	1	0.00
709	Dummy_1256	DUMMY	0.00	0.00	0.00	0.00	1	0.00
710	Dummy_1258	DUMMY	0.00	0.00	0.00	0.00	1	0.00
711	Dummy_1260	DUMMY	0.00	0.00	0.00	0.00	1	0.00
712	Dummy_1263	DUMMY	0.00	0.00	0.00	0.00	1	0.00
713	Dummy_1264	DUMMY	0.00	0.00	0.00	0.00	1	0.00
714	Dummy_1272	DUMMY	0.00	0.00	0.00	0.00	1	0.00
715	Dummy_1274	DUMMY	0.00	0.00	0.00	0.00	1	0.00
716	Dummy_129	DUMMY	0.00	0.00	0.00	0.00	1	0.00
717	Dummy_130	DUMMY	0.00	0.00	0.00	0.00	1	0.00
718	Dummy_1307	DUMMY	0.00	0.00	0.00	0.00	1	0.00
719	Dummy_1308	DUMMY	0.00	0.00	0.00	0.00	1	0.00
720	Dummy_1310	DUMMY	0.00	0.00	0.00	0.00	1	0.00
721	Dummy_1318	DUMMY	0.00	0.00	0.00	0.00	1	0.00
722	Dummy_1320	DUMMY	0.00	0.00	0.00	0.00	1	0.00
723	Dummy_1322	DUMMY	0.00	0.00	0.00	0.00	1	0.00
724	Dummy_1324	DUMMY	0.00	0.00	0.00	0.00	1	0.00
725	Dummy_1328	DUMMY	0.00	0.00	0.00	0.00	1	0.00
726	Dummy_1337	DUMMY	0.00	0.00	0.00	0.00	1	0.00

727	Dummy_134	DUMMY	0.00	0.00	0.00	0.00	1	0.00
728	Dummy_1341	DUMMY	0.00	0.00	0.00	0.00	1	0.00
729	Dummy_1348	DUMMY	0.00	0.00	0.00	0.00	1	0.00
730	Dummy_1349	DUMMY	0.00	0.00	0.00	0.00	1	0.00
731	Dummy_1352	DUMMY	0.00	0.00	0.00	0.00	1	0.00
732	Dummy_1354	DUMMY	0.00	0.00	0.00	0.00	1	0.00
733	Dummy_1356	DUMMY	0.00	0.00	0.00	0.00	1	0.00
734	Dummy_1358	DUMMY	0.00	0.00	0.00	0.00	1	0.00
735	Dummy_1362	DUMMY	0.00	0.00	0.00	0.00	1	0.00
736	Dummy_1364	DUMMY	0.00	0.00	0.00	0.00	1	0.00
737	Dummy_1368	DUMMY	0.00	0.00	0.00	0.00	1	0.00
738	Dummy_1372	DUMMY	0.00	0.00	0.00	0.00	1	0.00
739	Dummy_1382	DUMMY	0.00	0.00	0.00	0.00	1	0.00
740	Dummy_1386	DUMMY	0.00	0.00	0.00	0.00	1	0.00
741	Dummy_1388	DUMMY	0.00	0.00	0.00	0.00	1	0.00
742	Dummy_1392	DUMMY	0.00	0.00	0.00	0.00	1	0.00
743	Dummy_1394	DUMMY	0.00	0.00	0.00	0.00	1	0.00
744	Dummy_1396	DUMMY	0.00	0.00	0.00	0.00	1	0.00
745	Dummy_1398	DUMMY	0.00	0.00	0.00	0.00	1	0.00
746	Dummy_142	DUMMY	0.00	0.00	0.00	0.00	1	0.00
747	Dummy_150	DUMMY	0.00	0.00	0.00	0.00	1	0.00
748	Dummy_210	DUMMY	0.00	0.00	0.00	0.00	1	0.00
749	Dummy_219	DUMMY	0.00	0.00	0.00	0.00	1	0.00
750	Dummy_220	DUMMY	0.00	0.00	0.00	0.00	1	0.00
751	Dummy_223	DUMMY	0.00	0.00	0.00	0.00	1	0.00
752	Dummy_224	DUMMY	0.00	0.00	0.00	0.00	1	0.00
753	Dummy_226	DUMMY	0.00	0.00	0.00	0.00	1	0.00
754	Dummy_231	DUMMY	0.00	0.00	0.00	0.00	1	0.00
755	Dummy_232	DUMMY	0.00	0.00	0.00	0.00	1	0.00
756	Dummy_236	DUMMY	0.00	0.00	0.00	0.00	1	0.00
757	Dummy_237	DUMMY	0.00	0.00	0.00	0.00	1	0.00
758	Dummy_240	DUMMY	0.00	0.00	0.00	0.00	1	0.00
759	Dummy_243	DUMMY	0.00	0.00	0.00	0.00	1	0.00
760	Dummy_244	DUMMY	0.00	0.00	0.00	0.00	1	0.00
761	Dummy_247	DUMMY	0.00	0.00	0.00	0.00	1	0.00
762	Dummy_248	DUMMY	0.00	0.00	0.00	0.00	1	0.00
763	Dummy_252	DUMMY	0.00	0.00	0.00	0.00	1	0.00
764	Dummy_256	DUMMY	0.00	0.00	0.00	0.00	1	0.00
765	Dummy_259	DUMMY	0.00	0.00	0.00	0.00	1	0.00
766	Dummy_260	DUMMY	0.00	0.00	0.00	0.00	1	0.00
767	Dummy_264	DUMMY	0.00	0.00	0.00	0.00	1	0.00
768	Dummy_300	DUMMY	0.00	0.00	0.00	0.00	1	0.00
769	Dummy_310	DUMMY	0.00	0.00	0.00	0.00	1	0.00
770	Dummy_410	DUMMY	0.00	0.00	0.00	0.00	1	0.00
771	Dummy_414	DUMMY	0.00	0.00	0.00	0.00	1	0.00
772	Dummy_418	DUMMY	0.00	0.00	0.00	0.00	1	0.00
773	Dummy_422	DUMMY	0.00	0.00	0.00	0.00	1	0.00
774	Dummy_426	DUMMY	0.00	0.00	0.00	0.00	1	0.00
775	Dummy_500	DUMMY	0.00	0.00	0.00	0.00	1	0.00
776	Dummy_510	DUMMY	0.00	0.00	0.00	0.00	1	0.00
777	Dummy_514	DUMMY	0.00	0.00	0.00	0.00	1	0.00
778	Dummy_515	DUMMY	0.00	0.00	0.00	0.00	1	0.00
779	Dummy_518	DUMMY	0.00	0.00	0.00	0.00	1	0.00
780	Dummy_600	DUMMY	0.00	0.00	0.00	0.00	1	0.00
781	Dummy_610	DUMMY	0.00	0.00	0.00	0.00	1	0.00
782	Dummy_614	DUMMY	0.00	0.00	0.00	0.00	1	0.00
783	Dummy_617	DUMMY	0.00	0.00	0.00	0.00	1	0.00
784	Dummy_618	DUMMY	0.00	0.00	0.00	0.00	1	0.00
785	Dummy_620	DUMMY	0.00	0.00	0.00	0.00	1	0.00
786	Dummy_708	DUMMY	0.00	0.00	0.00	0.00	1	0.00
787	Dummy_714	DUMMY	0.00	0.00	0.00	0.00	1	0.00
788	Dummy_803	DUMMY	0.00	0.00	0.00	0.00	1	0.00
789	Dummy_804	DUMMY	0.00	0.00	0.00	0.00	1	0.00
790	Dummy_810	DUMMY	0.00	0.00	0.00	0.00	1	0.00
791	Dummy_820	DUMMY	0.00	0.00	0.00	0.00	1	0.00
792	Dummy_830	DUMMY	0.00	0.00	0.00	0.00	1	0.00

793	Dummy_840	DUMMY	0.00	0.00	0.00	0.00	1	0.00
794	Dummy_842	DUMMY	0.00	0.00	0.00	0.00	1	0.00
795	Dummy_844	DUMMY	0.00	0.00	0.00	0.00	1	0.00
796	Dummy_909	DUMMY	0.00	0.00	0.00	0.00	1	0.00
797	Dummy_910	DUMMY	0.00	0.00	0.00	0.00	1	0.00
798	Dummy_929	DUMMY	0.00	0.00	0.00	0.00	1	0.00
799	Dummy_930	DUMMY	0.00	0.00	0.00	0.00	1	0.00
800	Dummy_940	DUMMY	0.00	0.00	0.00	0.00	1	0.00
801	Dummy_950	DUMMY	0.00	0.00	0.00	0.00	1	0.00
802	Dummy_960	DUMMY	0.00	0.00	0.00	0.00	1	0.00
803	L_1004	TRAPEZOIDAL	20.00	4000.00	13.16	300.00	1	36105.48
804	L_1006	TRAPEZOIDAL	30.00	7500.00	18.48	400.00	1	93278.75
805	L_1008	TRAPEZOIDAL	20.00	6000.00	14.85	400.00	1	79618.10
806	L_1010	TRAPEZOIDAL	20.00	6000.00	14.85	400.00	1	65719.47
807	L_1012	TRAPEZOIDAL	30.00	10500.00	20.75	500.00	1	90910.53
808	L_1014	TRAPEZOIDAL	30.00	10500.00	20.75	500.00	1	71173.90
809	L_1016	TRAPEZOIDAL	20.00	4700.00	13.87	335.00	1	58033.24
810	L_1018	TRAPEZOIDAL	20.00	6000.00	14.85	400.00	1	58841.27
811	L_1020	TRAPEZOIDAL	20.00	6000.00	14.85	400.00	1	89658.01
812	L_1022	TRAPEZOIDAL	20.00	6000.00	14.85	400.00	1	78225.22
813	L_1024	TRAPEZOIDAL	20.00	6000.00	14.85	400.00	1	72808.05
814	L_1026	TRAPEZOIDAL	20.00	6000.00	14.85	400.00	1	84619.23
815	L_1028	TRAPEZOIDAL	20.00	6000.00	14.85	400.00	1	94309.77
816	L_1030	TRAPEZOIDAL	20.00	5200.00	14.29	360.00	1	75037.06
817	L_1034	TRAPEZOIDAL	20.00	5000.00	14.13	350.00	1	60545.52
818	L_1036	TRAPEZOIDAL	20.00	5000.00	14.13	350.00	1	72064.21
819	L_1038	TRAPEZOIDAL	20.00	5000.00	14.13	350.00	1	57421.54
820	L_1040	TRAPEZOIDAL	20.00	5000.00	14.13	350.00	1	76075.04
821	L_1042	TRAPEZOIDAL	20.00	5000.00	14.13	350.00	1	85804.45
822	L_1044	TRAPEZOIDAL	20.00	5000.00	14.13	350.00	1	88539.35
823	L_1046	TRAPEZOIDAL	20.00	2800.00	11.48	240.00	1	23997.75
824	L_1048	TRAPEZOIDAL	20.00	2700.00	11.30	235.00	1	24233.06
825	L_1115	TRAPEZOIDAL	10.00	1350.00	7.22	185.00	1	13111.30
826	L_1123	TRAPEZOIDAL	10.00	1050.00	7.60	135.00	1	16249.85
827	L_1125	TRAPEZOIDAL	10.00	500.00	5.69	85.00	1	17477.64
828	L_1127	TRAPEZOIDAL	10.00	1150.00	7.99	140.00	1	16818.94
829	L_1130	TRAPEZOIDAL	10.00	1150.00	7.99	140.00	1	12984.86
830	L_114	TRIANGULAR	10.00	1000.00	4.98	200.00	1	23063.49
831	L_1147	TRAPEZOIDAL	10.00	750.00	5.91	125.00	1	7960.09
832	L_115	TRAPEZOIDAL	10.00	1680.00	7.64	218.00	1	27704.67
833	L_1151	TRAPEZOIDAL	10.00	400.00	5.46	70.00	1	4582.03
834	L_117	TRAPEZOIDAL	10.00	300.00	5.48	50.00	1	4869.25
835	L_119	TRAPEZOIDAL	10.00	1390.00	7.28	189.00	1	26891.70
836	L_1209	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	9700.40
837	L_1217	TRAPEZOIDAL	10.00	500.00	6.01	80.00	1	2940.75
838	L_1223	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	9636.96
839	L_1231	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	11203.97
840	L_1233	TRAPEZOIDAL	10.00	600.00	5.86	100.00	1	6424.77
841	L_1235	TRAPEZOIDAL	10.00	750.00	5.91	125.00	1	13088.25
842	L_1237	TRAPEZOIDAL	10.00	60.00	2.31	6.00	1	1026.73
843	L_1239	TRAPEZOIDAL	10.00	400.01	4.85	80.00	1	3562.04
844	L_1247	TRAPEZOIDAL	10.00	450.00	5.15	85.00	1	6126.54
845	L_1255	TRAPEZOIDAL	10.00	400.01	4.85	80.00	1	2975.52
846	L_1257	TRAPEZOIDAL	10.00	240.00	4.93	44.00	1	1320.07
847	L_1259	TRAPEZOIDAL	10.00	1900.00	5.58	340.00	1	38939.80
848	L_126	TRAPEZOIDAL	10.00	500.00	6.69	70.00	1	13419.02
849	L_1273	TRAPEZOIDAL	10.00	400.01	4.85	80.00	1	1801.12
850	L_1315	TRAPEZOIDAL	10.00	1200.00	7.83	150.00	1	14577.20
851	L_1316	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	11537.95
852	L_1319	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	16888.71
853	L_1321	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	17713.70
854	L_1323	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	18619.74
855	L_1327	TRAPEZOIDAL	1.00	42.00	0.94	44.00	1	334.42
856	L_133	TRAPEZOIDAL	10.00	1550.00	6.56	235.00	1	39885.90
857	L_1340	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	16889.34
858	L_1351	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	16736.47

859	L_1353	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	11334.83
860	L_1355	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	20835.18
861	L_1357	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	14440.98
862	L_1361	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	16242.72
863	L_1363	TRAPEZOIDAL	10.00	600.00	7.08	80.00	1	19296.64
864	L_1367	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	19332.24
865	L_1371	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	20765.15
866	L_138	TRAPEZOIDAL	10.00	1300.00	6.15	210.00	1	20612.48
867	L_1387	TRAPEZOIDAL	10.00	800.00	6.06	130.00	1	13192.31
868	L_139	TRAPEZOIDAL	10.00	400.00	6.18	60.00	1	3666.51
869	L_1393	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	21493.05
870	L_1395	TRAPEZOIDAL	10.00	1750.00	5.37	325.00	1	21953.06
871	L_141	TRAPEZOIDAL	10.00	500.00	6.69	70.00	1	10240.20
872	L_146	TRAPEZOIDAL	10.00	1200.00	5.43	220.00	1	57731.32
873	L_149	TRAPEZOIDAL	10.00	1300.00	7.14	180.00	1	34506.54
874	L_154	TRAPEZOIDAL	10.00	1290.00	7.13	179.00	1	29345.37
875	L_221	TRAPEZOIDAL	10.00	1900.00	7.85	240.00	1	27427.89
876	L_225	TRAPEZOIDAL	10.00	1400.00	7.29	190.00	1	36025.43
877	L_228	TRAPEZOIDAL	10.00	400.00	6.18	60.00	1	9629.49
878	L_235	TRAPEZOIDAL	10.00	2400.00	8.22	290.00	1	53401.95
879	L_239	TRAPEZOIDAL	10.00	1900.00	7.85	240.00	1	37558.48
880	L_241	TRAPEZOIDAL	10.00	1500.00	7.43	200.00	1	25412.99
881	L_245	TRAPEZOIDAL	10.00	1600.00	7.55	210.00	1	44159.42
882	L_250	TRAPEZOIDAL	10.00	5100.00	5.05	1010.00	1	81811.71
883	L_263	TRAPEZOIDAL	10.00	900.00	6.34	140.00	1	20275.83
884	L_268	TRAPEZOIDAL	10.00	400.00	6.18	60.00	1	12423.61
885	L_314	TRAPEZOIDAL	10.00	700.00	7.39	90.00	1	17197.82
886	L_513	TRAPEZOIDAL	10.00	700.00	7.39	90.00	1	14166.86
887	L_613	TRAPEZOIDAL	10.00	1300.00	7.96	160.00	1	30295.16
888	L_617	TRAPEZOIDAL	10.00	1000.00	8.02	120.00	1	26318.93
889	L_622	TRAPEZOIDAL	10.00	1510.00	7.44	201.00	1	37441.25
890	L_708	TRAPEZOIDAL	10.00	420.00	6.29	62.00	1	20580.76
891	L_709	TRAPEZOIDAL	10.00	900.00	6.79	130.00	1	26173.35
892	L_710	TRAPEZOIDAL	10.00	900.00	7.85	110.00	1	23769.29
893	L_711	TRAPEZOIDAL	10.00	1130.00	7.27	153.00	1	19052.01
894	L_712	TRAPEZOIDAL	10.00	2560.00	6.30	406.00	1	60698.05
895	L_713	TRAPEZOIDAL	10.00	1550.00	6.05	255.00	1	17837.15
896	L_808	TRAPEZOIDAL	10.00	950.00	7.41	125.00	1	9906.73
897	L_809	RECT_CLOSED	15.00	75.00	1.88	5.00	1	3074.94
898	L_811	TRAPEZOIDAL	10.00	1670.00	7.30	227.00	1	26581.36
899	L_819	TRAPEZOIDAL	10.00	1450.00	8.13	175.00	1	12765.94
900	L_822	TRAPEZOIDAL	10.00	2850.00	8.46	335.00	1	88198.34
901	L_823	TRAPEZOIDAL	10.00	2850.00	8.46	335.00	1	24789.61
902	L_824	TRAPEZOIDAL	10.00	9570.00	7.61	1257.00	1	237606.05
903	L_829	TRAPEZOIDAL	10.00	1250.00	7.06	175.00	1	36264.24
904	L_831	TRAPEZOIDAL	15.00	2325.00	9.39	245.00	1	121915.29
905	L_834	TRAPEZOIDAL	15.00	2310.00	9.37	244.00	1	22129.56
906	L_836	CIRCULAR	4.00	12.57	1.00	4.00	1	246.40
907	L_838	TRAPEZOIDAL	15.00	3735.00	7.86	474.00	1	25766.89
908	L_839	TRAPEZOIDAL	15.00	5662.50	8.63	655.00	1	77684.49
909	L_841	TRIANGULAR	10.00	1000.00	4.98	200.00	1	10098.48
910	L_843	CIRCULAR	15.00	176.71	3.75	15.00	1	3285.42
911	L_850	TRAPEZOIDAL	10.00	1400.00	5.37	260.00	1	16665.33
912	L_911	TRAPEZOIDAL	10.00	1250.00	7.46	165.00	1	17661.02
913	L_912	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	17129.02
914	L_931	TRAPEZOIDAL	10.00	1500.01	4.99	300.00	1	15918.36
915	Overflow_836	TRAPEZOIDAL	15.00	3975.00	8.10	490.00	1	116720.41
916	Dummy_Drop_1006	DUMMY	0.00	0.00	0.00	0.00	1	0.00
917								
918								
919	**********							
920	Analysis Options							
921	**********							
922	Flow Units ..... CFS							
923	Process Models:							
924	Rainfall/Runoff ..... NO							

```
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Flow Routing Method ...... KINWAVE
Starting Date ............ 01/01/2024 00:00:00
Ending Date .............. 01/04/2024 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:05:00
Routing Time Step ........ 20.00 sec


**************************        Volume        Volume
Flow Routing Continuity        acre-feet      10^6 gal
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.000         0.000
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........      1364.948       444.789
External Outflow .........      1346.045       438.629
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....        32.930        10.731
Final Stored Volume ......        68.307        22.259
Continuity Error (%) .....        -1.179


*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :    20.00 sec
Average Time Step           :    20.00 sec
Maximum Time Step           :    20.00 sec
% of Time in Steady State   :     0.00
Average Iterations per Step :     1.00
% of Steps Not Converging   :     0.00


******************
Node Depth Summary
******************

--------------------------------------------------------------------------------
                                 Average  Maximum  Maximum  Time of Max    Reported
                                   Depth    Depth      HGL   Occurrence   Max Depth
Node                 Type          Feet     Feet     Feet  days hr:min        Feet
--------------------------------------------------------------------------------
1002_Drop            JUNCTION      0.78     6.64  4765.64     0  02:00         6.64
1004                 JUNCTION      0.78     6.65  4775.65     0  01:57         6.64
1006_RR              JUNCTION      0.68     5.60  4777.60     0  01:58         5.59
1008                 JUNCTION      0.45     3.82  4777.82     0  01:57         3.81
1010                 JUNCTION      0.58     4.93  4779.83     0  01:56         4.93
1012                 JUNCTION      0.64     5.35  4783.25     0  01:53         5.35
1014                 JUNCTION      0.63     5.36  4784.36     0  01:51         5.35
1016                 JUNCTION      0.48     4.01  4785.01     0  01:50         4.01
1018                 JUNCTION      0.44     3.78  4785.78     0  01:49         3.78
```

991	1020	JUNCTION	0.37	3.18	4787.18	0	01:48	3.18
992	1022	JUNCTION	0.39	3.32	4792.32	0	01:46	3.31
993	1024	JUNCTION	0.39	3.32	4795.32	0	01:45	3.32
994	1026	JUNCTION	0.35	3.02	4796.02	0	01:45	3.02
995	1028	JUNCTION	0.33	2.82	4805.72	0	01:43	2.82
996	1030	JUNCTION	0.39	3.12	4815.02	0	01:42	3.12
997	1032	JUNCTION	0.00	0.00	4770.00	0	00:00	0.00
998	1034	JUNCTION	0.36	2.86	4817.76	0	01:45	2.86
999	1036	JUNCTION	0.37	2.92	4820.92	0	01:45	2.92
1000	1038	JUNCTION	0.37	2.92	4823.92	0	01:43	2.92
1001	1040	JUNCTION	0.31	2.47	4830.37	0	01:41	2.47
1002	1042	JUNCTION	0.29	2.23	4840.23	0	01:40	2.23
1003	1044	JUNCTION	0.28	2.18	4846.18	0	01:40	2.18
1004	1046	JUNCTION	0.84	5.69	4856.69	0	01:39	5.69
1005	1048	JUNCTION	0.87	5.79	4860.79	0	01:38	5.78
1006	109	JUNCTION	0.43	3.00	4782.00	0	01:19	3.00
1007	110	JUNCTION	0.00	0.00	4794.00	0	00:00	0.00
1008	1108	JUNCTION	0.00	0.00	4816.00	0	00:00	0.00
1009	1110	JUNCTION	0.00	0.00	4855.00	0	00:00	0.00
1010	1115	JUNCTION	0.12	1.68	4791.68	0	00:54	1.68
1011	1116	JUNCTION	0.00	0.00	4850.00	0	00:00	0.00
1012	1123	JUNCTION	0.10	1.20	4826.20	0	00:55	1.20
1013	1124	JUNCTION	0.00	0.00	4864.00	0	00:00	0.00
1014	1125	JUNCTION	0.01	1.16	4853.16	0	00:30	1.14
1015	1126	JUNCTION	0.00	0.00	4864.00	0	00:00	0.00
1016	1127	JUNCTION	0.10	1.16	4842.16	0	00:30	1.14
1017	113	JUNCTION	0.43	3.00	4787.00	0	01:19	3.00
1018	1130	JUNCTION	0.10	1.12	4855.12	0	01:17	1.12
1019	1132	JUNCTION	0.00	0.00	4874.00	0	00:00	0.00
1020	1139	JUNCTION	0.00	0.00	4857.00	0	00:00	0.00
1021	114	JUNCTION	0.00	0.00	4798.00	0	00:00	0.00
1022	1140	JUNCTION	0.00	0.00	4879.00	0	00:00	0.00
1023	1141	JUNCTION	0.00	0.00	4878.00	0	00:00	0.00
1024	1142	JUNCTION	0.00	0.00	4902.00	0	00:00	0.00
1025	1144	JUNCTION	0.00	0.00	4925.00	0	00:00	0.00
1026	1147	JUNCTION	0.17	1.88	4894.88	0	01:34	1.88
1027	1148	JUNCTION	0.00	0.00	4946.00	0	00:00	0.00
1028	115	JUNCTION	0.23	3.38	4820.08	0	01:13	3.37
1029	1150	JUNCTION	0.00	0.00	4955.00	0	00:00	0.00
1030	1151	JUNCTION	0.19	2.24	4943.24	0	01:05	2.24
1031	1152	JUNCTION	0.00	0.00	4966.00	0	00:00	0.00
1032	1153	JUNCTION	0.00	0.00	4943.00	0	00:00	0.00
1033	1154	JUNCTION	0.00	0.00	4976.00	0	00:00	0.00
1034	1156	JUNCTION	0.00	0.00	4935.00	0	00:00	0.00
1035	1164	JUNCTION	0.00	0.00	4958.00	0	00:00	0.00
1036	117	JUNCTION	0.23	3.38	4821.38	0	01:13	3.37
1037	1172	JUNCTION	0.00	0.00	4832.00	0	00:00	0.00
1038	118	JUNCTION	0.00	0.00	4830.00	0	00:00	0.00
1039	1180	JUNCTION	0.00	0.00	4838.00	0	00:00	0.00
1040	119	JUNCTION	0.06	1.00	4835.00	0	01:11	1.00
1041	1208	JUNCTION	0.00	0.00	4868.00	0	00:00	0.00
1042	1209	JUNCTION	0.05	1.60	4878.60	0	00:50	1.60
1043	121	JUNCTION	0.00	0.00	4835.00	0	00:00	0.00
1044	1210	JUNCTION	0.00	0.00	4889.00	0	00:00	0.00
1045	1215	JUNCTION	0.51	5.00	4873.00	0	01:12	4.99
1046	1216	JUNCTION	0.00	0.00	4882.00	0	00:00	0.00
1047	1217	JUNCTION	0.71	5.02	4878.02	0	01:05	5.01
1048	122	JUNCTION	0.00	0.00	4983.00	0	00:00	0.00
1049	1223	JUNCTION	0.66	3.41	4883.41	0	01:00	3.41
1050	1224	JUNCTION	0.00	0.00	4890.00	0	00:00	0.00
1051	1226	JUNCTION	0.00	0.00	4895.00	0	00:00	0.00
1052	1228	JUNCTION	0.00	0.00	4903.00	0	00:00	0.00
1053	1230	JUNCTION	0.00	0.00	4883.00	0	00:00	0.00
1054	1231	JUNCTION	0.58	2.86	4910.86	0	00:35	2.85
1055	1232	JUNCTION	0.00	0.00	4955.00	0	00:00	0.00
1056	1233	JUNCTION	0.06	2.54	4919.54	0	00:48	2.54

1057	1233_Lake	JUNCTION	0.06	2.91	4913.91	0	00:47	2.90
1058	1234	JUNCTION	0.00	0.00	4960.00	0	00:00	0.00
1059	1235	JUNCTION	0.02	1.03	4942.03	0	00:45	1.02
1060	1236	JUNCTION	0.00	0.00	4998.00	0	00:00	0.00
1061	1237	JUNCTION	0.04	2.37	4975.37	0	00:45	2.37
1062	1238	JUNCTION	0.00	0.00	5005.00	0	00:00	0.00
1063	1239	JUNCTION	0.21	5.05	4959.05	0	01:03	5.05
1064	1239_Lake	JUNCTION	0.00	0.00	4941.00	0	00:00	0.00
1065	1240	JUNCTION	0.00	0.00	4981.00	0	00:00	0.00
1066	1247	JUNCTION	1.06	3.55	4949.55	0	00:45	3.54
1067	1248	JUNCTION	0.00	0.00	4967.00	0	00:00	0.00
1068	1249	JUNCTION	0.04	2.37	4959.37	0	00:46	2.36
1069	1255	JUNCTION	0.17	4.06	4969.06	0	00:58	4.05
1070	1256	JUNCTION	0.00	0.00	4993.00	0	00:00	0.00
1071	1257	JUNCTION	0.13	4.05	4974.05	0	00:58	4.05
1072	1258	JUNCTION	0.00	0.00	4989.00	0	00:00	0.00
1073	1259	JUNCTION	0.01	0.46	4990.46	0	00:55	0.46
1074	126	JUNCTION	0.01	0.30	4999.30	0	00:45	0.30
1075	1260	JUNCTION	0.00	0.00	5019.00	0	00:00	0.00
1076	1264	JUNCTION	0.00	0.00	4876.00	0	00:00	0.00
1077	1272	JUNCTION	0.00	0.00	4880.00	0	00:00	0.00
1078	1273	JUNCTION	0.20	5.05	4964.05	0	00:59	5.05
1079	1274	JUNCTION	0.00	0.00	4978.00	0	00:00	0.00
1080	129	JUNCTION	0.04	0.55	4835.55	0	01:21	0.55
1081	130	JUNCTION	0.00	0.00	4910.00	0	00:00	0.00
1082	1308	JUNCTION	0.00	0.00	4891.00	0	00:00	0.00
1083	1310	JUNCTION	0.00	0.00	4912.00	0	00:00	0.00
1084	1315	JUNCTION	0.91	2.73	4895.73	0	00:57	2.72
1085	1316	JUNCTION	0.91	2.74	4906.74	0	00:52	2.74
1086	1318	JUNCTION	0.00	0.00	4923.00	0	00:00	0.00
1087	1319	JUNCTION	0.03	1.59	4930.59	0	00:40	1.59
1088	1320	JUNCTION	0.00	0.00	4970.00	0	00:00	0.00
1089	1321	JUNCTION	0.04	1.48	4932.48	0	00:50	1.48
1090	1322	JUNCTION	0.00	0.00	4975.00	0	00:00	0.00
1091	1323	JUNCTION	0.03	1.30	4967.30	0	00:45	1.30
1092	1324	JUNCTION	0.00	0.00	4975.00	0	00:00	0.00
1093	1327	JUNCTION	0.00	0.10	4984.10	0	01:05	0.10
1094	1328	JUNCTION	0.00	0.00	4989.00	0	00:00	0.00
1095	133	JUNCTION	0.04	0.55	4917.55	0	01:15	0.55
1096	1339	JUNCTION	0.76	1.62	4935.28	0	03:03	1.62
1097	134	JUNCTION	0.00	0.00	4945.00	0	00:00	0.00
1098	1341	JUNCTION	0.03	1.30	4958.30	0	00:47	1.30
1099	1347	JUNCTION	0.05	1.67	4950.67	0	00:54	1.67
1100	1348	JUNCTION	0.00	0.00	4981.00	0	00:00	0.00
1101	1349	JUNCTION	0.09	2.34	4954.34	0	00:59	2.34
1102	1351	JUNCTION	0.07	2.29	4981.29	0	00:55	2.29
1103	1352	JUNCTION	0.00	0.00	5019.00	0	00:00	0.00
1104	1353	JUNCTION	0.06	2.10	4987.10	0	00:50	2.10
1105	1354	JUNCTION	0.00	0.00	5028.00	0	00:00	0.00
1106	1355	JUNCTION	0.09	2.34	4973.34	0	00:56	2.34
1107	1356	JUNCTION	0.00	0.00	4989.00	0	00:00	0.00
1108	1357	JUNCTION	0.09	2.33	4983.33	0	00:54	2.33
1109	1358	JUNCTION	0.00	0.00	4993.00	0	00:00	0.00
1110	1361	JUNCTION	0.05	1.86	5025.86	0	00:37	1.84
1111	1362	JUNCTION	0.00	0.00	5035.00	0	00:00	0.00
1112	1363	JUNCTION	0.01	0.65	5038.65	0	00:35	0.65
1113	1364	JUNCTION	0.00	0.00	5058.00	0	00:00	0.00
1114	1367	JUNCTION	0.03	1.34	5034.34	0	00:35	1.34
1115	1368	JUNCTION	0.00	0.00	5059.00	0	00:00	0.00
1116	1371	JUNCTION	0.05	1.67	4972.67	0	00:50	1.67
1117	1372	JUNCTION	0.00	0.00	4988.00	0	00:00	0.00
1118	138	JUNCTION	0.02	1.18	4971.18	0	00:35	1.18
1119	1382	JUNCTION	0.00	0.00	4921.00	0	00:00	0.00
1120	1386	JUNCTION	0.00	0.00	4960.00	0	00:00	0.00
1121	1387	JUNCTION	0.02	1.19	4944.19	0	00:45	1.19
1122	1388	JUNCTION	0.00	0.00	4995.00	0	00:00	0.00

1123	139	JUNCTION	0.15	2.73	4819.73	0	01:09	2.73
1124	1392	JUNCTION	0.00	0.00	4938.00	0	00:00	0.00
1125	1393	JUNCTION	0.05	1.55	4941.55	0	00:50	1.55
1126	1394	JUNCTION	0.00	0.00	4997.00	0	00:00	0.00
1127	1395	JUNCTION	0.10	1.43	4948.43	0	01:02	1.43
1128	1396	JUNCTION	0.00	0.00	4969.00	0	00:00	0.00
1129	1398	JUNCTION	0.00	0.00	4972.00	0	00:00	0.00
1130	141	JUNCTION	0.07	1.36	4828.36	0	01:09	1.36
1131	142	JUNCTION	0.00	0.00	4820.00	0	00:00	0.00
1132	146	JUNCTION	0.01	0.31	4849.31	0	00:55	0.31
1133	149	JUNCTION	0.03	0.60	4869.60	0	01:07	0.60
1134	150	JUNCTION	0.00	0.00	4890.00	0	00:00	0.00
1135	154	JUNCTION	0.01	0.76	4904.76	0	00:35	0.76
1136	210	JUNCTION	0.00	0.00	4770.00	0	00:00	0.00
1137	220	JUNCTION	0.00	0.00	4777.00	0	00:00	0.00
1138	221	JUNCTION	0.11	1.58	4792.18	0	01:19	1.58
1139	223	JUNCTION	0.03	0.60	4793.60	0	00:57	0.59
1140	224	JUNCTION	0.00	0.00	4810.00	0	00:00	0.00
1141	225	JUNCTION	0.03	0.61	4840.61	0	00:50	0.61
1142	226	JUNCTION	0.00	0.00	4850.00	0	00:00	0.00
1143	228	JUNCTION	0.02	0.98	4864.98	0	00:45	0.98
1144	231	JUNCTION	0.06	0.83	4791.63	0	01:25	0.83
1145	232	JUNCTION	0.00	0.00	4810.00	0	00:00	0.00
1146	235	JUNCTION	0.06	0.84	4845.84	0	01:18	0.84
1147	236	JUNCTION	0.00	0.00	4847.00	0	00:00	0.00
1148	237	JUNCTION	0.07	0.98	4846.98	0	01:20	0.98
1149	239	JUNCTION	0.09	1.14	4851.14	0	01:23	1.14
1150	240	JUNCTION	0.00	0.00	4849.00	0	00:00	0.00
1151	241	JUNCTION	0.09	1.14	4863.14	0	01:20	1.14
1152	243	JUNCTION	0.04	0.51	4863.51	0	01:30	0.51
1153	244	JUNCTION	0.00	0.00	4894.00	0	00:00	0.00
1154	245	JUNCTION	0.04	0.52	4980.52	0	01:18	0.52
1155	247	JUNCTION	0.02	0.89	4981.89	0	00:42	0.88
1156	248	JUNCTION	0.00	0.00	4986.00	0	00:00	0.00
1157	250	JUNCTION	0.01	0.93	5015.93	0	00:35	0.93
1158	252	JUNCTION	0.00	0.00	4990.00	0	00:00	0.00
1159	256	JUNCTION	0.00	0.00	4851.00	0	00:00	0.00
1160	259	JUNCTION	0.06	0.66	4863.66	0	01:33	0.66
1161	260	JUNCTION	0.00	0.00	4905.00	0	00:00	0.00
1162	263	JUNCTION	0.05	0.66	4922.66	0	01:28	0.66
1163	264	JUNCTION	0.00	0.00	4991.00	0	00:00	0.00
1164	268	JUNCTION	0.02	0.90	4991.90	0	00:40	0.89
1165	310	JUNCTION	0.00	0.00	4778.10	0	00:00	0.00
1166	314	JUNCTION	0.01	0.67	4839.67	0	00:40	0.67
1167	410	JUNCTION	0.00	0.00	4793.00	0	00:00	0.00
1168	414	JUNCTION	0.00	0.00	4796.00	0	00:00	0.00
1169	418	JUNCTION	0.00	0.00	4802.00	0	00:00	0.00
1170	422	JUNCTION	0.00	0.00	4800.00	0	00:00	0.00
1171	426	JUNCTION	0.00	0.00	4810.00	0	00:00	0.00
1172	510	JUNCTION	0.00	0.00	4856.00	0	00:00	0.00
1173	513	JUNCTION	0.00	0.00	4880.00	0	00:00	0.00
1174	514	JUNCTION	0.00	0.00	4931.00	0	00:00	0.00
1175	515	JUNCTION	0.06	0.86	4879.86	0	01:22	0.86
1176	518	JUNCTION	0.00	0.00	4940.00	0	00:00	0.00
1177	610	JUNCTION	0.00	0.00	4858.00	0	00:00	0.00
1178	613	JUNCTION	0.05	0.76	4888.76	0	01:09	0.76
1179	614	JUNCTION	0.00	0.00	4899.00	0	00:00	0.00
1180	616	JUNCTION	0.04	0.61	4941.61	0	01:15	0.61
1181	617	JUNCTION	0.01	0.68	4942.68	0	00:41	0.68
1182	618	JUNCTION	0.00	0.00	4950.00	0	00:00	0.00
1183	620	JUNCTION	0.00	0.00	4920.00	0	00:00	0.00
1184	622	JUNCTION	0.01	0.69	4981.69	0	00:35	0.68
1185	708	JUNCTION	0.03	0.53	4851.53	0	01:28	0.53
1186	709	JUNCTION	0.02	0.46	4866.46	0	01:27	0.45
1187	710	JUNCTION	0.02	0.42	4871.42	0	01:27	0.42
1188	711	JUNCTION	0.02	0.90	4889.90	0	00:47	0.90

1189	712	JUNCTION	0.01	0.41	4915.41	0	00:45	0.41
1190	713	JUNCTION	0.02	0.90	4898.90	0	00:46	0.90
1191	714	JUNCTION	0.00	0.00	4864.00	0	00:00	0.00
1192	804	JUNCTION	0.00	0.00	4882.00	0	00:00	0.00
1193	808	JUNCTION	0.30	2.05	4887.05	0	01:27	2.05
1194	809	JUNCTION	0.30	2.05	4892.05	0	01:27	2.05
1195	810	JUNCTION	0.00	0.00	4925.00	0	00:00	0.00
1196	811	JUNCTION	0.18	1.07	4894.07	0	02:27	1.07
1197	819	JUNCTION	0.18	1.07	4902.07	0	02:23	1.07
1198	820	JUNCTION	0.00	0.00	4945.00	0	00:00	0.00
1199	822	JUNCTION	0.00	0.22	4932.22	0	00:45	0.22
1200	823	JUNCTION	0.10	0.76	4908.76	0	01:47	0.76
1201	824	JUNCTION	0.00	0.14	4961.14	0	00:35	0.14
1202	829	JUNCTION	0.09	0.67	4918.67	0	01:46	0.67
1203	830	JUNCTION	0.00	0.00	4972.00	0	00:00	0.00
1204	831	JUNCTION	0.20	1.52	4930.02	0	01:48	1.52
1205	834	JUNCTION	0.53	4.00	4936.00	0	01:29	4.00
1206	838	JUNCTION	0.53	4.07	4953.07	0	00:52	3.99
1207	839	JUNCTION	0.54	2.62	4967.62	0	01:22	2.61
1208	840	JUNCTION	0.00	0.00	4990.00	0	00:00	0.00
1209	841	JUNCTION	0.53	2.62	4969.62	0	01:22	2.61
1210	842	JUNCTION	0.00	0.00	5000.00	0	00:00	0.00
1211	843	JUNCTION	0.53	4.07	4963.07	0	00:52	3.99
1212	844	JUNCTION	0.00	0.00	4995.00	0	00:00	0.00
1213	850	JUNCTION	0.03	1.77	4991.77	0	00:35	1.76
1214	910	JUNCTION	0.00	0.00	4916.00	0	00:00	0.00
1215	911	JUNCTION	0.10	2.85	4915.85	0	00:53	2.85
1216	912	JUNCTION	0.10	2.85	4922.85	0	00:52	2.84
1217	929	JUNCTION	0.09	2.39	4924.39	0	00:59	2.39
1218	930	JUNCTION	0.00	0.00	4927.00	0	00:00	0.00
1219	931	JUNCTION	0.08	2.41	4956.41	0	00:50	2.41
1220	940	JUNCTION	0.00	0.00	4986.00	0	00:00	0.00
1221	950	JUNCTION	0.00	0.00	4977.00	0	00:00	0.00
1222	960	JUNCTION	0.00	0.00	4970.00	0	00:00	0.00
1223	CulvertOut_1233	JUNCTION	0.06	2.91	4916.91	0	00:46	2.91
1224	Drop_1030	JUNCTION	0.38	3.12	4811.12	0	01:43	3.12
1225	Drop_1042	JUNCTION	0.29	2.23	4833.13	0	01:42	2.22
1226	Drop_1046	JUNCTION	0.84	5.69	4855.69	0	01:40	5.69
1227	Drop_1048	JUNCTION	0.87	5.79	4859.79	0	01:39	5.79
1228	Drop_1115	JUNCTION	0.12	1.68	4787.68	0	00:57	1.67
1229	Drop_1147	JUNCTION	0.17	1.88	4885.88	0	01:37	1.88
1230	Drop_1151	JUNCTION	0.19	2.23	4913.23	0	01:13	2.23
1231	Drop_1239	JUNCTION	0.16	4.08	4955.08	0	01:03	4.08
1232	O_1107	JUNCTION	0.00	0.00	4778.00	0	00:00	0.00
1233	O_1263	JUNCTION	0.00	0.00	4858.00	0	00:00	0.00
1234	O_1307	JUNCTION	0.26	2.10	4867.10	0	01:25	2.10
1235	O_220	JUNCTION	0.11	1.58	4773.58	0	01:25	1.58
1236	O_300	JUNCTION	0.01	0.65	4778.65	0	00:47	0.65
1237	O_500	JUNCTION	0.06	0.86	4826.86	0	01:30	0.86
1238	O_600	JUNCTION	0.05	0.75	4815.75	0	01:21	0.75
1239	O_708	JUNCTION	0.03	0.53	4828.53	0	01:29	0.53
1240	O_803	JUNCTION	0.23	1.35	4866.35	0	01:35	1.35
1241	O_909	JUNCTION	0.04	1.45	4866.45	0	00:59	1.45
1242	1006_Drop	JUNCTION	0.68	5.60	4775.60	0	01:59	5.60
1243	O_100	OUTFALL	0.00	0.00	4778.00	0	00:00	0.00
1244	O_1000	OUTFALL	0.00	0.00	4756.00	0	00:00	0.00
1245	836	DIVIDER	0.53	4.00	4949.00	0	01:21	4.00
1246	D_1141	STORAGE	4.65	7.83	4865.83	0	01:48	7.83
1247	D_1155	STORAGE	0.49	8.07	4901.07	0	02:02	8.06
1248	D_1163	STORAGE	2.87	7.10	4950.10	0	01:26	7.10
1249	D_1170	STORAGE	1.05	2.71	4903.81	0	01:23	2.71
1250	D_1233	STORAGE	2.48	7.75	4915.75	0	02:06	7.75
1251	D_1340	STORAGE	5.82	8.28	4941.94	0	03:03	8.28
1252	D_EURV_1172	STORAGE	2.19	6.47	4781.47	0	00:53	6.47
1253	D_EURV_1208	STORAGE	3.21	7.10	4800.10	0	00:55	7.10
1254	D_EURV_121	STORAGE	3.04	5.34	4840.34	0	00:55	5.34

D_EURV_1264	STORAGE	2.65	6.80	4864.80	0	00:50	6.80	
D_EURV_1316	STORAGE	2.55	7.67	4912.67	0	00:53	7.66	
D_EURV_134	STORAGE	3.07	5.54	4945.54	0	00:52	5.53	
D_EURV_1382	STORAGE	2.46	7.11	4952.11	0	01:05	7.11	
D_EURV_1392	STORAGE	5.07	8.27	4902.27	0	01:22	8.27	
D_EURV_1395	STORAGE	3.34	7.51	4954.51	0	01:02	7.50	
D_EURV_146	STORAGE	2.66	4.24	4831.24	0	00:56	4.24	
D_EURV_150	STORAGE	2.83	5.32	4875.32	0	00:48	5.32	
D_EURV_225	STORAGE	3.12	5.44	4845.44	0	00:50	5.44	
D_EURV_236	STORAGE	2.82	4.68	4850.68	0	00:48	4.68	
D_EURV_244	STORAGE	2.80	5.37	4868.37	0	00:51	5.37	
D_EURV_245	STORAGE	2.89	5.70	4985.70	0	00:54	5.70	
D_EURV_256	STORAGE	3.17	5.41	4856.91	0	00:56	5.41	
D_EURV_263	STORAGE	2.93	5.35	4927.35	0	00:53	5.35	
D_EURV_510	STORAGE	3.11	5.61	4884.61	0	00:54	5.61	
D_EURV_614	STORAGE	2.87	5.56	4894.56	0	00:46	5.56	
D_EURV_618	STORAGE	2.80	5.44	4946.44	0	00:53	5.44	
D_EURV_711	STORAGE	1.70	8.34	4888.34	0	01:02	8.33	
D_EURV_820	STORAGE	1.87	7.02	4938.02	0	00:46	7.00	
D_EURV_830	STORAGE	1.97	6.72	4941.72	0	00:48	6.71	
D_EURV_840	STORAGE	3.00	5.40	4970.40	0	00:51	5.40	
D_EURV_842	STORAGE	4.23	6.73	4973.73	0	01:13	6.73	
D_EURV_844	STORAGE	2.19	6.85	4983.85	0	00:47	6.83	
D_FC__842	STORAGE	0.58	6.37	4973.37	0	01:22	6.32	
D_FC_1050	STORAGE	2.84	9.61	4864.61	0	01:38	9.60	
D_FC_134	STORAGE	0.38	6.76	4945.76	0	01:15	6.76	
D_FC_150	STORAGE	0.33	7.24	4876.24	0	01:07	7.22	
D_FC_245	STORAGE	0.52	7.38	4987.38	0	01:18	7.38	
D_FC_263	STORAGE	0.38	8.46	4930.46	0	01:28	8.45	
D_FC_510	STORAGE	0.43	7.93	4886.93	0	01:22	7.91	
D_FC_618	STORAGE	0.45	6.46	4947.46	0	01:15	6.46	
D_FC_711	STORAGE	0.16	3.35	4878.35	0	01:27	3.34	
D_FC_823	STORAGE	1.03	6.55	4911.55	0	02:23	6.55	
D_FC_838	STORAGE	0.82	6.83	4954.83	0	01:43	6.81	

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Node Inflow Summary
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Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days	hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
1002_Drop	JUNCTION	0.00	4354.15	0	02:00	0	395	0.000
1004	JUNCTION	0.00	4348.17	0	01:57	0	392	0.000
1006_RR	JUNCTION	0.00	3508.16	0	01:58	0	328	0.000
1008	JUNCTION	0.00	3508.96	0	01:57	0	328	0.000
1010	JUNCTION	0.00	3495.44	0	01:56	0	327	0.000
1012	JUNCTION	0.00	3435.14	0	01:53	0	319	0.000
1014	JUNCTION	0.00	3091.14	0	01:51	0	278	0.000
1016	JUNCTION	0.00	3084.73	0	01:50	0	277	0.000
1018	JUNCTION	0.00	3079.50	0	01:49	0	277	0.000
1020	JUNCTION	0.00	3074.44	0	01:48	0	276	0.000
1022	JUNCTION	0.00	3052.28	0	01:46	0	274	0.000
1024	JUNCTION	0.00	3052.41	0	01:45	0	274	0.000
1026	JUNCTION	0.00	3024.57	0	01:45	0	272	0.000
1028	JUNCTION	0.00	3001.56	0	01:43	0	270	0.000
1030	JUNCTION	0.00	2710.38	0	01:42	0	252	0.000
1032	JUNCTION	21.92	21.92	0	00:35	0.421	0.421	0.000
1034	JUNCTION	0.00	1848.07	0	01:45	0	174	0.000
1036	JUNCTION	0.00	1848.37	0	01:44	0	174	0.000
1038	JUNCTION	0.00	1824.56	0	01:43	0	172	0.000
1040	JUNCTION	0.00	1817.44	0	01:41	0	171	0.000

1321	1042	JUNCTION	0.00	1718.09	0	01:40	0	166	0.000
1322	1044	JUNCTION	0.00	1708.57	0	01:40	0	165	0.000
1323	1046	JUNCTION	0.00	1644.94	0	01:39	0	161	0.000
1324	1048	JUNCTION	0.00	1645.25	0	01:38	0	161	0.000
1325	109	JUNCTION	0.00	994.57	0	01:19	0	43.6	0.000
1326	110	JUNCTION	72.63	72.63	0	01:05	3.54	3.54	0.000
1327	1108	JUNCTION	7.59	7.59	0	00:35	0.152	0.152	0.000
1328	1110	JUNCTION	28.58	28.58	0	00:40	0.739	0.739	0.000
1329	1115	JUNCTION	0.00	541.00	0	00:54	0	41.6	0.000
1330	1116	JUNCTION	144.71	144.71	0	00:40	3.21	3.21	0.000
1331	1123	JUNCTION	0.00	413.58	0	00:55	0	37.7	0.000
1332	1124	JUNCTION	65.92	65.92	0	00:40	1.52	1.52	0.000
1333	1125	JUNCTION	0.00	231.67	0	00:30	0	3.09	0.000
1334	1126	JUNCTION	231.67	231.67	0	00:30	3.09	3.09	0.000
1335	1127	JUNCTION	0.00	364.50	0	00:54	0	36.1	0.000
1336	113	JUNCTION	0.00	928.75	0	01:19	0	40.1	0.000
1337	1130	JUNCTION	0.00	311.03	0	01:17	0	33	0.000
1338	1132	JUNCTION	54.44	54.44	0	00:35	1.07	1.07	0.000
1339	1139	JUNCTION	0.00	300.89	0	01:48	0	32	0.000
1340	114	JUNCTION	157.34	157.34	0	00:50	5.39	5.39	0.000
1341	1140	JUNCTION	278.22	278.22	0	00:40	5.63	5.63	0.000
1342	1141	JUNCTION	0.00	285.70	0	01:16	0	27.9	0.000
1343	1142	JUNCTION	48.51	48.51	0	00:35	1.11	1.11	0.000
1344	1144	JUNCTION	203.80	203.80	0	00:35	3.74	3.74	0.000
1345	1147	JUNCTION	0.00	270.93	0	01:34	0	26.8	0.000
1346	1148	JUNCTION	194.50	194.50	0	00:40	5.12	5.12	0.000
1347	115	JUNCTION	0.00	822.66	0	01:12	0	34.5	0.000
1348	1150	JUNCTION	44.33	44.33	0	00:55	2.02	2.02	0.000
1349	1151	JUNCTION	0.00	185.06	0	01:05	0	12.3	0.000
1350	1152	JUNCTION	77.44	77.44	0	00:35	1.46	1.46	0.000
1351	1153	JUNCTION	0.00	161.21	0	01:26	0	10.8	0.000
1352	1154	JUNCTION	164.54	164.54	0	00:40	3.9	3.9	0.000
1353	1156	JUNCTION	148.41	148.41	0	00:40	3.98	3.98	0.000
1354	1164	JUNCTION	327.56	327.56	0	00:40	7.34	7.34	0.000
1355	117	JUNCTION	0.00	508.06	0	01:13	0	22.2	0.000
1356	1172	JUNCTION	28.40	28.40	0	00:50	1.25	1.25	0.000
1357	118	JUNCTION	53.03	53.03	0	00:50	1.8	1.8	0.000
1358	1180	JUNCTION	25.72	25.72	0	00:40	0.701	0.701	0.000
1359	119	JUNCTION	0.00	465.90	0	01:11	0	20.3	0.000
1360	1208	JUNCTION	104.79	104.79	0	00:40	2.55	2.55	0.000
1361	1209	JUNCTION	0.00	72.91	0	00:50	0	2.68	0.000
1362	121	JUNCTION	0.00	243.12	0	00:55	0	8.5	0.000
1363	1210	JUNCTION	72.91	72.91	0	00:50	2.68	2.68	0.000
1364	1215	JUNCTION	0.00	703.05	0	01:12	0	53.1	0.000
1365	1216	JUNCTION	100.32	100.32	0	01:10	5.53	5.53	0.000
1366	1217	JUNCTION	0.00	707.12	0	01:05	0	53	0.000
1367	122	JUNCTION	231.81	231.81	0	00:45	7.43	7.43	0.000
1368	1223	JUNCTION	0.00	546.54	0	01:00	0	44.7	0.000
1369	1224	JUNCTION	96.97	96.97	0	00:55	3.97	3.97	0.000
1370	1226	JUNCTION	58.73	58.73	0	00:50	2.48	2.48	0.000
1371	1228	JUNCTION	37.53	37.53	0	00:55	1.66	1.66	0.000
1372	1230	JUNCTION	46.68	46.68	0	00:45	1.47	1.47	0.000
1373	1231	JUNCTION	0.00	399.53	0	00:35	0	34.3	0.000
1374	1232	JUNCTION	396.23	396.23	0	00:35	7.51	7.51	0.000
1375	1233	JUNCTION	0.00	497.41	0	00:46	0	14.4	0.000
1376	1233_Lake	JUNCTION	0.00	497.28	0	00:47	0	14.4	0.000
1377	1234	JUNCTION	131.04	131.04	0	00:40	2.92	2.92	0.000
1378	1235	JUNCTION	0.00	150.40	0	00:45	0	4.61	0.000
1379	1236	JUNCTION	150.40	150.40	0	00:45	4.61	4.61	0.000
1380	1237	JUNCTION	0.00	168.02	0	00:45	0	4.98	0.000
1381	1238	JUNCTION	168.02	168.02	0	00:45	4.98	4.98	0.000
1382	1239	JUNCTION	0.00	326.18	0	01:02	0	12.4	0.000
1383	1239_Lake	JUNCTION	0.00	326.09	0	01:03	0	12.4	0.000
1384	1240	JUNCTION	41.16	41.16	0	00:45	1.2	1.2	0.000
1385	1247	JUNCTION	0.00	230.11	0	00:45	0	6.9	0.000
1386	1248	JUNCTION	62.50	62.50	0	00:45	1.92	1.92	0.000

1387	1249	JUNCTION	0.00	167.79	0	00:46	0	4.98	0.000
1388	1255	JUNCTION	0.00	268.37	0	00:58	0	10.2	0.000
1389	1256	JUNCTION	140.47	140.47	0	00:40	3.73	3.73	0.000
1390	1257	JUNCTION	0.00	158.55	0	00:58	0	6.39	0.000
1391	1258	JUNCTION	88.98	88.98	0	00:45	3	3	0.000
1392	1259	JUNCTION	0.00	77.87	0	00:55	0	3.35	0.000
1393	126	JUNCTION	30.89	30.89	0	00:45	1.01	1.01	0.000
1394	1260	JUNCTION	77.87	77.87	0	00:55	3.35	3.35	0.000
1395	1264	JUNCTION	47.41	47.41	0	00:45	1.57	1.57	0.000
1396	1272	JUNCTION	15.85	15.85	0	00:50	0.618	0.618	0.000
1397	1273	JUNCTION	0.00	291.74	0	00:59	0	11.2	0.000
1398	1274	JUNCTION	24.36	24.36	0	00:50	1.01	1.01	0.000
1399	129	JUNCTION	0.00	258.77	0	01:18	0	11.8	0.000
1400	130	JUNCTION	65.43	65.43	0	00:50	2.46	2.46	0.000
1401	1308	JUNCTION	66.60	66.60	0	00:55	2.76	2.76	0.000
1402	1310	JUNCTION	45.27	45.27	0	00:50	1.76	1.76	0.000
1403	1315	JUNCTION	0.00	979.89	0	01:20	0	88.2	0.000
1404	1316	JUNCTION	139.65	366.77	0	00:52	4.91	60.9	0.000
1405	1318	JUNCTION	39.95	39.95	0	00:50	1.57	1.57	0.000
1406	1319	JUNCTION	0.00	125.13	0	00:40	0	2.64	0.000
1407	1320	JUNCTION	125.13	125.13	0	00:40	2.64	2.64	0.000
1408	1321	JUNCTION	0.00	108.59	0	00:50	0	3.67	0.000
1409	1322	JUNCTION	108.59	108.59	0	00:50	3.67	3.67	0.000
1410	1323	JUNCTION	0.00	81.32	0	00:45	0	2.54	0.000
1411	1324	JUNCTION	81.32	81.32	0	00:45	2.54	2.54	0.000
1412	1327	JUNCTION	0.00	7.44	0	01:05	0	0.429	0.000
1413	1328	JUNCTION	7.44	7.44	0	01:05	0.429	0.429	0.000
1414	133	JUNCTION	0.00	210.19	0	01:15	0	9.26	0.000
1415	1339	JUNCTION	0.00	130.68	0	03:03	0	49.7	0.000
1416	134	JUNCTION	157.96	157.96	0	00:35	3.47	3.47	0.000
1417	1341	JUNCTION	0.00	80.88	0	00:47	0	2.54	0.000
1418	1347	JUNCTION	0.00	281.29	0	00:52	0	9.96	0.000
1419	1348	JUNCTION	108.38	108.38	0	00:45	3.64	3.64	0.000
1420	1349	JUNCTION	52.05	806.90	0	01:00	1.79	29	0.000
1421	1351	JUNCTION	0.00	328.47	0	00:55	0	11.6	0.000
1422	1352	JUNCTION	154.51	154.51	0	00:55	6.07	6.07	0.000
1423	1353	JUNCTION	0.00	176.00	0	00:50	0	5.48	0.000
1424	1354	JUNCTION	94.61	94.61	0	00:50	3.38	3.38	0.000
1425	1355	JUNCTION	0.00	431.95	0	00:56	0	15.1	0.000
1426	1356	JUNCTION	142.61	142.61	0	00:50	4.95	4.95	0.000
1427	1357	JUNCTION	0.00	296.01	0	00:54	0	10.2	0.000
1428	1358	JUNCTION	143.03	143.03	0	00:55	5.74	5.74	0.000
1429	1361	JUNCTION	0.00	182.58	0	00:37	0	4.27	0.000
1430	1362	JUNCTION	19.02	19.02	0	01:00	1.01	1.01	0.000
1431	1363	JUNCTION	0.00	170.93	0	00:35	0	3.25	0.000
1432	1364	JUNCTION	170.93	170.93	0	00:35	3.25	3.25	0.000
1433	1367	JUNCTION	0.00	91.21	0	00:35	0	2.06	0.000
1434	1368	JUNCTION	91.21	91.21	0	00:35	2.06	2.06	0.000
1435	1371	JUNCTION	0.00	176.07	0	00:50	0	6.31	0.000
1436	1372	JUNCTION	176.07	176.07	0	00:50	6.31	6.31	0.000
1437	138	JUNCTION	336.51	336.51	0	00:35	5.75	5.75	0.000
1438	1382	JUNCTION	86.62	86.62	0	01:05	4.32	4.32	0.000
1439	1386	JUNCTION	39.19	39.19	0	01:00	1.92	1.92	0.000
1440	1387	JUNCTION	0.00	215.43	0	00:45	0	6.16	-0.000
1441	1388	JUNCTION	215.43	215.43	0	00:45	6.16	6.16	0.000
1442	139	JUNCTION	0.00	315.89	0	01:09	0	12.4	0.000
1443	1392	JUNCTION	143.88	143.88	0	00:45	4.37	4.37	0.000
1444	1393	JUNCTION	0.00	150.17	0	00:50	0	5.76	0.000
1445	1394	JUNCTION	150.17	150.17	0	00:50	5.76	5.76	0.000
1446	1395	JUNCTION	0.00	268.48	0	01:02	0	9.29	-0.000
1447	1396	JUNCTION	237.90	237.90	0	00:40	5.64	5.64	0.000
1448	1398	JUNCTION	170.45	170.45	0	00:35	3.79	3.79	0.000
1449	141	JUNCTION	0.00	294.45	0	01:09	0	11.4	0.000
1450	142	JUNCTION	23.10	23.10	0	00:50	1	1	0.000
1451	146	JUNCTION	48.00	48.00	0	00:55	2.27	2.27	0.000
1452	149	JUNCTION	0.00	248.97	0	01:07	0	9.04	-0.000

1453	150	JUNCTION	99.63	99.63	0	00:45	3.25	3.25	0.000
1454	154	JUNCTION	314.17	314.17	0	00:35	5.79	5.79	0.000
1455	210	JUNCTION	90.13	90.13	0	00:45	2.42	2.42	0.000
1456	220	JUNCTION	134.33	134.33	0	00:50	4.78	4.78	0.000
1457	221	JUNCTION	0.00	1117.93	0	01:19	0	59.1	0.000
1458	223	JUNCTION	0.00	360.61	0	00:56	0	11.1	0.000
1459	224	JUNCTION	102.16	102.16	0	00:45	3.15	3.15	0.000
1460	225	JUNCTION	0.00	275.66	0	00:50	0	7.83	0.000
1461	226	JUNCTION	155.49	155.49	0	00:40	3.8	3.8	0.000
1462	228	JUNCTION	141.04	141.04	0	00:45	4.04	4.04	0.000
1463	231	JUNCTION	0.00	872.46	0	01:24	0	48	0.000
1464	232	JUNCTION	138.83	138.83	0	00:55	5.25	5.25	0.000
1465	235	JUNCTION	0.00	778.08	0	01:18	0	42.6	0.000
1466	236	JUNCTION	104.05	104.05	0	00:45	3.48	3.48	0.000
1467	237	JUNCTION	0.00	702.73	0	01:19	0	39.1	0.000
1468	239	JUNCTION	0.00	680.33	0	01:19	0	38	0.000
1469	240	JUNCTION	33.33	33.33	0	00:45	1.04	1.04	0.000
1470	241	JUNCTION	0.00	561.92	0	01:20	0	32.5	0.000
1471	243	JUNCTION	0.00	361.15	0	01:21	0	20.5	0.000
1472	244	JUNCTION	235.09	235.09	0	00:40	5.9	5.9	0.000
1473	245	JUNCTION	0.00	266.00	0	01:18	0	14.4	-0.000
1474	247	JUNCTION	0.00	508.32	0	00:39	0	9.97	0.000
1475	248	JUNCTION	371.93	371.93	0	00:35	6.99	6.99	0.000
1476	250	JUNCTION	181.38	181.38	0	00:35	2.95	2.95	0.000
1477	252	JUNCTION	172.31	172.31	0	00:40	4.42	4.42	0.000
1478	256	JUNCTION	179.67	179.67	0	00:45	5.52	5.52	0.000
1479	259	JUNCTION	0.00	201.32	0	01:17	0	12	0.000
1480	260	JUNCTION	98.76	98.76	0	00:50	3.31	3.31	0.000
1481	263	JUNCTION	0.00	136.60	0	01:28	0	8.64	-0.000
1482	264	JUNCTION	194.91	194.91	0	00:40	4.77	4.77	0.000
1483	268	JUNCTION	157.14	157.14	0	00:40	3.88	3.88	0.000
1484	310	JUNCTION	110.60	110.60	0	00:50	3.8	3.8	0.000
1485	314	JUNCTION	165.51	165.51	0	00:40	3.85	3.85	0.000
1486	410	JUNCTION	19.10	19.10	0	00:45	0.649	0.649	0.000
1487	414	JUNCTION	19.85	19.85	0	00:45	0.578	0.578	0.000
1488	418	JUNCTION	53.80	53.80	0	00:50	1.96	1.96	0.000
1489	422	JUNCTION	2.89	2.89	0	00:40	0.0778	0.0778	0.000
1490	426	JUNCTION	52.54	52.54	0	00:50	1.96	1.96	0.000
1491	510	JUNCTION	174.63	174.63	0	00:50	6.53	6.53	0.000
1492	513	JUNCTION	0.00	453.19	0	00:40	0	11.1	0.000
1493	514	JUNCTION	227.72	227.72	0	00:40	5.98	5.98	0.000
1494	515	JUNCTION	0.00	209.40	0	01:22	0	11.1	0.000
1495	518	JUNCTION	225.47	225.47	0	00:40	5.14	5.14	0.000
1496	610	JUNCTION	145.64	145.64	0	00:50	5.66	5.66	0.000
1497	613	JUNCTION	0.00	370.46	0	01:09	0	17.8	0.000
1498	614	JUNCTION	319.18	319.18	0	00:35	6.48	6.48	0.000
1499	616	JUNCTION	0.00	233.92	0	01:15	0	11.2	0.000
1500	617	JUNCTION	0.00	543.86	0	00:39	0	11.2	0.000
1501	618	JUNCTION	216.95	216.95	0	00:35	3.84	3.84	0.000
1502	620	JUNCTION	37.02	37.02	0	01:00	1.88	1.88	0.000
1503	622	JUNCTION	358.66	358.66	0	00:35	7.37	7.37	0.000
1504	708	JUNCTION	0.00	110.79	0	01:28	0	5.19	0.000
1505	709	JUNCTION	0.00	110.82	0	01:27	0	5.19	0.000
1506	710	JUNCTION	0.00	110.83	0	01:27	0	5.19	0.000
1507	711	JUNCTION	0.00	170.06	0	00:47	0	5.2	0.000
1508	712	JUNCTION	170.73	170.73	0	00:45	5.19	5.19	0.000
1509	713	JUNCTION	0.00	170.29	0	00:46	0	5.19	0.000
1510	714	JUNCTION	51.54	51.54	0	00:40	1.17	1.17	0.000
1511	804	JUNCTION	25.38	25.38	0	00:40	0.596	0.596	0.000
1512	808	JUNCTION	0.00	298.54	0	01:27	0	46.3	0.000
1513	809	JUNCTION	0.00	298.54	0	01:27	0	46.3	0.000
1514	810	JUNCTION	187.92	187.92	0	00:40	4.69	4.69	0.000
1515	811	JUNCTION	0.00	282.68	0	02:27	0	41.7	0.000
1516	819	JUNCTION	0.00	282.73	0	02:23	0	41.6	0.000
1517	820	JUNCTION	331.54	331.54	0	00:35	5.63	5.63	0.000
1518	822	JUNCTION	0.00	145.96	0	00:45	0	3.24	0.000

1519	823	JUNCTION	0.00	311.33	0	01:47	0	32.7	0.000
1520	824	JUNCTION	164.78	164.78	0	00:35	3.18	3.18	0.000
1521	829	JUNCTION	0.00	311.34	0	01:46	0	32.7	0.000
1522	830	JUNCTION	293.46	293.46	0	00:35	4.85	4.85	0.000
1523	831	JUNCTION	0.00	311.34	0	01:46	0	32.7	0.000
1524	834	JUNCTION	0.00	291.93	0	01:44	0	27.8	0.000
1525	838	JUNCTION	0.00	528.23	0	00:52	0	27.9	0.000
1526	839	JUNCTION	0.00	534.64	0	00:50	0	27.9	0.000
1527	840	JUNCTION	199.75	199.75	0	00:40	4.63	4.63	0.000
1528	841	JUNCTION	0.00	283.97	0	01:22	0	14.1	-0.000
1529	842	JUNCTION	352.84	352.84	0	00:40	7.78	7.78	0.000
1530	843	JUNCTION	0.00	528.33	0	00:52	0	27.9	0.000
1531	844	JUNCTION	523.28	523.28	0	00:35	9.24	9.24	0.000
1532	850	JUNCTION	313.34	313.34	0	00:35	6.5	6.5	0.000
1533	910	JUNCTION	140.59	140.59	0	00:50	5.08	5.08	0.000
1534	911	JUNCTION	0.00	601.74	0	00:53	0	20.9	0.000
1535	912	JUNCTION	0.00	602.04	0	00:52	0	20.9	0.000
1536	929	JUNCTION	0.00	602.04	0	00:52	0	20.9	0.000
1537	930	JUNCTION	334.77	334.77	0	00:40	7.52	7.52	0.000
1538	931	JUNCTION	0.00	359.16	0	00:50	0	13.2	0.000
1539	940	JUNCTION	137.30	137.30	0	00:50	5.01	5.01	0.000
1540	950	JUNCTION	145.62	145.62	0	00:55	6.1	6.1	0.000
1541	960	JUNCTION	85.75	85.75	0	00:40	2.11	2.11	0.000
1542	CulvertOut_1233	JUNCTION	0.00	497.41	0	00:46	0	14.4	0.000
1543	Drop_1030	JUNCTION	0.00	2709.74	0	01:43	0	252	0.000
1544	Drop_1042	JUNCTION	0.00	1717.51	0	01:42	0	166	0.000
1545	Drop_1046	JUNCTION	0.00	1644.51	0	01:40	0	161	0.000
1546	Drop_1048	JUNCTION	0.00	1644.94	0	01:39	0	161	0.000
1547	Drop_1115	JUNCTION	0.00	540.64	0	00:57	0	41.6	0.000
1548	Drop_1147	JUNCTION	0.00	270.91	0	01:37	0	26.8	0.000
1549	Drop_1151	JUNCTION	0.00	184.00	0	01:13	0	12.3	0.000
1550	Drop_1239	JUNCTION	0.00	326.09	0	01:03	0	12.4	0.000
1551	O_1107	JUNCTION	0.00	545.67	0	00:55	0	41.8	0.000
1552	O_1263	JUNCTION	0.00	741.32	0	01:11	0	54.6	0.000
1553	O_1307	JUNCTION	0.00	1022.90	0	01:25	0	90.8	0.000
1554	O_220	JUNCTION	0.00	1208.67	0	01:23	0	64.1	0.000
1555	O_300	JUNCTION	0.00	267.40	0	00:49	0	7.69	0.000
1556	O_500	JUNCTION	0.00	335.32	0	01:19	0	17.8	0.000
1557	O_600	JUNCTION	0.00	479.07	0	01:19	0	23.8	0.000
1558	O_708	JUNCTION	0.00	110.78	0	01:29	0	5.19	0.000
1559	O_803	JUNCTION	0.00	306.44	0	01:28	0	46.9	0.000
1560	O_909	JUNCTION	0.00	727.72	0	00:59	0	26.1	0.000
1561	1006_Drop	JUNCTION	0.00	3507.31	0	01:59	0	328	0.000
1562	O_100	OUTFALL	0.00	994.57	0	01:19	0	43.6	0.000
1563	O_1000	OUTFALL	0.00	4354.15	0	02:00	0	395	0.000
1564	836	DIVIDER	0.00	291.98	0	01:43	0	27.8	0.000
1565	D_1141	STORAGE	0.00	459.45	0	00:55	0	33.5	0.055
1566	D_1155	STORAGE	0.00	499.05	0	00:54	0	24.7	0.013
1567	D_1163	STORAGE	0.00	492.10	0	00:40	0	11.2	0.083
1568	D_1170	STORAGE	0.00	148.41	0	00:40	0	3.98	0.101
1569	D_1233	STORAGE	0.00	779.25	0	00:54	0	26.8	0.028
1570	D_1340	STORAGE	283.52	1426.01	0	00:57	7.17	61.3	0.011
1571	D_EURV_1172	STORAGE	0.00	28.40	0	00:50	0	1.25	0.154
1572	D_EURV_1208	STORAGE	0.00	104.79	0	00:40	0	2.55	0.239
1573	D_EURV_121	STORAGE	0.00	247.89	0	00:50	0	8.51	0.176
1574	D_EURV_1264	STORAGE	0.00	47.41	0	00:45	0	1.57	0.208
1575	D_EURV_1316	STORAGE	0.00	221.16	0	00:52	0	6.39	0.249
1576	D_EURV_134	STORAGE	0.00	464.80	0	00:40	0	9.29	0.253
1577	D_EURV_1382	STORAGE	0.00	86.62	0	01:05	0	4.32	0.135
1578	D_EURV_1392	STORAGE	0.00	665.77	0	01:10	0	25.9	0.163
1579	D_EURV_1395	STORAGE	0.00	405.29	0	00:40	0	9.43	0.201
1580	D_EURV_146	STORAGE	0.00	47.99	0	00:55	0	2.27	0.159
1581	D_EURV_150	STORAGE	0.00	398.47	0	00:41	0	9.06	0.270
1582	D_EURV_225	STORAGE	0.00	293.84	0	00:41	0	7.84	0.219
1583	D_EURV_236	STORAGE	0.00	104.05	0	00:45	0	3.48	0.203
1584	D_EURV_244	STORAGE	0.00	235.09	0	00:40	0	5.9	0.210

1585	D_EURV_245	STORAGE	0.00	679.30	0	00:40	0	14.4	0.203
1586	D_EURV_256	STORAGE	0.00	179.67	0	00:45	0	5.52	0.173
1587	D_EURV_263	STORAGE	0.00	349.02	0	00:41	0	8.66	0.203
1588	D_EURV_510	STORAGE	0.00	453.19	0	00:40	0	11.1	0.190
1589	D_EURV_614	STORAGE	0.00	319.18	0	00:35	0	6.48	0.268
1590	D_EURV_618	STORAGE	0.00	543.86	0	00:39	0	11.2	0.225
1591	D_EURV_711	STORAGE	0.00	169.72	0	00:49	0	5.21	0.212
1592	D_EURV_820	STORAGE	0.00	331.54	0	00:35	0	5.63	0.308
1593	D_EURV_830	STORAGE	0.00	293.46	0	00:35	0	4.85	0.285
1594	D_EURV_840	STORAGE	0.00	199.75	0	00:40	0	4.63	0.213
1595	D_EURV_842	STORAGE	0.00	646.49	0	00:41	0	14.3	0.118
1596	D_EURV_844	STORAGE	0.00	523.28	0	00:35	0	9.24	0.299
1597	D_FC__842	STORAGE	0.00	328.28	0	01:13	0	14.1	0.004
1598	D_FC_1050	STORAGE	0.00	1894.59	0	01:21	0	164	0.073
1599	D_FC_134	STORAGE	0.00	371.47	0	00:52	0	9.26	0.019
1600	D_FC_150	STORAGE	0.00	365.30	0	00:48	0	9.04	0.020
1601	D_FC_245	STORAGE	0.00	505.55	0	00:54	0	14.4	0.019
1602	D_FC_263	STORAGE	0.00	298.61	0	00:53	0	8.64	0.013
1603	D_FC_510	STORAGE	0.00	379.57	0	00:54	0	11.1	0.013
1604	D_FC_618	STORAGE	0.00	411.43	0	00:53	0	11.2	0.044
1605	D_FC_711	STORAGE	0.00	155.18	0	01:02	0	5.2	0.151
1606	D_FC_823	STORAGE	0.00	474.73	0	00:55	0	41.7	0.026
1607	D_FC_838	STORAGE	0.00	524.38	0	00:54	0	27.9	0.020
1608									
1609									
1610	**********								
1611	Node Flooding Summary								
1612	**********								
1613									
1614	No nodes were flooded.								
1615									
1616									
1617	**********								
1618	Storage Volume Summary								
1619	**********								
1620									

	Storage Unit	Average Volume 1000 ftxB3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ftxB3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
1626	D_1141	223.894	14.5	0.0	0.0	761.678	49.3	0 01:48	300.89
1627	D_1155	41.821	2.5	0.0	0.0	1103.686	64.7	0 02:02	246.05
1628	D_1163	160.519	11.5	0.0	0.0	911.827	65.1	0 01:26	161.21
1629	D_1170	55.041	6.2	0.0	0.0	261.540	29.7	0 01:23	70.80
1630	D_1233	425.808	12.9	0.0	0.0	2621.397	79.1	0 02:06	226.94
1631	D_1340	2952.739	13.7	0.0	0.0	7069.781	32.9	0 03:03	130.68
1632	D_EURV_1172	3.861	8.1	0.0	0.0	18.091	37.9	0 00:53	28.28
1633	D_EURV_1208	33.874	16.8	0.0	0.0	113.607	56.3	0 00:55	85.86
1634	D_EURV_121	69.492	5.4	0.0	0.0	265.237	20.6	0 00:55	243.12
1635	D_EURV_1264	4.430	9.5	0.0	0.0	19.452	41.8	0 00:50	47.27
1636	D_EURV_1316	16.690	12.8	0.0	0.0	80.665	62.1	0 00:53	220.78
1637	D_EURV_134	107.884	6.2	0.0	0.0	488.364	28.0	0 00:52	371.47
1638	D_EURV_1382	12.022	11.8	0.0	0.0	53.931	52.9	0 01:05	86.53
1639	D_EURV_1392	499.746	37.2	0.0	0.0	1026.839	76.5	0 01:22	593.76
1640	D_EURV_1395	169.652	19.4	0.0	0.0	580.186	66.4	0 01:02	268.48
1641	D_EURV_146	14.899	6.2	0.0	0.0	46.331	19.2	0 00:56	47.97
1642	D_EURV_150	67.042	5.3	0.0	0.0	316.411	25.2	0 00:48	365.30
1643	D_EURV_225	65.676	4.6	0.0	0.0	271.149	18.8	0 00:50	275.66
1644	D_EURV_236	24.656	5.9	0.0	0.0	89.021	21.3	0 00:48	103.36
1645	D_EURV_244	52.065	5.1	0.0	0.0	253.109	24.6	0 00:51	211.20
1646	D_EURV_245	145.335	4.9	0.0	0.0	801.922	27.2	0 00:54	505.55
1647	D_EURV_256	52.880	5.3	0.0	0.0	210.340	21.0	0 00:56	166.83
1648	D_EURV_263	92.838	6.1	0.0	0.0	419.084	27.5	0 00:53	298.61
1649	D_EURV_510	114.372	5.5	0.0	0.0	529.177	25.3	0 00:54	379.57
1650	D_EURV_614	57.746	4.9	0.0	0.0	290.078	24.5	0 00:46	280.31

D_EURV_618	121.223	5.7	0.0	0.0	623.551	29.4	0	00:53	411.43
D_EURV_711	22.084	9.1	0.0	0.0	180.897	74.7	0	01:02	155.18
D_EURV_820	47.458	9.2	0.0	0.0	308.156	59.9	0	00:46	239.67
D_EURV_830	53.698	9.7	0.0	0.0	312.050	56.4	0	00:48	192.74
D_EURV_840	58.601	6.3	0.0	0.0	250.810	26.9	0	00:51	164.78
D_EURV_842	389.162	14.2	0.0	0.0	1235.721	45.1	0	01:13	328.28
D_EURV_844	99.456	11.4	0.0	0.0	514.151	58.8	0	00:47	382.80
D_FC__842	6.728	3.1	0.0	0.0	107.807	50.5	0	01:22	283.97
D_FC_1050	925.398	26.6	0.0	0.0	3325.195	95.7	0	01:38	1645.25
D_FC_134	10.418	2.6	0.0	0.0	235.553	58.4	0	01:15	210.19
D_FC_150	5.794	2.1	0.0	0.0	174.558	62.3	0	01:07	248.97
D_FC_245	26.268	3.9	0.0	0.0	453.307	67.5	0	01:18	266.00
D_FC_263	9.820	2.7	0.0	0.0	284.945	78.7	0	01:28	136.60
D_FC_510	13.844	3.0	0.0	0.0	330.733	72.7	0	01:22	209.40
D_FC_618	16.962	3.2	0.0	0.0	298.786	56.2	0	01:15	233.92
D_FC_711	6.196	1.1	0.0	0.0	142.646	25.8	0	01:27	110.83
D_FC_823	84.274	4.5	0.0	0.0	1017.633	53.9	0	02:23	282.73
D_FC_838	92.616	6.7	0.0	0.0	872.573	63.3	0	01:43	291.98

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Outfall Loading Summary
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Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
O_100	99.75	22.57	994.57	43.642
O_1000	99.88	203.96	4354.15	394.954
System	99.81	226.53	4900.72	438.596

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Link Flow Summary
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Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days	hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
Dummy_1002	DUMMY	4354.15	0	02:00			
Dummy_1030	DUMMY	2709.74	0	01:43			
Dummy_1032	DUMMY	21.92	0	00:35			
Dummy_1042	DUMMY	1717.51	0	01:42			
Dummy_1046	DUMMY	1644.51	0	01:40			
Dummy_1048	DUMMY	1644.94	0	01:39			
Dummy_109	DUMMY	994.57	0	01:19			
Dummy_110	DUMMY	72.63	0	01:05			
Dummy_1107	DUMMY	545.67	0	00:55			
Dummy_1108	DUMMY	7.59	0	00:35			
Dummy_1110	DUMMY	28.58	0	00:40			
Dummy_1115	DUMMY	540.64	0	00:57			
Dummy_1116	DUMMY	144.71	0	00:40			
Dummy_1124	DUMMY	65.92	0	00:40			
Dummy_1126	DUMMY	231.67	0	00:30			
Dummy_1132	DUMMY	54.44	0	00:35			
Dummy_1139	DUMMY	300.89	0	01:48			
Dummy_114	DUMMY	157.34	0	00:50			
Dummy_1140	DUMMY	278.22	0	00:40			
Dummy_1141	DUMMY	285.70	0	01:16			
Dummy_1142	DUMMY	48.51	0	00:35			
Dummy_1144	DUMMY	203.80	0	00:35			

1717	Dummy_1147	DUMMY	270.91	0	01:37
1718	Dummy_1148	DUMMY	194.50	0	00:40
1719	Dummy_1150	DUMMY	44.33	0	00:55
1720	Dummy_1151	DUMMY	184.00	0	01:13
1721	Dummy_1152	DUMMY	77.44	0	00:35
1722	Dummy_1153	DUMMY	161.21	0	01:26
1723	Dummy_1154	DUMMY	164.54	0	00:40
1724	Dummy_1156	DUMMY	148.41	0	00:40
1725	Dummy_1164	DUMMY	327.56	0	00:40
1726	Dummy_1172	DUMMY	28.40	0	00:50
1727	Dummy_118	DUMMY	53.03	0	00:50
1728	Dummy_1180	DUMMY	25.72	0	00:40
1729	Dummy_1208	DUMMY	104.79	0	00:40
1730	Dummy_121	DUMMY	243.12	0	00:55
1731	Dummy_1210	DUMMY	72.91	0	00:50
1732	Dummy_1215	DUMMY	703.05	0	01:12
1733	Dummy_1216	DUMMY	100.32	0	01:10
1734	Dummy_122	DUMMY	231.81	0	00:45
1735	Dummy_1224	DUMMY	96.97	0	00:55
1736	Dummy_1226	DUMMY	58.73	0	00:50
1737	Dummy_1228	DUMMY	37.53	0	00:55
1738	Dummy_1230	DUMMY	46.68	0	00:45
1739	Dummy_1232	DUMMY	396.23	0	00:35
1740	Dummy_1233	DUMMY	497.41	0	00:46
1741	Dummy_1233_Lake	DUMMY	497.28	0	00:47
1742	Dummy_1234	DUMMY	131.04	0	00:40
1743	Dummy_1236	DUMMY	150.40	0	00:45
1744	Dummy_1238	DUMMY	168.02	0	00:45
1745	Dummy_1239	DUMMY	326.09	0	01:03
1746	Dummy_1239_Lake	DUMMY	326.09	0	01:03
1747	Dummy_1240	DUMMY	41.16	0	00:45
1748	Dummy_1248	DUMMY	62.50	0	00:45
1749	Dummy_1249	DUMMY	167.79	0	00:46
1750	Dummy_1256	DUMMY	140.47	0	00:40
1751	Dummy_1258	DUMMY	88.98	0	00:45
1752	Dummy_1260	DUMMY	77.87	0	00:55
1753	Dummy_1263	DUMMY	741.32	0	01:11
1754	Dummy_1264	DUMMY	47.41	0	00:45
1755	Dummy_1272	DUMMY	15.85	0	00:50
1756	Dummy_1274	DUMMY	24.36	0	00:50
1757	Dummy_129	DUMMY	258.77	0	01:18
1758	Dummy_130	DUMMY	65.43	0	00:50
1759	Dummy_1307	DUMMY	1022.90	0	01:25
1760	Dummy_1308	DUMMY	66.60	0	00:55
1761	Dummy_1310	DUMMY	45.27	0	00:50
1762	Dummy_1318	DUMMY	39.95	0	00:50
1763	Dummy_1320	DUMMY	125.13	0	00:40
1764	Dummy_1322	DUMMY	108.59	0	00:50
1765	Dummy_1324	DUMMY	81.32	0	00:45
1766	Dummy_1328	DUMMY	7.44	0	01:05
1767	Dummy_1337	DUMMY	281.29	0	00:52
1768	Dummy_134	DUMMY	157.96	0	00:35
1769	Dummy_1341	DUMMY	80.88	0	00:47
1770	Dummy_1348	DUMMY	108.38	0	00:45
1771	Dummy_1349	DUMMY	806.90	0	01:00
1772	Dummy_1352	DUMMY	154.51	0	00:55
1773	Dummy_1354	DUMMY	94.61	0	00:50
1774	Dummy_1356	DUMMY	142.61	0	00:50
1775	Dummy_1358	DUMMY	143.03	0	00:55
1776	Dummy_1362	DUMMY	19.02	0	01:00
1777	Dummy_1364	DUMMY	170.93	0	00:35
1778	Dummy_1368	DUMMY	91.21	0	00:35
1779	Dummy_1372	DUMMY	176.07	0	00:50
1780	Dummy_1382	DUMMY	86.62	0	01:05
1781	Dummy_1386	DUMMY	39.19	0	01:00
1782	Dummy_1388	DUMMY	215.43	0	00:45

1783	Dummy_1392	DUMMY	143.88	0	00:45			
1784	Dummy_1394	DUMMY	150.17	0	00:50			
1785	Dummy_1396	DUMMY	237.90	0	00:40			
1786	Dummy_1398	DUMMY	170.45	0	00:35			
1787	Dummy_142	DUMMY	23.10	0	00:50			
1788	Dummy_150	DUMMY	99.63	0	00:45			
1789	Dummy_210	DUMMY	90.13	0	00:45			
1790	Dummy_219	DUMMY	1208.67	0	01:23			
1791	Dummy_220	DUMMY	134.33	0	00:50			
1792	Dummy_223	DUMMY	360.61	0	00:56			
1793	Dummy_224	DUMMY	102.16	0	00:45			
1794	Dummy_226	DUMMY	155.49	0	00:40			
1795	Dummy_231	DUMMY	872.46	0	01:24			
1796	Dummy_232	DUMMY	138.83	0	00:55			
1797	Dummy_236	DUMMY	104.05	0	00:45			
1798	Dummy_237	DUMMY	702.73	0	01:19			
1799	Dummy_240	DUMMY	33.33	0	00:45			
1800	Dummy_243	DUMMY	361.15	0	01:21			
1801	Dummy_244	DUMMY	235.09	0	00:40			
1802	Dummy_247	DUMMY	508.32	0	00:39			
1803	Dummy_248	DUMMY	371.93	0	00:35			
1804	Dummy_252	DUMMY	172.31	0	00:40			
1805	Dummy_256	DUMMY	179.67	0	00:45			
1806	Dummy_259	DUMMY	201.32	0	01:17			
1807	Dummy_260	DUMMY	98.76	0	00:50			
1808	Dummy_264	DUMMY	194.91	0	00:40			
1809	Dummy_300	DUMMY	267.40	0	00:49			
1810	Dummy_310	DUMMY	110.60	0	00:50			
1811	Dummy_410	DUMMY	19.10	0	00:45			
1812	Dummy_414	DUMMY	19.85	0	00:45			
1813	Dummy_418	DUMMY	53.80	0	00:50			
1814	Dummy_422	DUMMY	2.89	0	00:40			
1815	Dummy_426	DUMMY	52.54	0	00:50			
1816	Dummy_500	DUMMY	335.32	0	01:19			
1817	Dummy_510	DUMMY	174.63	0	00:50			
1818	Dummy_514	DUMMY	227.72	0	00:40			
1819	Dummy_515	DUMMY	453.19	0	00:40			
1820	Dummy_518	DUMMY	225.47	0	00:40			
1821	Dummy_600	DUMMY	479.07	0	01:19			
1822	Dummy_610	DUMMY	145.64	0	00:50			
1823	Dummy_614	DUMMY	319.18	0	00:35			
1824	Dummy_617	DUMMY	543.86	0	00:39			
1825	Dummy_618	DUMMY	216.95	0	00:35			
1826	Dummy_620	DUMMY	37.02	0	01:00			
1827	Dummy_708	DUMMY	110.78	0	01:29			
1828	Dummy_714	DUMMY	51.54	0	00:40			
1829	Dummy_803	DUMMY	306.44	0	01:28			
1830	Dummy_804	DUMMY	25.38	0	00:40			
1831	Dummy_810	DUMMY	187.92	0	00:40			
1832	Dummy_820	DUMMY	331.54	0	00:35			
1833	Dummy_830	DUMMY	293.46	0	00:35			
1834	Dummy_840	DUMMY	199.75	0	00:40			
1835	Dummy_842	DUMMY	352.84	0	00:40			
1836	Dummy_844	DUMMY	523.28	0	00:35			
1837	Dummy_909	DUMMY	727.72	0	00:59			
1838	Dummy_910	DUMMY	140.59	0	00:50			
1839	Dummy_929	DUMMY	602.04	0	00:52			
1840	Dummy_930	DUMMY	334.77	0	00:40			
1841	Dummy_940	DUMMY	137.30	0	00:50			
1842	Dummy_950	DUMMY	145.62	0	00:55			
1843	Dummy_960	DUMMY	85.75	0	00:40			
1844	L_1004	CONDUIT	4337.41	0	02:00	4.92	0.12	0.33
1845	L_1006	CONDUIT	3507.31	0	01:59	4.90	0.04	0.19
1846	L_1008	CONDUIT	3508.16	0	01:58	4.73	0.04	0.17
1847	L_1010	CONDUIT	3494.73	0	01:57	4.18	0.05	0.19
1848	L_1012	CONDUIT	3427.88	0	01:56	3.10	0.04	0.16

1849	L_1014	CONDUIT	3087.41	0	01:53	2.55	0.04	0.18
1850	L_1016	CONDUIT	3084.32	0	01:51	4.96	0.05	0.20
1851	L_1018	CONDUIT	3078.44	0	01:50	3.72	0.05	0.19
1852	L_1020	CONDUIT	3073.89	0	01:49	4.86	0.03	0.15
1853	L_1022	CONDUIT	3050.12	0	01:48	4.45	0.04	0.16
1854	L_1024	CONDUIT	3051.52	0	01:46	4.25	0.04	0.17
1855	L_1026	CONDUIT	3024.52	0	01:45	4.65	0.04	0.15
1856	L_1028	CONDUIT	2998.40	0	01:45	4.98	0.03	0.14
1857	L_1030	CONDUIT	2709.74	0	01:43	4.94	0.04	0.16
1858	L_1034	CONDUIT	1847.37	0	01:47	3.94	0.03	0.14
1859	L_1036	CONDUIT	1848.07	0	01:45	4.40	0.03	0.13
1860	L_1038	CONDUIT	1823.64	0	01:45	3.79	0.03	0.15
1861	L_1040	CONDUIT	1816.41	0	01:43	4.53	0.02	0.12
1862	L_1042	CONDUIT	1717.51	0	01:42	4.79	0.02	0.11
1863	L_1044	CONDUIT	1708.22	0	01:41	4.87	0.02	0.11
1864	L_1046	CONDUIT	1644.51	0	01:40	4.23	0.07	0.28
1865	L_1048	CONDUIT	1644.94	0	01:39	4.45	0.07	0.29
1866	L_1115	CONDUIT	540.64	0	00:57	3.46	0.04	0.17
1867	L_1123	CONDUIT	412.17	0	00:59	4.39	0.03	0.12
1868	L_1125	CONDUIT	232.24	0	00:30	10.54	0.01	0.12
1869	L_1127	CONDUIT	363.29	0	00:57	3.72	0.02	0.11
1870	L_1130	CONDUIT	311.00	0	01:19	2.98	0.02	0.11
1871	L_114	CONDUIT	928.75	0	01:19	10.33	0.04	0.30
1872	L_1147	CONDUIT	270.91	0	01:37	4.19	0.03	0.19
1873	L_115	CONDUIT	810.54	0	01:20	4.99	0.03	0.13
1874	L_1151	CONDUIT	184.00	0	01:13	4.97	0.04	0.22
1875	L_117	CONDUIT	508.05	0	01:13	8.98	0.10	0.34
1876	L_119	CONDUIT	465.32	0	01:14	4.97	0.02	0.10
1877	L_1209	CONDUIT	71.75	0	00:57	1.93	0.01	0.16
1878	L_1217	CONDUIT	703.05	0	01:12	4.05	0.24	0.50
1879	L_1223	CONDUIT	539.00	0	01:07	3.17	0.06	0.34
1880	L_1231	CONDUIT	315.29	0	01:00	3.53	0.03	0.26
1881	L_1233	CONDUIT	497.28	0	00:47	5.40	0.08	0.29
1882	L_1235	CONDUIT	149.61	0	00:47	4.87	0.01	0.10
1883	L_1237	CONDUIT	167.79	0	00:46	11.83	0.16	0.24
1884	L_1239	CONDUIT	326.09	0	01:03	4.90	0.09	0.41
1885	L_1247	CONDUIT	228.77	0	00:48	5.98	0.04	0.25
1886	L_1255	CONDUIT	268.22	0	01:00	4.08	0.09	0.41
1887	L_1257	CONDUIT	157.53	0	01:06	3.27	0.12	0.40
1888	L_1259	CONDUIT	76.46	0	01:06	3.59	0.00	0.05
1889	L_126	CONDUIT	27.61	0	01:10	3.36	0.00	0.03
1890	L_1273	CONDUIT	291.16	0	01:03	2.87	0.16	0.50
1891	L_1315	CONDUIT	973.09	0	01:25	4.86	0.07	0.21
1892	L_1316	CONDUIT	362.09	0	00:57	3.27	0.03	0.27
1893	L_1319	CONDUIT	118.79	0	00:48	3.36	0.01	0.16
1894	L_1321	CONDUIT	106.55	0	00:56	3.33	0.01	0.15
1895	L_1323	CONDUIT	80.88	0	00:47	3.20	0.00	0.13
1896	L_1327	CONDUIT	7.16	0	01:18	1.81	0.02	0.10
1897	L_133	CONDUIT	208.87	0	01:21	4.81	0.01	0.06
1898	L_1340	CONDUIT	130.66	0	03:12	3.34	0.01	0.16
1899	L_1351	CONDUIT	323.03	0	01:02	4.21	0.02	0.23
1900	L_1353	CONDUIT	173.98	0	00:55	2.69	0.02	0.21
1901	L_1355	CONDUIT	431.45	0	00:59	5.29	0.02	0.23
1902	L_1357	CONDUIT	295.11	0	00:57	3.67	0.02	0.23
1903	L_1361	CONDUIT	153.30	0	00:53	3.64	0.01	0.17
1904	L_1363	CONDUIT	168.52	0	00:37	6.37	0.01	0.06
1905	L_1367	CONDUIT	81.46	0	00:51	4.25	0.00	0.13
1906	L_1371	CONDUIT	174.83	0	00:54	4.21	0.01	0.17
1907	L_138	CONDUIT	309.87	0	00:41	4.81	0.02	0.11
1908	L_1387	CONDUIT	211.23	0	00:51	5.03	0.02	0.12
1909	L_139	CONDUIT	315.89	0	01:10	4.55	0.09	0.27
1910	L_1393	CONDUIT	147.79	0	00:58	4.17	0.01	0.15
1911	L_1395	CONDUIT	245.90	0	01:15	4.22	0.01	0.14
1912	L_141	CONDUIT	294.42	0	01:10	6.63	0.03	0.14
1913	L_146	CONDUIT	47.99	0	00:55	6.61	0.00	0.03
1914	L_149	CONDUIT	248.70	0	01:10	4.99	0.01	0.06

1915	L_154	CONDUIT	302.31	0	00:40	4.97	0.01	0.07
1916	L_221	CONDUIT	1112.66	0	01:25	4.81	0.04	0.16
1917	L_225	CONDUIT	264.43	0	00:57	4.80	0.01	0.06
1918	L_228	CONDUIT	141.13	0	00:45	6.58	0.01	0.10
1919	L_235	CONDUIT	769.96	0	01:25	4.81	0.01	0.08
1920	L_239	CONDUIT	680.28	0	01:20	4.81	0.02	0.10
1921	L_241	CONDUIT	561.44	0	01:23	4.68	0.02	0.11
1922	L_245	CONDUIT	261.12	0	01:30	4.59	0.01	0.05
1923	L_250	CONDUIT	162.24	0	00:42	3.61	0.00	0.09
1924	L_263	CONDUIT	136.40	0	01:33	4.76	0.01	0.07
1925	L_268	CONDUIT	156.00	0	00:42	8.04	0.01	0.09
1926	L_314	CONDUIT	158.78	0	00:47	4.83	0.01	0.06
1927	L_513	CONDUIT	208.27	0	01:30	4.72	0.01	0.09
1928	L_613	CONDUIT	363.67	0	01:21	4.85	0.01	0.07
1929	L_617	CONDUIT	232.99	0	01:20	4.71	0.01	0.06
1930	L_622	CONDUIT	350.42	0	00:41	4.99	0.01	0.07
1931	L_708	CONDUIT	110.78	0	01:29	9.07	0.01	0.05
1932	L_709	CONDUIT	110.79	0	01:28	4.69	0.00	0.05
1933	L_710	CONDUIT	110.82	0	01:27	3.72	0.00	0.04
1934	L_711	CONDUIT	169.72	0	00:49	3.36	0.01	0.07
1935	L_712	CONDUIT	170.29	0	00:46	3.71	0.00	0.04
1936	L_713	CONDUIT	170.06	0	00:47	2.96	0.01	0.09
1937	L_808	CONDUIT	298.34	0	01:35	3.21	0.03	0.13
1938	L_809	CONDUIT	298.54	0	01:27	29.17	0.10	0.14
1939	L_811	CONDUIT	282.68	0	02:27	3.39	0.01	0.07
1940	L_819	CONDUIT	282.68	0	02:27	2.23	0.02	0.11
1941	L_822	CONDUIT	145.15	0	00:48	2.76	0.00	0.02
1942	L_823	CONDUIT	310.91	0	01:52	1.73	0.01	0.08
1943	L_824	CONDUIT	145.96	0	00:45	1.72	0.00	0.01
1944	L_829	CONDUIT	311.33	0	01:47	5.89	0.01	0.07
1945	L_831	CONDUIT	311.34	0	01:46	7.89	0.00	0.04
1946	L_834	CONDUIT	291.52	0	01:48	2.63	0.01	0.10
1947	L_836	CONDUIT	264.39	0	02:08	22.79	1.07	1.00
1948	L_838	CONDUIT	524.38	0	00:54	2.60	0.02	0.20
1949	L_839	CONDUIT	528.33	0	00:52	3.42	0.01	0.08
1950	L_841	CONDUIT	283.93	0	01:22	4.14	0.03	0.26
1951	L_843	CONDUIT	528.23	0	00:52	13.64	0.16	0.27
1952	L_850	CONDUIT	303.93	0	00:43	4.36	0.02	0.17
1953	L_911	CONDUIT	594.45	0	00:59	4.57	0.03	0.14
1954	L_912	CONDUIT	601.74	0	00:53	4.95	0.04	0.28
1955	L_931	CONDUIT	349.34	0	00:59	4.18	0.02	0.24
1956	Overflow_836	CONDUIT	45.53	0	01:44	3.35	0.00	0.02
1957	Dummy_Drop_1006	DUMMY	3507.31	0	01:59			
1958	D_EURV_614	DUMMY	280.31	0	00:46			
1959	D_FC_150	DUMMY	365.30	0	00:48			
1960	O_EURV_1172	DUMMY	28.28	0	00:53			
1961	O_EURV_1208	DUMMY	85.86	0	00:55			
1962	O_EURV_121	DUMMY	243.12	0	00:55			
1963	O_EURV_134	DUMMY	371.47	0	00:52			
1964	O_EURV_1364	DUMMY	47.27	0	00:50			
1965	O_EURV_1382	DUMMY	86.53	0	01:05			
1966	O_EURV_1392	DUMMY	593.76	0	01:22			
1967	O_EURV_1395	DUMMY	268.48	0	01:02			
1968	O_EURV_146	DUMMY	47.97	0	00:56			
1969	O_EURV_225	DUMMY	275.66	0	00:50			
1970	O_EURV_236	DUMMY	103.36	0	00:48			
1971	O_EURV_244	DUMMY	211.20	0	00:51			
1972	O_EURV_245	DUMMY	505.55	0	00:54			
1973	O_EURV_256	DUMMY	166.83	0	00:56			
1974	O_EURV_263	DUMMY	298.61	0	00:53			
1975	O_EURV_510	DUMMY	379.57	0	00:54			
1976	O_EURV_618	DUMMY	411.43	0	00:53			
1977	O_EURV_711	DUMMY	155.18	0	01:02			
1978	O_EURV_820	DUMMY	239.67	0	00:46			
1979	O_EURV_830	DUMMY	192.74	0	00:48			
1980	O_EURV_840	DUMMY	164.78	0	00:51			

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O_EURV_842           DUMMY      328.28     0  01:13
O_EURV_844           DUMMY      382.80     0  00:47
O_FC_1050            DUMMY     1645.25     0  01:38
O_FC_134             DUMMY      210.19     0  01:15
O_FC_150             DUMMY      248.97     0  01:07
O_FC_245             DUMMY      266.00     0  01:18
O_FC_263             DUMMY      136.60     0  01:28
O_FC_510             DUMMY      209.40     0  01:22
O_FC_618             DUMMY      233.92     0  01:15
O_FC_711             DUMMY      110.83     0  01:27
O_FC_823             DUMMY      282.73     0  02:23
O_FC_838             DUMMY      291.98     0  01:43
O_FC_842             DUMMY      283.97     0  01:22
Outlet_1141          DUMMY      300.89     0  01:48
Outlet_1155          DUMMY      246.05     0  02:02
Outlet_1163          DUMMY      161.21     0  01:26
Outlet_1170          DUMMY       70.80     0  01:23
Outlet_1233          DUMMY      226.94     0  02:06
Outlet_1316          DUMMY      220.78     0  00:53
Outlet_1340          DUMMY      130.68     0  03:03


*************************
Conduit Surcharge Summary
*************************

---------------------------------------------------------------------------
                                                      Hours        Hours
                         --------- Hours Full --------   Above Full   Capacity
Conduit                  Both Ends  Upstream  Dnstream   Normal Flow   Limited
---------------------------------------------------------------------------
L_836                         0.88      0.88      0.88      0.88         0.88


  Analysis begun on:  Wed Jul 30 10:11:13 2025
  Analysis ended on:  Wed Jul 30 10:11:14 2025
  Total elapsed time: 00:00:01
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APPENDIX F-5
Master Plan Hydrology Summary

Design Point		Drainage Area	Existing Conditions (cfs)	Future Conditions Do Nothing (cfs)	Future Conditions Concept Design (cfs)
Number	Type	(acres)	Q_{100}	Q_{100}	Q_{100}
109	JUNCTION	755	1,049	1,460	995
110	BASIN	71	73	73	73
113	JUNCTION	684	976	1,389	929
114	BASIN	112	157	157	157
115	JUNCTION	572	846	1,278	823
117	JUNCTION	364	527	821	508
118	BASIN	38	53	53	53
119	JUNCTION	326	477	769	466
121	JUNCTION	143	168	251	243
122	BASIN	123	143	235	232
126	BASIN	20	31	31	31
129	JUNCTION	183	311	522	259
130	BASIN	47	63	65	65
133	JUNCTION	137	255	474	210
134	BASIN	53	84	159	158
138	BASIN	83	177	336	337
139	JUNCTION	208	326	465	316
141	JUNCTION	188	303	444	294
142	BASIN	20	23	23	23
146	BASIN	40	38	49	48
149	JUNCTION	149	269	401	249
150	BASIN	60	90	100	100
154	BASIN	89	181	316	314
210	BASIN	49	90	90	90
220	BASIN	100	134	134	134
221	JUNCTION	958	1,282	2,160	1,118
223	JUNCTION	191	302	397	361
224	BASIN	64	102	102	102
225	JUNCTION	127	202	297	276
226	BASIN	61	124	157	155
228	BASIN	66	84	143	141
231	JUNCTION	767	1,002	1,772	872
232	BASIN	106	138	139	139
235	JUNCTION	661	877	1,663	778
236	BASIN	60	75	106	104
237	JUNCTION	601	803	1,558	703
239	JUNCTION	579	772	1,525	680
240	BASIN	22	33	33	33
241	JUNCTION	486	677	1,343	562
243	JUNCTION	294	414	901	361
244	BASIN	90	116	237	235
245	JUNCTION	203	302	680	266
247	JUNCTION	140	232	509	508
248	BASIN	97	152	372	372
250	BASIN	44	87	182	181

Design Point		Drainage Area	Existing Conditions (cfs)	Future Conditions Do Nothing (cfs)	Future Conditions Concept Design (cfs)
Number	Type	(acres)	Q_{100}	Q_{100}	Q_{100}
252	BASIN	63	71	173	172
256	BASIN	94	97	183	180
259	JUNCTION	192	263	445	201
260	BASIN	65	95	99	99
263	JUNCTION	127	171	351	137
264	BASIN	69	90	196	195
268	BASIN	59	82	158	157
310	BASIN	88	111	111	111
314	BASIN	69	155	168	166
410	BASIN	13	19	19	19
414	BASIN	12	20	20	20
418	BASIN	40	54	54	54
422	BASIN	4	3	3	3
426	BASIN	43	53	53	53
510	BASIN	123	174	175	175
513	JUNCTION	168	214	456	453
514	BASIN	89	101	229	228
518	BASIN	80	117	227	225
610	BASIN	106	135	146	146
613	JUNCTION	257	404	847	370
614	BASIN	100	182	322	319
617	JUNCTION	157	237	550	544
618	BASIN	54	95	217	217
620	BASIN	34	37	37	37
712	BASIN	90	161	173	171
714	BASIN	23	50	52	52
804	BASIN	26	25	25	25
809	JUNCTION	596	1,024	2,058	299
810	BASIN	74	101	190	188
819	JUNCTION	515	929	1,887	283
820	BASIN	81	292	331	332
824	BASIN	43	70	165	165
829	JUNCTION	444	711	1,511	311
830	BASIN	71	259	294	293
839	JUNCTION	253	372	846	535
840	BASIN	64	82	200	200
841	JUNCTION	142	290	649	284
842	BASIN	111	152	353	353
843	JUNCTION	317	578	1,300	528
844	BASIN	127	221	523	523
850	BASIN	100	142	316	313
910	BASIN	102	107	141	141
912	JUNCTION	345	434	602	602
930	BASIN	105	131	335	335
931	JUNCTION	240	315	359	359

Design Point		Drainage Area	Existing Conditions (cfs)	Future Conditions Do Nothing (cfs)	Future Conditions Concept Design (cfs)
Number	Type	(acres)	Q_{100}	Q_{100}	Q_{100}
940	BASIN	91	119	137	137
950	BASIN	111	126	146	146
960	BASIN	38	84	86	86
1032	BASIN	10	22	23	22
1108	BASIN	4	5	8	8
1110	BASIN	17	15	29	29
1115	JUNCTION	850	1,029	1,507	285
1116	BASIN	60	91	145	145
1123	JUNCTION	772	952	1,394	285
1124	BASIN	29	32	66	66
1125	JUNCTION	743	91	232	232
1126	BASIN	25	91	232	232
1130	JUNCTION	682	893	1,289	311
1132	BASIN	60	26	54	54
1140	BASIN	121	124	278	278
1141	JUNCTION	657	817	1,109	286
1142	BASIN	19	35	49	49
1144	BASIN	81	122	204	204
1147	JUNCTION	517	790	1,071	271
1148	BASIN	109	103	195	195
1150	BASIN	57	44	44	44
1151	JUNCTION	194	416	551	185
1152	BASIN	21	35	77	77
1154	BASIN	55	66	165	165
1156	BASIN	78	141	148	148
1164	BASIN	118	325	328	328
1172	BASIN	49	28	28	28
1180	BASIN	13	25	26	26
1208	BASIN	63	65	109	105
1209	JUNCTION	97	62	73	73
1210	BASIN	97	62	73	73
1216	BASIN	129	92	101	100
1223	JUNCTION	777	1,173	1,225	547
1224	BASIN	81	89	97	97
1226	BASIN	46	44	60	59
1228	BASIN	37	35	38	38
1230	BASIN	31	44	47	47
1231	JUNCTION	582	1,063	1,097	400
1232	BASIN	125	373	402	396
1234	BASIN	49	133	133	131
1235	JUNCTION	76	151	153	150
1236	BASIN	76	151	153	150
1237	JUNCTION	79	170	170	168
1238	BASIN	79	170	170	168
1239	JUNCTION	223	316	327	326

Design Point		Drainage Area	Existing Conditions (cfs)	Future Conditions Do Nothing (cfs)	Future Conditions Concept Design (cfs)
Number	Type	(acres)	Q_{100}	Q_{100}	Q_{100}
1240	BASIN	25	40	41	41
1247	JUNCTION	110	230	233	230
1248	BASIN	30	61	63	63
1255	JUNCTION	178	261	269	268
1256	BASIN	59	126	142	140
1257	JUNCTION	120	158	159	159
1258	BASIN	56	89	89	89
1259	JUNCTION	63	78	78	78
1260	BASIN	63	78	78	78
1264	BASIN	40	44	48	47
1272	BASIN	23	14	16	16
1273	JUNCTION	198	283	292	292
1274	BASIN	20	22	24	24
1308	BASIN	63	63	67	67
1310	BASIN	36	43	45	45
1315	JUNCTION	1,548	2,302	2,640	980
1316	BASIN	102	1,659	1,762	367
1318	BASIN	33	38	40	40
1319	JUNCTION	56	122	125	125
1320	BASIN	56	122	125	125
1321	JUNCTION	71	106	109	109
1322	BASIN	71	106	109	109
1323	JUNCTION	53	76	81	81
1324	BASIN	53	76	81	81
1327	JUNCTION	8	7	7	7
1328	BASIN	8	7	7	7
1340	BASIN	114	1,339	1,428	1,426
1347	JUNCTION	191	269	281	281
1348	BASIN	70	105	108	108
1349	BASIN	34	747	808	807
1351	JUNCTION	213	296	329	328
1352	BASIN	118	148	155	155
1353	JUNCTION	95	150	176	176
1354	BASIN	66	90	95	95
1355	JUNCTION	269	405	432	432
1356	BASIN	95	138	143	143
1357	JUNCTION	174	274	296	296
1358	BASIN	111	136	143	143
1361	JUNCTION	64	162	183	183
1362	BASIN	19	18	19	19
1363	JUNCTION	45	151	171	171
1364	BASIN	45	151	171	171
1367	JUNCTION	29	67	92	91
1368	BASIN	29	67	92	91
1371	JUNCTION	122	167	176	176

Design Point		Drainage Area	Existing Conditions (cfs)	Future Conditions Do Nothing (cfs)	Future Conditions Concept Design (cfs)
Number	Type	(acres)	Q_{100}	Q_{100}	Q_{100}
1372	BASIN	122	167	176	176
1382	BASIN	92	83	87	87
1386	BASIN	37	39	39	39
1388	BASIN	118	204	216	215
1392	BASIN	82	118	147	144
1394	BASIN	103	126	151	150
1396	BASIN	77	94	238	238
1398	BASIN	52	74	171	170
O_100	OUTFALL	755	1,049	1,460	995
O_220	OUTFALL	1,058	1,401	2,273	1,209
O_300	OUTFALL	157	258	270	267
O_500	OUTFALL	292	378	609	335
O_600	OUTFALL	363	521	945	479
O_708	OUTFALL	90	160	172	111
O_803	OUTFALL	696	1,039	2,072	306
O_909	OUTFALL	446	527	728	728
O_1000	OUTFALL	7,181	9,020	11,827	3,343
O_1107	OUTFALL	854	1,031	1,511	285
O_1263	OUTFALL	1,042	1,340	1,415	741
O_1307	OUTFALL	1,712	2,356	2,697	1,023

Design Point		Drainage Area	Future Conditions Concept Design Peak Flows (cfs)						
Number	Type	(acres)	Q_2	Q_5	Q_{10}	Q_{25}	Q_{50}	Q_{100}	Q_{500}
109	JUNCTION	755	9	13	84	386	666	995	1,621
110	BASIN	71	1	5	13	35	51	73	125
113	JUNCTION	684	9	11	78	362	624	929	1,498
114	BASIN	112	1	6	26	75	111	157	273
115	JUNCTION	572	9	11	81	334	566	823	1,269
117	JUNCTION	364	6	9	41	198	344	508	841
118	BASIN	38	0	2	8	25	37	53	92
119	JUNCTION	326	6	8	39	186	319	466	756
121	JUNCTION	143	2	2	31	111	171	243	412
122	BASIN	123	26	45	69	129	175	232	380
126	BASIN	20	2	3	6	15	22	31	53
129	JUNCTION	183	5	7	15	103	182	259	372
130	BASIN	47	3	7	15	34	47	65	110
133	JUNCTION	137	5	5	14	89	153	210	272
134	BASIN	53	25	39	56	93	122	158	253
138	BASIN	83	70	103	136	206	263	337	521
139	JUNCTION	208	3	4	41	152	231	316	430
141	JUNCTION	188	3	3	39	143	216	294	391
142	BASIN	20	1	2	4	11	17	23	40
146	BASIN	40	4	7	12	25	35	48	80
149	JUNCTION	149	3	3	31	123	185	249	311
150	BASIN	60	6	14	25	52	73	100	166
154	BASIN	89	49	79	112	185	243	314	500
210	BASIN	49	1	7	18	45	65	90	154
220	BASIN	100	1	4	21	63	94	134	234
221	JUNCTION	958	19	20	79	391	708	1,118	2,018
223	JUNCTION	191	2	7	39	155	245	361	634
224	BASIN	64	1	7	20	50	73	102	175
225	JUNCTION	127	2	3	40	129	195	276	473
226	BASIN	61	20	34	50	89	119	155	251
228	BASIN	66	17	29	44	80	107	141	230
231	JUNCTION	767	17	18	66	319	573	872	1,515
232	BASIN	106	1	10	26	68	98	139	238
235	JUNCTION	661	17	18	65	292	521	778	1,310
236	BASIN	60	9	17	28	56	77	104	173
237	JUNCTION	601	16	17	61	267	476	703	1,160
239	JUNCTION	579	16	17	60	262	464	680	1,111
240	BASIN	22	0	1	5	16	23	33	58
241	JUNCTION	486	14	15	55	224	394	562	866
243	JUNCTION	294	10	11	38	128	249	361	568
244	BASIN	90	37	58	82	139	182	235	375
245	JUNCTION	203	8	8	32	103	192	266	330
247	JUNCTION	140	101	147	195	309	398	508	799
248	BASIN	97	82	118	155	232	295	372	574
250	BASIN	44	36	54	72	109	140	181	282
252	BASIN	63	34	50	66	106	136	172	269

Design Point		Drainage Area	Future Conditions Concept Design Peak Flows (cfs)						
Number	Type	(acres)	Q_2	Q_5	Q_{10}	Q_{25}	Q_{50}	Q_{100}	Q_{500}
256	BASIN	94	21	33	51	99	135	180	295
259	JUNCTION	192	4	10	21	97	146	201	299
260	BASIN	65	3	10	21	50	71	99	168
263	JUNCTION	127	4	4	18	75	105	137	150
264	BASIN	69	37	55	74	119	153	195	305
268	BASIN	59	26	40	56	94	122	157	249
310	BASIN	88	0	1	10	49	75	111	199
314	BASIN	69	16	26	44	89	124	166	275
410	BASIN	13	0	1	3	9	13	19	33
414	BASIN	12	0	1	3	9	14	20	34
418	BASIN	40	1	4	10	26	38	54	92
422	BASIN	4	0	0	0	0	1	3	7
426	BASIN	43	0	1	7	24	37	53	93
510	BASIN	123	7	20	40	90	127	175	295
513	JUNCTION	168	74	115	161	269	352	453	719
514	BASIN	89	40	61	83	137	178	228	360
518	BASIN	80	34	55	78	133	174	225	359
610	BASIN	106	7	18	34	75	106	146	245
613	JUNCTION	257	9	9	29	123	247	370	623
614	BASIN	100	49	78	112	187	248	319	511
617	JUNCTION	157	109	159	212	335	429	544	849
618	BASIN	54	50	71	91	135	170	217	333
620	BASIN	34	2	5	9	19	27	37	62
712	BASIN	90	14	28	46	91	127	171	284
714	BASIN	23	2	6	12	27	38	52	87
804	BASIN	26	0	0	1	5	14	25	56
809	JUNCTION	596	26	43	62	110	190	299	497
810	BASIN	74	26	43	62	108	145	188	303
819	JUNCTION	515	15	24	32	92	184	283	385
820	BASIN	81	70	102	134	202	259	332	513
824	BASIN	43	37	53	69	102	130	165	254
829	JUNCTION	444	15	18	23	77	179	311	479
830	BASIN	71	60	88	117	177	228	293	456
839	JUNCTION	253	16	17	46	201	347	535	1,065
840	BASIN	64	44	63	82	124	159	200	309
841	JUNCTION	142	7	7	8	8	128	284	396
842	BASIN	111	70	103	136	215	277	353	549
843	JUNCTION	317	16	17	45	198	341	528	1,064
844	BASIN	127	117	168	219	325	415	523	806
850	BASIN	100	53	79	111	184	245	313	500
910	BASIN	102	11	17	26	68	99	141	244
912	JUNCTION	345	78	113	169	328	447	602	995
930	BASIN	105	74	100	132	206	264	335	518
931	JUNCTION	240	26	49	86	189	263	359	602
940	BASIN	91	9	18	32	72	100	137	230
950	BASIN	111	10	19	34	76	106	146	244

Design Point		Drainage Area	Future Conditions Concept Design Peak Flows (cfs)						
Number	Type	(acres)	Q_2	Q_5	Q_{10}	Q_{25}	Q_{50}	Q_{100}	Q_{500}
960	BASIN	38	7	13	23	46	64	86	143
1032	BASIN	10	2	4	6	10	15	22	39
1108	BASIN	4	1	1	2	3	5	8	14
1110	BASIN	17	4	5	7	13	20	29	52
1115	JUNCTION	850	63	103	141	247	366	541	984
1116	BASIN	60	18	28	37	75	106	145	243
1123	JUNCTION	772	58	94	127	212	306	414	717
1124	BASIN	29	9	14	18	34	48	66	112
1125	JUNCTION	743	46	61	80	122	178	232	403
1126	BASIN	25	46	61	80	122	178	232	403
1130	JUNCTION	682	50	82	108	194	273	311	392
1132	BASIN	60	8	10	14	24	38	54	100
1140	BASIN	121	42	57	77	134	200	278	497
1141	JUNCTION	657	54	66	79	171	235	286	399
1142	BASIN	19	10	14	18	27	37	49	80
1144	BASIN	81	27	38	52	96	144	204	364
1147	JUNCTION	517	48	59	75	167	224	271	364
1148	BASIN	109	29	39	52	94	140	195	347
1150	BASIN	57	1	2	3	16	27	44	86
1151	JUNCTION	194	16	23	45	103	146	185	252
1152	BASIN	21	16	23	31	47	60	77	120
1154	BASIN	55	36	50	65	101	130	165	255
1156	BASIN	78	22	31	41	76	108	148	256
1164	BASIN	118	45	70	104	187	251	328	527
1172	BASIN	49	1	1	2	7	16	28	64
1180	BASIN	13	3	5	6	13	19	26	43
1208	BASIN	63	7	13	20	45	72	105	197
1209	JUNCTION	97	1	1	4	20	42	73	156
1210	BASIN	97	1	1	4	20	42	73	156
1216	BASIN	129	1	4	10	41	66	100	183
1223	JUNCTION	777	43	73	125	278	391	547	1,186
1224	BASIN	81	4	8	18	47	69	97	167
1226	BASIN	46	4	7	13	30	43	59	100
1228	BASIN	37	1	2	5	17	26	38	66
1230	BASIN	31	1	3	8	22	33	47	81
1231	JUNCTION	582	52	82	126	225	306	400	1,030
1232	BASIN	125	51	81	124	222	303	396	647
1234	BASIN	49	17	27	41	74	100	131	215
1235	JUNCTION	76	19	30	45	84	113	150	246
1236	BASIN	76	19	30	45	84	113	150	246
1237	JUNCTION	79	21	35	52	95	127	168	272
1238	BASIN	79	21	35	52	95	127	168	272
1239	JUNCTION	223	24	41	72	163	233	326	557
1240	BASIN	25	1	3	8	20	30	41	71
1247	JUNCTION	110	30	49	72	130	174	230	372
1248	BASIN	30	9	14	20	36	48	63	101

Design Point		Drainage Area	Future Conditions Concept Design Peak Flows (cfs)						
Number	Type	(acres)	Q_2	Q_5	Q_{10}	Q_{25}	Q_{50}	Q_{100}	Q_{500}
1255	JUNCTION	178	22	37	63	137	193	268	454
1256	BASIN	59	22	32	47	81	109	140	226
1257	JUNCTION	120	5	15	32	78	113	159	271
1258	BASIN	56	4	10	20	46	65	89	150
1259	JUNCTION	63	3	9	17	40	56	78	132
1260	BASIN	63	3	9	17	40	56	78	132
1264	BASIN	40	0	2	4	19	31	47	87
1272	BASIN	23	0	0	1	4	9	16	35
1273	JUNCTION	198	24	39	67	148	210	292	495
1274	BASIN	20	1	3	5	12	18	24	42
1308	BASIN	63	1	3	8	30	45	67	119
1310	BASIN	36	1	3	8	22	32	45	79
1315	JUNCTION	1,548	14	23	65	305	582	980	1,910
1316	BASIN	102	11	17	54	180	263	367	626
1318	BASIN	33	1	2	7	19	28	40	69
1319	JUNCTION	56	4	8	23	62	91	125	215
1320	BASIN	56	4	8	23	62	91	125	215
1321	JUNCTION	71	4	11	23	55	78	109	184
1322	BASIN	71	4	11	23	55	78	109	184
1323	JUNCTION	53	2	6	15	40	58	81	140
1324	BASIN	53	2	6	15	40	58	81	140
1327	JUNCTION	8	0	1	2	4	5	7	13
1328	BASIN	8	0	1	2	4	5	7	13
1340	BASIN	114	42	64	94	163	219	284	457
1347	JUNCTION	191	9	27	59	142	203	281	478
1348	BASIN	70	4	11	24	55	79	108	184
1349	BASIN	34	2	109	192	419	587	807	1,356
1351	JUNCTION	213	21	43	77	171	240	328	550
1352	BASIN	118	5	15	31	77	110	155	263
1353	JUNCTION	95	17	30	48	96	131	176	290
1354	BASIN	66	3	9	19	48	68	95	161
1355	JUNCTION	269	36	66	110	229	317	432	720
1356	BASIN	95	6	15	30	73	103	143	241
1357	JUNCTION	174	33	54	84	163	221	296	487
1358	BASIN	111	5	14	29	72	102	143	243
1361	JUNCTION	64	38	55	72	112	144	183	285
1362	BASIN	19	1	2	4	10	14	19	32
1363	JUNCTION	45	39	55	71	106	135	171	263
1364	BASIN	45	39	55	71	106	135	171	263
1367	JUNCTION	29	18	27	36	56	72	91	143
1368	BASIN	29	18	27	36	56	72	91	143
1371	JUNCTION	122	6	17	37	89	127	176	299
1372	BASIN	122	6	17	37	89	127	176	299
1382	BASIN	92	2	5	13	40	60	87	152
1386	BASIN	37	1	4	8	19	28	39	67
1388	BASIN	118	8	23	47	110	156	215	364

Design Point		Drainage Area	Future Conditions Concept Design Peak Flows (cfs)						
Number	Type	(acres)	Q_2	Q_5	Q_{10}	Q_{25}	Q_{50}	Q_{100}	Q_{500}
1392	BASIN	82	11	18	33	75	105	144	246
1394	BASIN	103	11	22	37	80	110	150	251
1396	BASIN	77	52	74	96	148	189	238	367
1398	BASIN	52	37	53	70	106	136	170	264
O_100	OUTFALL	755	9	13	84	386	666	995	1,621
O_220	OUTFALL	1,058	19	20	81	416	757	1,209	2,216
O_300	OUTFALL	157	13	22	48	131	190	267	462
O_500	OUTFALL	292	7	20	40	153	236	335	508
O_600	OUTFALL	363	9	18	34	159	310	479	842
O_708	OUTFALL	90	1	6	8	37	68	111	215
O_803	OUTFALL	696	23	38	58	111	191	306	534
O_909	OUTFALL	446	79	123	187	383	531	728	1,223
O_1000	OUTFALL	7,181	98	211	426	1,393	2,551	4,354	7,744
O_1107	OUTFALL	854	63	103	141	249	369	546	995
O_1263	OUTFALL	1,042	41	73	131	339	503	741	1,446
O_1307	OUTFALL	1,712	13	22	67	314	605	1,023	2,009

Design Point		Drainage Area	Future Conditions Concept Design Peak Volume (arce-ft)						
Number	Type	(acres)	V_2	V_5	V_{10}	V_{25}	V_{50}	V_{100}	V_{500}
109	JUNCTION	755	13	23	38	71	98	134	218
110	BASIN	71	0	1	2	5	7	11	20
113	JUNCTION	684	13	22	36	66	91	123	199
114	BASIN	112	0	1	2	7	11	17	30
115	JUNCTION	572	13	21	33	58	79	106	168
117	JUNCTION	364	9	14	22	38	51	68	109
118	BASIN	38	0	0	1	2	4	6	10
119	JUNCTION	326	9	14	21	35	47	62	99
121	JUNCTION	143	3	5	8	14	19	26	44
122	BASIN	123	3	5	7	13	17	23	38
126	BASIN	20	0	0	1	1	2	3	6
129	JUNCTION	183	6	9	13	21	28	36	55
130	BASIN	47	0	1	2	4	5	8	13
133	JUNCTION	137	5	8	11	17	22	28	41
134	BASIN	53	2	3	4	6	8	11	17
138	BASIN	83	4	5	7	11	14	18	28
139	JUNCTION	208	4	7	11	20	28	38	59
141	JUNCTION	188	4	7	11	19	26	35	53
142	BASIN	20	0	0	1	1	2	3	5
146	BASIN	40	1	1	2	4	5	7	12
149	JUNCTION	149	3	6	9	15	21	28	41
150	BASIN	60	1	1	2	5	7	10	17
154	BASIN	89	3	4	6	10	14	18	29
210	BASIN	49	0	0	1	3	5	7	13
220	BASIN	100	0	0	2	6	10	15	27
221	JUNCTION	958	24	39	59	101	137	181	284
223	JUNCTION	191	3	6	10	18	25	34	58
224	BASIN	64	0	1	2	4	7	10	17
225	JUNCTION	127	3	5	8	13	18	24	40
226	BASIN	61	2	3	4	7	9	12	19
228	BASIN	66	2	3	4	7	9	12	21
231	JUNCTION	767	21	33	49	83	112	147	226
232	BASIN	106	0	1	3	7	11	16	29
235	JUNCTION	661	20	32	46	75	100	131	195
236	BASIN	60	1	2	3	6	8	11	18
237	JUNCTION	601	19	30	43	69	92	120	177
239	JUNCTION	579	19	30	43	68	90	117	172
240	BASIN	22	0	0	0	1	2	3	6
241	JUNCTION	486	17	27	37	59	77	100	143
243	JUNCTION	294	12	18	25	38	49	63	91
244	BASIN	90	3	5	7	11	14	18	29
245	JUNCTION	203	9	14	18	27	35	44	61
247	JUNCTION	140	7	10	13	19	24	31	48
248	BASIN	97	5	7	9	13	17	21	33
250	BASIN	44	2	3	4	5	7	9	14
252	BASIN	63	3	4	6	8	11	14	21

Design Point		Drainage Area	Future Conditions Concept Design Peak Volume (arce-ft)						
Number	Type	(acres)	V_2	V_5	V_{10}	V_{25}	V_{50}	V_{100}	V_{500}
256	BASIN	94	2	3	5	9	13	17	28
259	JUNCTION	192	5	8	12	21	28	37	52
260	BASIN	65	0	1	2	5	7	10	18
263	JUNCTION	127	5	7	10	16	21	27	34
264	BASIN	69	3	4	6	9	12	15	23
268	BASIN	59	2	3	4	7	9	12	19
310	BASIN	88	0	0	1	5	8	12	22
314	BASIN	69	1	2	3	6	9	12	20
410	BASIN	13	0	0	0	1	1	2	4
414	BASIN	12	0	0	0	1	1	2	3
418	BASIN	40	0	0	1	3	4	6	11
422	BASIN	4	0	0	0	0	0	0	1
426	BASIN	43	0	0	1	3	4	6	11
510	BASIN	123	1	2	4	10	14	20	35
513	JUNCTION	168	6	9	13	20	26	34	55
514	BASIN	89	3	5	7	11	14	18	29
518	BASIN	80	2	4	6	9	12	16	26
610	BASIN	106	1	2	4	9	12	17	30
613	JUNCTION	257	11	16	22	33	43	55	83
614	BASIN	100	3	5	7	12	15	20	32
617	JUNCTION	157	8	11	15	21	27	34	54
618	BASIN	54	3	4	5	7	9	12	18
620	BASIN	34	0	1	1	3	4	6	10
712	BASIN	90	1	3	4	8	12	16	27
714	BASIN	23	0	0	1	2	3	4	6
804	BASIN	26	0	0	0	0	1	2	5
809	JUNCTION	596	29	42	58	85	111	142	203
810	BASIN	74	2	3	5	8	11	14	24
819	JUNCTION	515	27	39	53	77	101	128	180
820	BASIN	81	4	5	7	11	14	17	27
824	BASIN	43	2	3	4	6	8	10	15
829	JUNCTION	444	21	30	41	61	79	100	140
830	BASIN	71	3	4	6	9	12	15	24
839	JUNCTION	253	18	26	35	52	68	86	128
840	BASIN	64	3	5	6	9	11	14	22
841	JUNCTION	142	8	12	17	26	34	43	62
842	BASIN	111	5	7	10	14	19	24	38
843	JUNCTION	317	18	26	35	52	68	86	128
844	BASIN	127	6	9	12	18	23	28	44
850	BASIN	100	3	5	7	12	15	20	32
910	BASIN	102	1	2	3	7	11	16	28
912	JUNCTION	345	8	13	20	35	48	64	106
930	BASIN	105	5	7	10	14	18	23	36
931	JUNCTION	240	3	6	10	21	29	41	70
940	BASIN	91	1	2	4	8	11	15	27
950	BASIN	111	1	3	5	10	14	19	33

Design Point		Drainage Area	Future Conditions Concept Design Peak Volume (arce-ft)						
Number	Type	(acres)	V_2	V_5	V_{10}	V_{25}	V_{50}	V_{100}	V_{500}
960	BASIN	38	1	1	2	3	5	6	11
1032	BASIN	10	0	0	0	1	1	1	2
1108	BASIN	4	0	0	0	0	0	0	1
1110	BASIN	17	0	1	1	1	2	2	4
1115	JUNCTION	850	16	26	37	64	91	128	208
1116	BASIN	60	1	2	3	5	7	10	17
1123	JUNCTION	772	14	23	33	58	83	116	187
1124	BASIN	29	1	1	1	2	3	5	8
1125	JUNCTION	743	2	3	4	5	7	9	16
1126	BASIN	25	2	3	4	5	7	9	16
1130	JUNCTION	682	12	19	28	50	72	101	162
1132	BASIN	60	1	1	1	2	2	3	6
1140	BASIN	121	3	4	6	9	12	17	31
1141	JUNCTION	657	13	19	26	44	62	86	130
1142	BASIN	19	1	1	1	2	3	3	6
1144	BASIN	81	2	3	3	6	8	11	21
1147	JUNCTION	517	12	18	25	42	60	82	124
1148	BASIN	109	3	4	5	8	11	16	28
1150	BASIN	57	0	0	1	2	4	6	12
1151	JUNCTION	194	6	9	13	22	29	38	58
1152	BASIN	21	1	1	2	3	4	4	7
1154	BASIN	55	3	4	5	7	10	12	19
1156	BASIN	78	2	3	4	6	9	12	21
1164	BASIN	118	3	5	8	13	17	23	37
1172	BASIN	49	0	0	0	1	2	4	9
1180	BASIN	13	0	0	1	1	2	2	4
1208	BASIN	63	1	1	2	3	5	8	15
1209	JUNCTION	97	0	0	1	2	5	8	19
1210	BASIN	97	0	0	1	2	5	8	19
1216	BASIN	129	0	1	2	7	11	17	32
1223	JUNCTION	777	14	24	38	72	101	137	232
1224	BASIN	81	0	1	2	6	8	12	22
1226	BASIN	46	1	1	2	4	5	8	13
1228	BASIN	37	0	0	1	2	3	5	9
1230	BASIN	31	0	0	1	2	3	5	8
1231	JUNCTION	582	12	20	32	57	79	105	177
1232	BASIN	125	3	5	7	13	17	23	38
1234	BASIN	49	1	2	3	5	7	9	15
1235	JUNCTION	76	2	3	5	8	11	14	23
1236	BASIN	76	2	3	5	8	11	14	23
1237	JUNCTION	79	2	3	5	9	12	15	25
1238	BASIN	79	2	3	5	9	12	15	25
1239	JUNCTION	223	3	6	10	19	28	38	65
1240	BASIN	25	0	0	1	2	3	4	7
1247	JUNCTION	110	3	5	7	12	16	21	35
1248	BASIN	30	1	1	2	3	5	6	10

Design Point		Drainage Area	Future Conditions Concept Design Peak Volume (arce-ft)						
Number	Type	(acres)	V_2	V_5	V_{10}	V_{25}	V_{50}	V_{100}	V_{500}
1255	JUNCTION	178	3	5	8	16	23	31	53
1256	BASIN	59	2	3	4	7	9	11	19
1257	JUNCTION	120	1	2	4	10	14	20	34
1258	BASIN	56	0	1	2	4	7	9	16
1259	JUNCTION	63	0	1	2	5	7	10	18
1260	BASIN	63	0	1	2	5	7	10	18
1264	BASIN	40	0	0	0	2	3	5	9
1272	BASIN	23	0	0	0	0	1	2	4
1273	JUNCTION	198	3	5	9	18	25	34	59
1274	BASIN	20	0	0	1	1	2	3	5
1308	BASIN	63	0	0	1	3	6	8	16
1310	BASIN	36	0	0	1	2	4	5	10
1315	JUNCTION	1,548	48	59	74	138	196	271	466
1316	BASIN	102	38	44	53	96	136	187	322
1318	BASIN	33	0	0	1	2	3	5	9
1319	JUNCTION	56	0	0	1	4	6	8	15
1320	BASIN	56	0	0	1	4	6	8	15
1321	JUNCTION	71	0	1	2	5	8	11	20
1322	BASIN	71	0	1	2	5	8	11	20
1323	JUNCTION	53	0	1	1	4	5	8	14
1324	BASIN	53	0	1	1	4	5	8	14
1327	JUNCTION	8	0	0	0	1	1	1	2
1328	BASIN	8	0	0	0	1	1	1	2
1340	BASIN	114	3	5	8	12	17	22	36
1347	JUNCTION	191	1	3	6	15	22	31	54
1348	BASIN	70	0	1	2	5	8	11	20
1349	BASIN	34	6	12	22	45	64	89	154
1351	JUNCTION	213	2	5	8	18	26	36	62
1352	BASIN	118	1	2	4	9	13	19	33
1353	JUNCTION	95	2	3	5	9	12	17	29
1354	BASIN	66	0	1	2	5	7	10	18
1355	JUNCTION	269	4	7	12	24	34	46	80
1356	BASIN	95	1	1	3	7	11	15	27
1357	JUNCTION	174	3	5	9	17	23	31	53
1358	BASIN	111	1	2	4	8	12	18	31
1361	JUNCTION	64	2	4	5	8	10	13	21
1362	BASIN	19	0	0	1	2	2	3	5
1363	JUNCTION	45	2	3	4	6	8	10	16
1364	BASIN	45	2	3	4	6	8	10	16
1367	JUNCTION	29	1	2	3	4	5	6	10
1368	BASIN	29	1	2	3	4	5	6	10
1371	JUNCTION	122	1	2	4	9	14	19	34
1372	BASIN	122	1	2	4	9	14	19	34
1382	BASIN	92	0	1	2	6	9	13	24
1386	BASIN	37	0	1	1	3	4	6	10
1388	BASIN	118	1	2	4	9	13	19	33

Design Point		Drainage Area	Future Conditions Concept Design Peak Volume (arce-ft)						
Number	Type	(acres)	V_2	V_5	V_{10}	V_{25}	V_{50}	V_{100}	V_{500}
1392	BASIN	82	1	2	3	7	10	13	23
1394	BASIN	103	1	3	5	9	13	18	30
1396	BASIN	77	4	6	7	11	14	17	27
1398	BASIN	52	3	4	5	7	9	12	18
O_100	OUTFALL	755	13	23	38	71	98	134	218
O_220	OUTFALL	1,058	24	39	61	108	147	197	310
O_300	OUTFALL	157	1	2	4	11	16	24	42
O_500	OUTFALL	292	7	11	17	30	41	55	82
O_600	OUTFALL	363	12	18	26	42	56	73	115
O_708	OUTFALL	90	1	3	5	8	12	16	27
O_803	OUTFALL	696	29	42	58	86	113	144	208
O_909	OUTFALL	446	10	16	24	43	59	80	135
O_1000	OUTFALL	7,181	155	235	344	632	887	1,212	1,933
O_1107	OUTFALL	854	16	26	37	64	92	128	209
O_1263	OUTFALL	1,042	15	25	41	83	120	168	292
O_1307	OUTFALL	1,712	48	59	74	141	201	279	485

APPENDIX F-6
Master Plan HY-8 Culverts

Culvert Data: Structure#101

Site Data - Structure#101

Site Data : Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4778.22 ft
Outlet Station: 52.00 ft
Outlet Elevation: 4777.89 ft
Number of Barrels: 2

Culvert Data Summary - Structure#101

Barrel Shape: Concrete Box
Barrel Span: 14.00 ft
Barrel Rise: 4.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

Table 27 - Culvert Summary Table: Structure#101

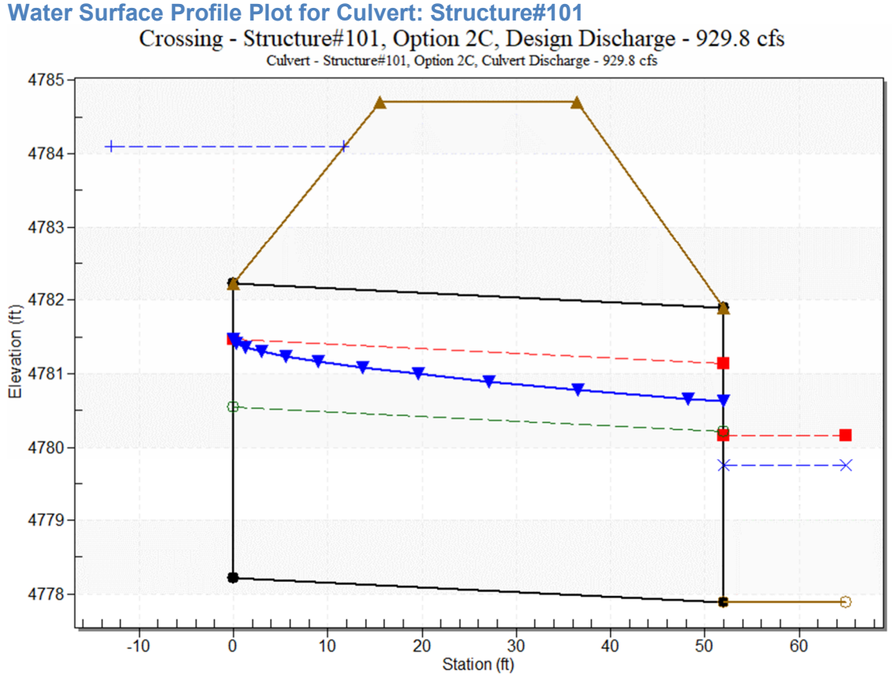
Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	5.18 cfs	5.18 cfs	4778.39	0.17	0.0*	1-JS1t	0.09	0.10	0.27	0.27	0.70	2.44
100 Year	72.62 cfs	72.62 cfs	4779.23	1.01	0.396	1-S2n	0.46	0.59	0.47	0.72	5.56	4.73
100-YR, L_115	929.80 cfs	929.80 cfs	4784.10	5.88	5.028	5-S2n	2.32	3.25	2.73	1.86	12.14	8.95

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4778.22 ft,
Outlet Elevation (invert): 4777.89 ft
Culvert Length: 52.00 ft,
Culvert Slope: 0.0063

Water Surface Profile Plot for Culvert: Structure#101



Tailwater Data for Crossing: Structure#101

Table 28 - Downstream Channel Rating Curve (Crossing: Structure#101)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
5.18	4778.16	0.27	2.44	0.38	1.18
72.62	4778.61	0.72	4.73	1.03	1.39
929.80	4779.75	1.86	8.95	2.67	1.63

Tailwater Channel Data - Structure#101

Tailwater Channel : Triangular Channel
Side Slope (H:V): 30.00 (_:1)
Channel Slope: 0.0230
Channel Manning's n: 0.0240
Channel Invert Elevation: 4777.89 ft

Roadway Data for Crossing: Structure#101

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4784.70 ft
Roadway Surface: Paved
Roadway Top Width: 21.00 ft

Culvert Data: Structure#102,

Site Data - Structure#102,

Site Data : Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4782.03 ft
Outlet Station: 60.00 ft
Outlet Elevation: 4781.65 ft
Number of Barrels: 2

Culvert Data Summary - Structure#102,

Barrel Shape: Concrete Box
Barrel Span: 10.00 ft
Barrel Rise: 6.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

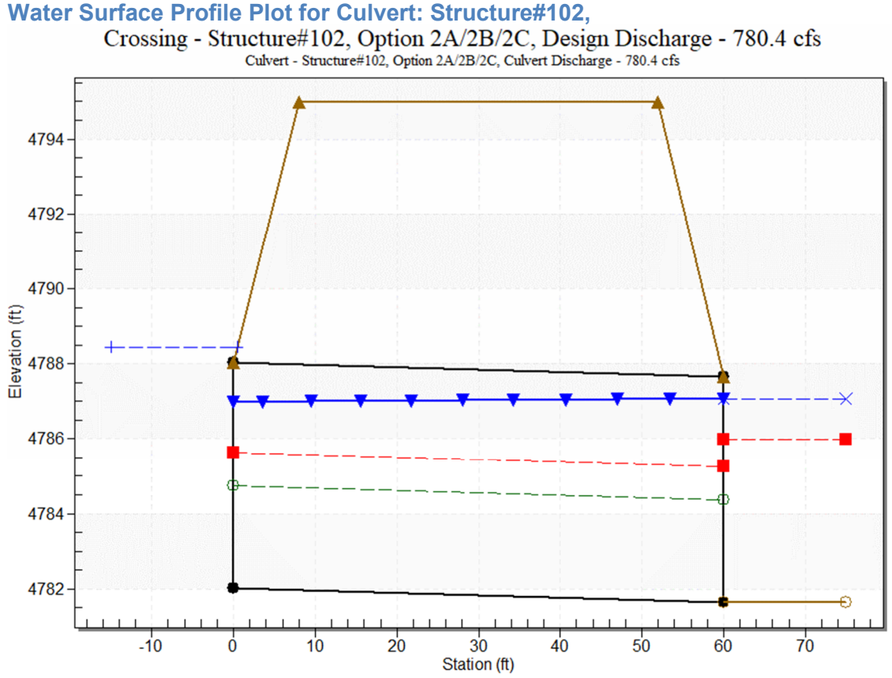
Table 9 - Culvert Summary Table: Structure#102,

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	6.28 cfs	6.28 cfs	4782.55	0.25	0.516	1-S1t	0.11	0.15	0.89	0.89	0.35	1.59
100 Year	157.30 cfs	157.30 cfs	4784.82	2.12	2.791	1-S1t	0.93	1.24	2.98	2.98	2.64	3.55
100-YR, L_115	780.40 cfs	780.40 cfs	4788.43	6.13	6.396	1-S1t	2.71	3.62	5.42	5.42	7.19	5.30

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4782.03 ft,
Outlet Elevation (invert): 4781.65 ft
Culvert Length: 60.00 ft,
Culvert Slope: 0.0063

Water Surface Profile Plot for Culvert: Structure#102,



Tailwater Data for Crossing: Structure#102,

Table 10 - Downstream Channel Rating Curve (Crossing: Structure#102,)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
6.28	4782.54	0.89	1.59	0.39	0.42
157.30	4784.63	2.98	3.55	1.30	0.51
780.40	4787.07	5.42	5.30	2.37	0.57

Tailwater Channel Data - Structure#102,

Tailwater Channel : Triangular Channel
Side Slope (H:V): 5.00 (_:1)
Channel Slope: 0.0070
Channel Manning's n: 0.0450
Channel Invert Elevation: 4781.65 ft

Roadway Data for Crossing: Structure#102,

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4794.98 ft
Roadway Surface: Paved
Roadway Top Width: 44.00 ft

Culvert Data: Structure#103,

Site Data - Structure#103,

Site Data : Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4864.72 ft
Outlet Station: 295.00 ft
Outlet Elevation: 4858.55 ft
Number of Barrels: 1

Culvert Data Summary - Structure#103,

Barrel Shape: Concrete Box
Barrel Span: 6.00 ft
Barrel Rise: 4.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

Table 7 - Culvert Summary Table: Structure#103,

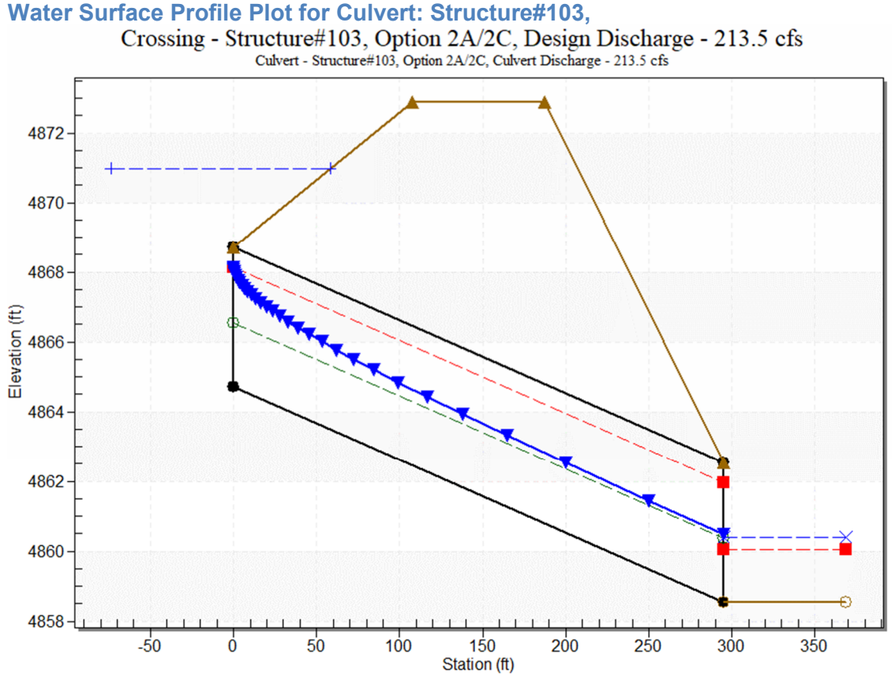
Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	85.77 cfs	85.77 cfs	4867.81	3.09	0.0*	1-S2n	0.98	1.85	0.98	1.18	14.65	3.21
100	213.50 cfs	213.50 cfs	4870.98	6.26	0.561	5-S2n	1.82	3.40	1.92	1.85	18.52	4.12
Year_L_149												

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4864.72 ft,
Outlet Elevation (invert): 4858.55 ft
Culvert Length: 295.06 ft,
Culvert Slope: 0.0209

Water Surface Profile Plot for Culvert: Structure#103,



Tailwater Data for Crossing: Structure#103,

Table 8 - Downstream Channel Rating Curve (Crossing: Structure#103,)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
85.77	4859.73	1.18	3.21	0.91	0.62
213.50	4860.40	1.85	4.12	1.42	0.66

Tailwater Channel Data - Structure#103,

Tailwater Channel : Trapezoidal Channel
Bottom Width: 12.70 ft
Side Slope (H:V): 8.30 (_:1)
Channel Slope: 0.0123
Channel Manning's n: 0.0450
Channel Invert Elevation: 4858.55 ft

Roadway Data for Crossing: Structure#103,

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4872.88 ft
Roadway Surface: Paved
Roadway Top Width: 80.00 ft

Culvert Data: Structure#104,

Site Data - Structure#104,

Site Data : Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4921.39 ft
Outlet Station: 127.00 ft
Outlet Elevation: 4919.92 ft
Number of Barrels: 1

Culvert Data Summary - Structure#104,

Barrel Shape: Concrete Box
Barrel Span: 6.00 ft
Barrel Rise: 3.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

Table 5 - Culvert Summary Table: Structure#104,

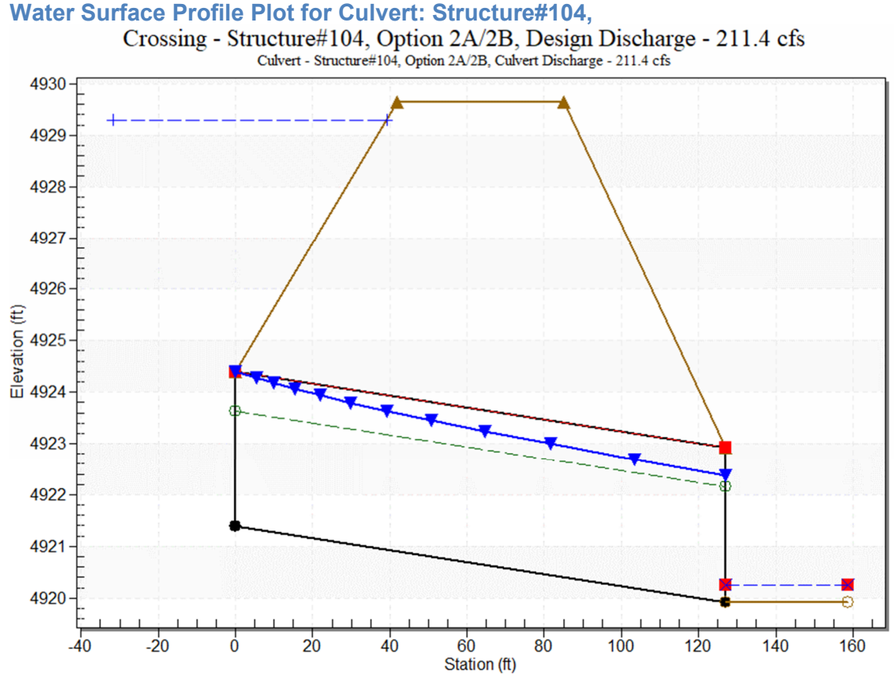
Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	124.36 cfs	124.36 cfs	4925.63	4.24	2.721	5-S2n	1.54	2.37	1.66	0.26	12.48	2.12
100 Year,	211.40 cfs	211.40 cfs	4929.30	7.91	5.879	5-S2n	2.24	3.00	2.46	0.33	14.34	2.44

L_133

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4921.39 ft,
Outlet Elevation (invert): 4919.92 ft
Culvert Length: 127.01 ft,
Culvert Slope: 0.0116

Water Surface Profile Plot for Culvert: Structure#104,



Tailwater Data for Crossing: Structure#104,

Table 6 - Downstream Channel Rating Curve (Crossing: Structure#104,)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
124.36	4920.18	0.26	2.12	0.74	0.92
211.40	4920.25	0.33	2.44	0.94	0.96

Tailwater Channel Data - Structure#104,

Tailwater Channel : Trapezoidal Channel
Bottom Width: 100.00 ft
Side Slope (H:V): 500.00 (_:1)
Channel Slope: 0.0460
Channel Manning's n: 0.0450
Channel Invert Elevation: 4919.92 ft

Roadway Data for Crossing: Structure#104,

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4929.64 ft
Roadway Surface: Paved
Roadway Top Width: 43.00 ft

Culvert Data: Structure#201,

Site Data - Structure#201,

Site Data : Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4761.52 ft
Outlet Station: 30.46 ft
Outlet Elevation: 4760.40 ft
Number of Barrels: 2

Culvert Data Summary - Structure#201,

Barrel Shape: Concrete Box
Barrel Span: 11.00 ft
Barrel Rise: 4.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

Table 25 - Culvert Summary Table: Structure#201,

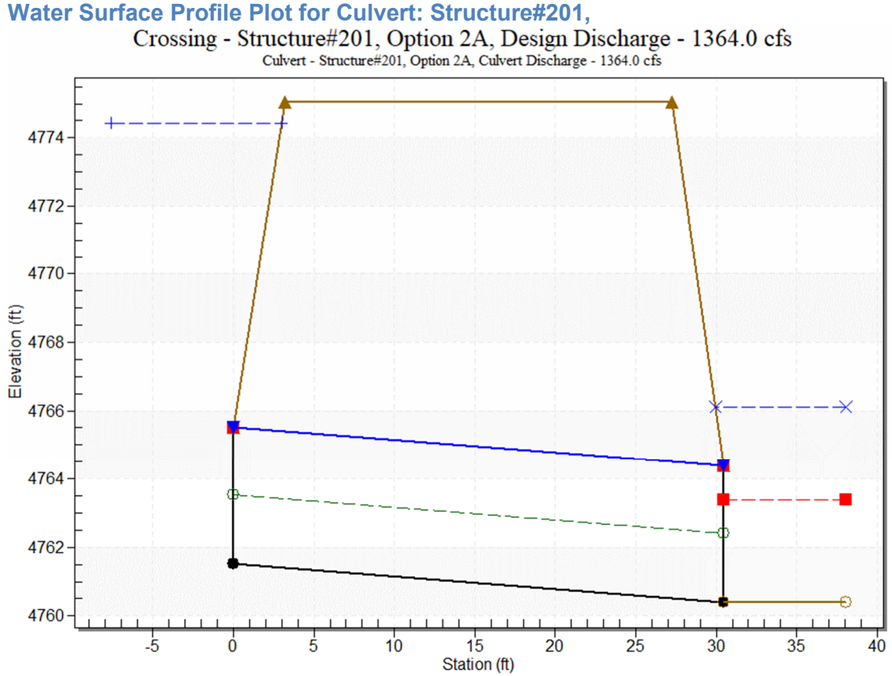
Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	5.00 cfs	5.00 cfs	4761.71	0.19	0.0*	1-S2n	0.04	0.12	0.06	0.23	3.60	0.54
100-YR, O_220	1364.00 cfs	1364.00 cfs	4774.42	12.90	10.475	4-FFf	2.01	4.00	4.00	5.71	15.50	3.80

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4761.52 ft,
Outlet Elevation (invert): 4760.40 ft
Culvert Length: 30.48 ft,
Culvert Slope: 0.0368

Water Surface Profile Plot for Culvert: Structure#201,



Tailwater Data for Crossing: Structure#201,

Table 26 - Downstream Channel Rating Curve (Crossing: Structure#201,)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
5.00	4760.63	0.23	0.54	0.03	0.20
1364.00	4766.11	5.71	3.80	0.71	0.33

Tailwater Channel Data - Structure#201,

Tailwater Channel : Trapezoidal Channel
Bottom Width: 40.00 ft
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.0020
Channel Manning's n: 0.0450
Channel Invert Elevation: 4760.40 ft

Roadway Data for Crossing: Structure#201,

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4775.04 ft
Roadway Surface: Gravel
Roadway Top Width: 24.00 ft

Culvert Data: Structure#202,

Site Data - Structure#202,

Site Data : Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4949.72 ft
Outlet Station: 100.00 ft
Outlet Elevation: 4944.32 ft
Number of Barrels: 1

Culvert Data Summary - Structure#202,

Barrel Shape: Concrete Box
Barrel Span: 6.00 ft
Barrel Rise: 3.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

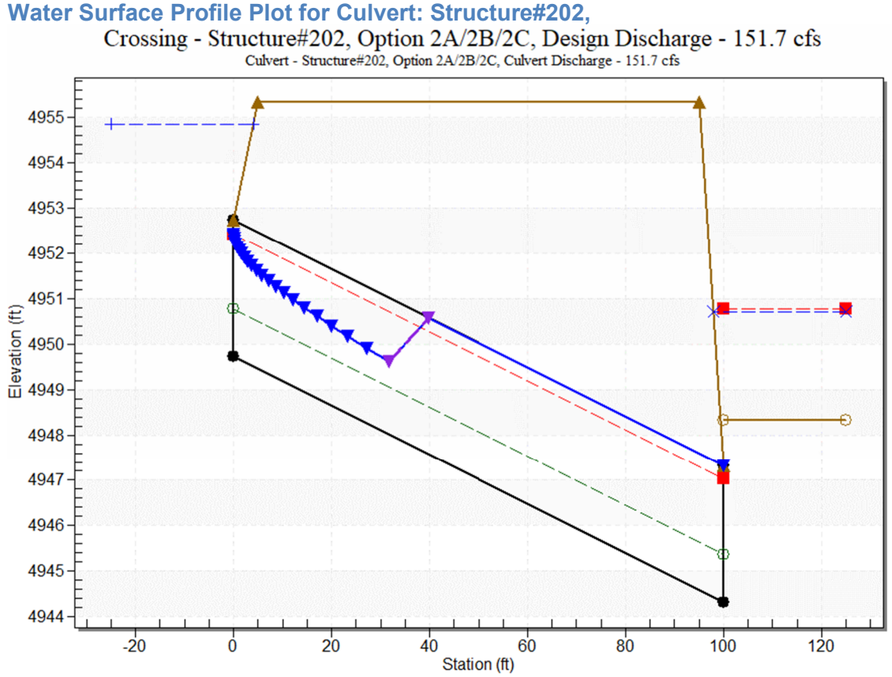
Table 3 - Culvert Summary Table: Structure#202,

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5	40.39 cfs	40.39 cfs	4951.55	1.83	0.052	1-JS1f	0.44	1.12	3.00	1.31	2.24	5.11
100-YR,	151.66 cfs	151.66 cfs	4954.84	5.12	3.080	5-JS1f	1.04	2.71	3.00	2.37	8.43	7.55
Junction_263												

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4949.72 ft,
Outlet Elevation (invert): 4944.32 ft
Culvert Length: 100.15 ft,
Culvert Slope: 0.0540

Water Surface Profile Plot for Culvert: Structure#202,



Tailwater Data for Crossing: Structure#202,

Table 4 - Downstream Channel Rating Curve (Crossing: Structure#202,)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
40.39	4949.63	1.31	5.11	2.68	0.99
151.66	4950.69	2.37	7.55	4.86	1.08

Tailwater Channel Data - Structure#202,

Tailwater Channel : Irregular Channel
Channel Slope: Irregular Channel

User Defined Channel Cross-Section

Coord No.	Station (ft)	Elevation (ft)	Manning's n
1	0.00	4962.30	0.0450
2	3.23	4962.09	0.0450
3	6.47	4961.86	0.0450
4	9.70	4961.61	0.0450
5	12.93	4961.41	0.0450
6	16.17	4961.22	0.0450
7	19.40	4960.97	0.0450
8	22.64	4960.70	0.0450

9	25.87	4960.41	0.0450
10	29.10	4960.10	0.0450
11	32.34	4959.84	0.0450
12	35.57	4959.59	0.0450
13	38.80	4959.34	0.0450
14	42.04	4959.06	0.0450
15	45.27	4958.74	0.0450
16	48.50	4958.41	0.0450
17	51.74	4958.07	0.0450
18	54.97	4957.68	0.0450
19	58.20	4957.27	0.0450
20	61.44	4956.89	0.0450
21	64.67	4956.54	0.0450
22	67.91	4956.23	0.0450
23	71.14	4955.85	0.0450
24	74.37	4955.38	0.0450
25	77.61	4954.97	0.0450
26	80.84	4954.70	0.0450
27	84.07	4954.43	0.0450
28	87.31	4954.23	0.0450
29	90.54	4954.07	0.0450
30	93.77	4953.94	0.0450
31	97.01	4953.82	0.0450
32	100.24	4953.72	0.0450
33	103.47	4953.55	0.0450
34	106.71	4953.08	0.0450
35	109.94	4952.92	0.0450
36	113.17	4953.12	0.0450
37	116.41	4951.97	0.0450
38	119.64	4950.01	0.0450
39	122.88	4948.73	0.0450
40	126.11	4948.32	0.0450
41	129.34	4949.03	0.0450
42	132.58	4951.36	0.0450
43	135.81	4953.47	0.0450
44	139.04	4955.07	0.0450
45	142.28	4956.11	0.0450
46	145.51	4956.75	0.0450
47	148.75	4956.69	0.0450
48	151.98	4955.86	0.0450
49	155.21	4954.91	0.0450
50	158.45	4954.71	0.0450
51	161.68	4954.76	0.0450
52	164.91	4954.65	0.0450
53	168.15	4954.77	0.0450
54	171.38	4955.49	0.0450
55	174.61	4956.04	0.0450
56	177.85	4956.47	0.0450
57	181.08	4957.05	0.0450
58	184.31	4957.49	0.0450
59	187.55	4957.86	0.0450
60	190.78	4958.15	0.0450
61	194.01	4958.40	0.0450
62	197.25	4958.70	0.0450
63	200.48	4958.98	0.0450
64	203.72	4959.11	0.0450
65	206.95	4959.15	0.0450
66	210.18	4959.21	0.0450
67	213.42	4959.31	0.0450
68	216.65	4959.39	0.0450
69	219.88	4959.50	0.0450
70	223.12	4959.56	0.0000

Roadway Data for Crossing: Structure#202,

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4955.33 ft
Roadway Surface: Gravel
Roadway Top Width: 90.00 ft

Culvert Data: Structure#203,

Site Data - Structure#203,

Site Data : Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4979.58 ft
Outlet Station: 327.00 ft
Outlet Elevation: 4970.79 ft
Number of Barrels: 1

Culvert Data Summary - Structure#203,

Barrel Shape: Circular
Barrel Diameter: 4.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall (Ke=0.5)
Inlet Depression: None

Table 1 - Culvert Summary Table: Structure#203,

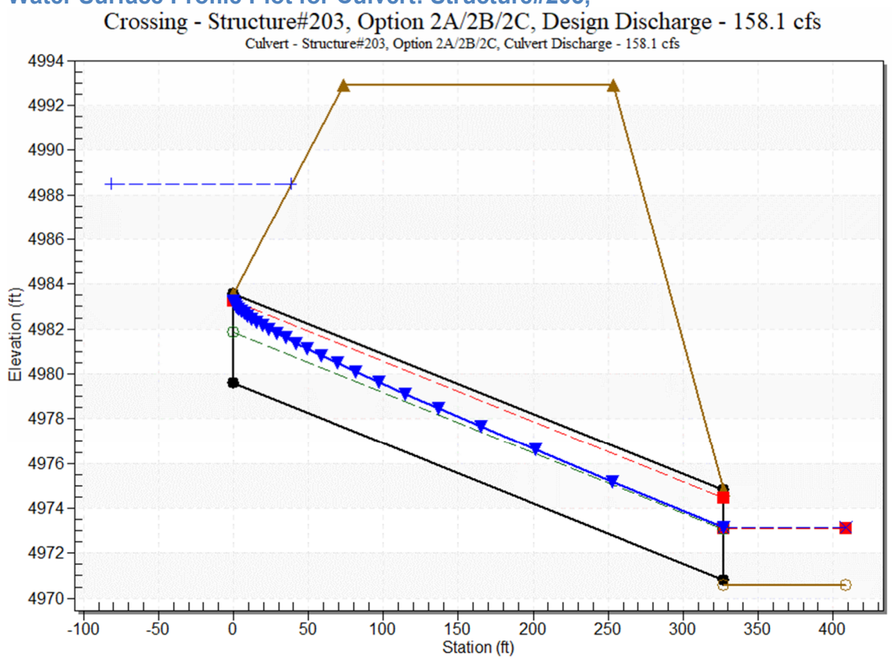
Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5-year	40.39 cfs	40.39 cfs	4982.30	2.72	0.0*	1-S2n	1.07	1.90	1.07	1.52	14.86	4.35
100-year, Junction _268	158.12 cfs	158.12 cfs	4988.47	8.89	2.083	5-S2n	2.28	3.65	2.36	2.54	20.51	6.12

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4979.58 ft,
Outlet Elevation (invert): 4970.79 ft
Culvert Length: 327.12 ft,
Culvert Slope: 0.0269

Water Surface Profile Plot for Culvert: Structure#203,



Tailwater Data for Crossing: Structure#203,

Table 2 - Downstream Channel Rating Curve (Crossing: Structure#203,)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
40.39	4972.10	1.52	4.35	2.47	0.88
158.12	4973.12	2.54	6.12	4.12	0.96

Tailwater Channel Data - Structure#203,

Tailwater Channel : Triangular Channel
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.0260
Channel Manning's n: 0.0450
Channel Invert Elevation: 4970.58 ft

Roadway Data for Crossing: Structure#203,

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4992.89 ft
Roadway Surface: Paved
Roadway Top Width: 180.00 ft

Culvert Data: Structure#301, Reach 300

Site Data - Structure#301, Reach 300

Site Data : Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4786.49 ft
Outlet Station: 35.60 ft
Outlet Elevation: 4786.34 ft
Number of Barrels: 1

Culvert Data Summary - Structure#301, Reach 300

Barrel Shape: Concrete Box
Barrel Span: 8.00 ft
Barrel Rise: 3.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

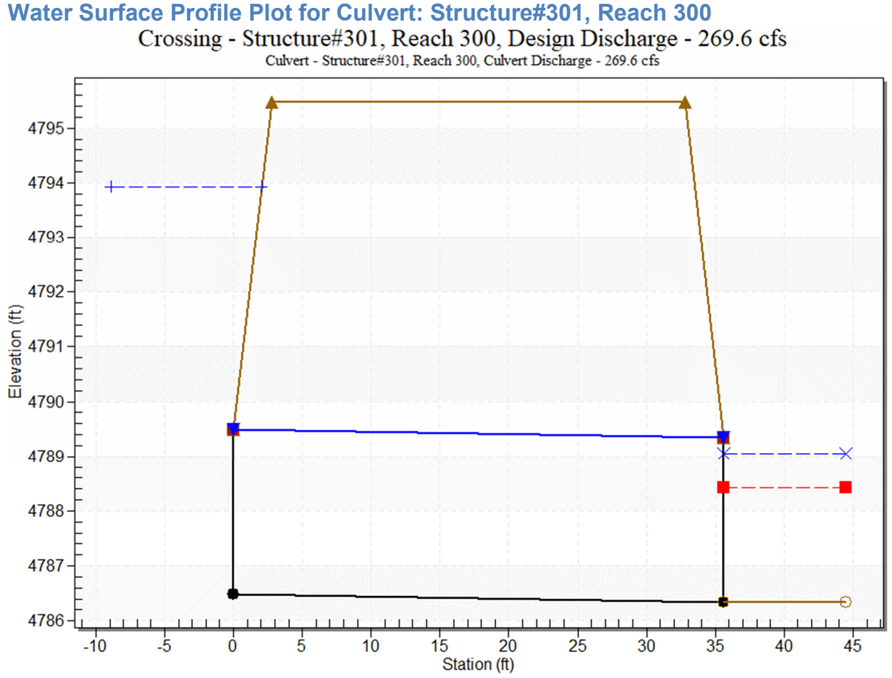
Table 23 - Culvert Summary Table: Structure#301, Reach 300

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	23.55 cfs	23.55 cfs	4787.59	1.10	0.649	1-JS1t	0.58	0.65	0.78	0.78	3.80	2.25
100 Year	269.56 cfs	269.56 cfs	4793.92	7.43	6.048	6-FFc	3.00	3.00	3.00	2.71	11.23	4.49

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4786.49 ft,
Outlet Elevation (invert): 4786.34 ft
Culvert Length: 35.60 ft,
Culvert Slope: 0.0042

Water Surface Profile Plot for Culvert: Structure#301, Reach 300



Tailwater Data for Crossing: Structure#301, Reach 300

Table 24 - Downstream Channel Rating Curve (Crossing: Structure#301, Reach 300)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
23.55	4787.12	0.78	2.25	0.44	0.51
269.56	4789.05	2.71	4.49	1.52	0.60

Tailwater Channel Data - Structure#301, Reach 300

Tailwater Channel : Trapezoidal Channel
Bottom Width: 10.00 ft
Side Slope (H:V): 4.50 (_:1)
Channel Slope: 0.0090
Channel Manning's n: 0.0450
Channel Invert Elevation: 4786.34 ft

Roadway Data for Crossing: Structure#301, Reach 300

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4795.47 ft
Roadway Surface: Gravel
Roadway Top Width: 30.00 ft

Culvert Data: Structure#501,

Site Data - Structure#501,

Site Data : Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4824.39 ft
Outlet Station: 88.00 ft
Outlet Elevation: 4816.39 ft
Number of Barrels: 1

Culvert Data Summary - Structure#501,

Barrel Shape: Concrete Box
Barrel Span: 8.00 ft
Barrel Rise: 3.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

Table 13 - Culvert Summary Table: Structure#501,

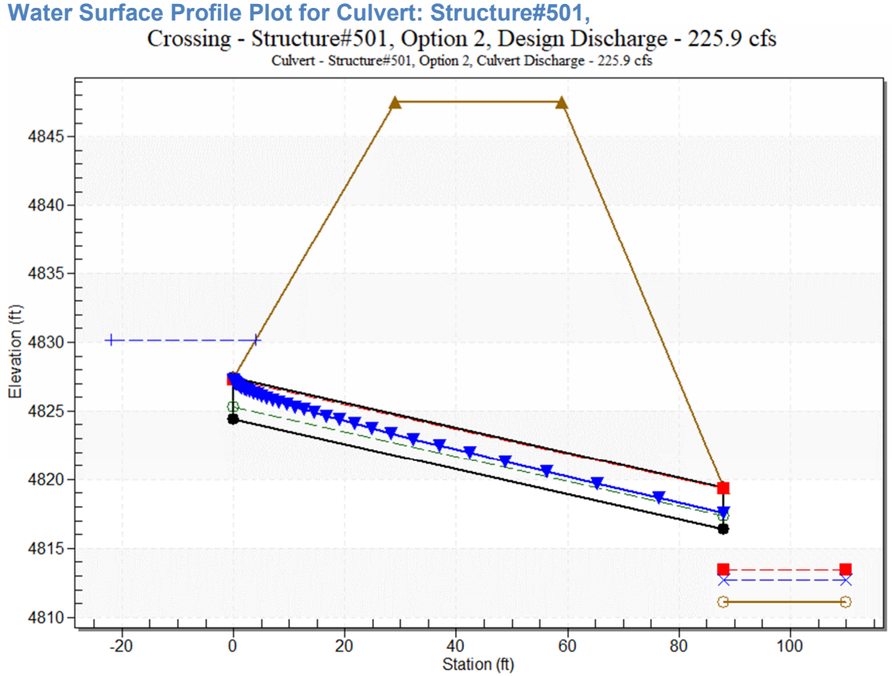
Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	19.99 cfs	19.99 cfs	4825.30	0.91	0.0*	1-S2n	0.20	0.58	0.20	0.64	12.57	7.02
100 Year	174.84 cfs	174.84 cfs	4828.73	4.34	0.0*	5-S2n	0.78	2.46	0.95	1.44	23.02	12.07
100-YR, L_513	225.90 cfs	225.90 cfs	4830.16	5.77	0.0*	5-S2n	0.92	2.91	1.17	1.58	24.08	12.87

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4824.39 ft,
Outlet Elevation (invert): 4816.39 ft
Culvert Length: 88.36 ft,
Culvert Slope: 0.0909

Water Surface Profile Plot for Culvert: Structure#501,



Tailwater Data for Crossing: Structure#501,

Table 14 - Downstream Channel Rating Curve (Crossing: Structure#501,)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
19.99	4811.74	0.64	7.02	8.36	2.19
174.84	4812.54	1.44	12.07	18.85	2.51
225.90	4812.68	1.58	12.87	20.75	2.55

Tailwater Channel Data - Structure#501,

Tailwater Channel : Triangular Channel
Side Slope (H:V): 7.00 (_:1)
Channel Slope: 0.2100
Channel Manning's n: 0.0450
Channel Invert Elevation: 4811.10 ft

Roadway Data for Crossing: Structure#501,

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4847.50 ft
Roadway Surface: Paved
Roadway Top Width: 30.00 ft

Culvert Data: Structure#601,

Site Data - Structure#601,

Site Data : Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4827.99 ft
Outlet Station: 120.50 ft
Outlet Elevation: 4825.15 ft
Number of Barrels: 1

Culvert Data Summary - Structure#601,

Barrel Shape: Concrete Box
Barrel Span: 8.00 ft
Barrel Rise: 5.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

Table 21 - Culvert Summary Table: Structure#601,

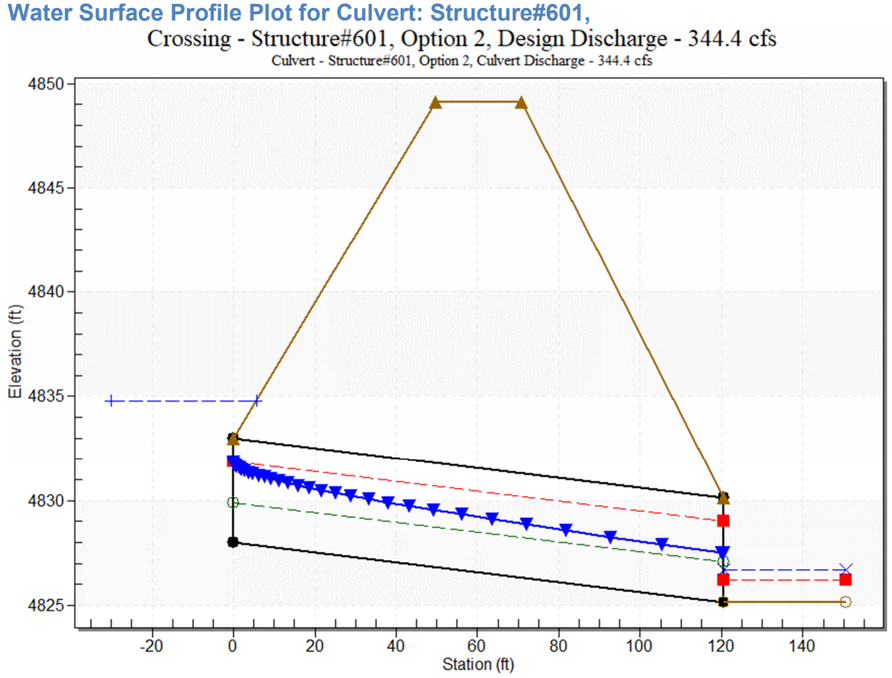
Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	17.62 cfs	17.62 cfs	4828.88	0.89	0.0*	1-S2n	0.28	0.53	0.28	0.31	7.89	1.20
100 Year	145.90 cfs	145.90 cfs	4831.62	3.63	0.0*	1-S2n	1.07	2.18	1.21	1.00	15.07	2.34
100-YR, L_613	344.40 cfs	344.40 cfs	4834.80	6.81	3.643	5-S2n	1.91	3.86	2.36	1.56	18.25	2.98

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4827.99 ft,
Outlet Elevation (invert): 4825.15 ft
Culvert Length: 120.53 ft,
Culvert Slope: 0.0236

Water Surface Profile Plot for Culvert: Structure#601,



Tailwater Data for Crossing: Structure#601,

Table 22 - Downstream Channel Rating Curve (Crossing: Structure#601,)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
17.62	4825.46	0.31	1.20	0.15	0.41
145.90	4826.15	1.00	2.34	0.47	0.48
344.40	4826.71	1.56	2.98	0.73	0.51

Tailwater Channel Data - Structure#601,

Tailwater Channel : Trapezoidal Channel
Bottom Width: 40.00 ft
Side Slope (H:V): 21.90 (_:1)
Channel Slope: 0.0075
Channel Manning's n: 0.0450
Channel Invert Elevation: 4825.15 ft

Roadway Data for Crossing: Structure#601,

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4849.11 ft
Roadway Surface: Gravel
Roadway Top Width: 21.00 ft

Culvert Data: Structure#602,

Site Data - Structure#602,

Site Data : Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4832.33 ft
Outlet Station: 41.00 ft
Outlet Elevation: 4832.02 ft
Number of Barrels: 1

Culvert Data Summary - Structure#602,

Barrel Shape: Concrete Box
Barrel Span: 8.00 ft
Barrel Rise: 4.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

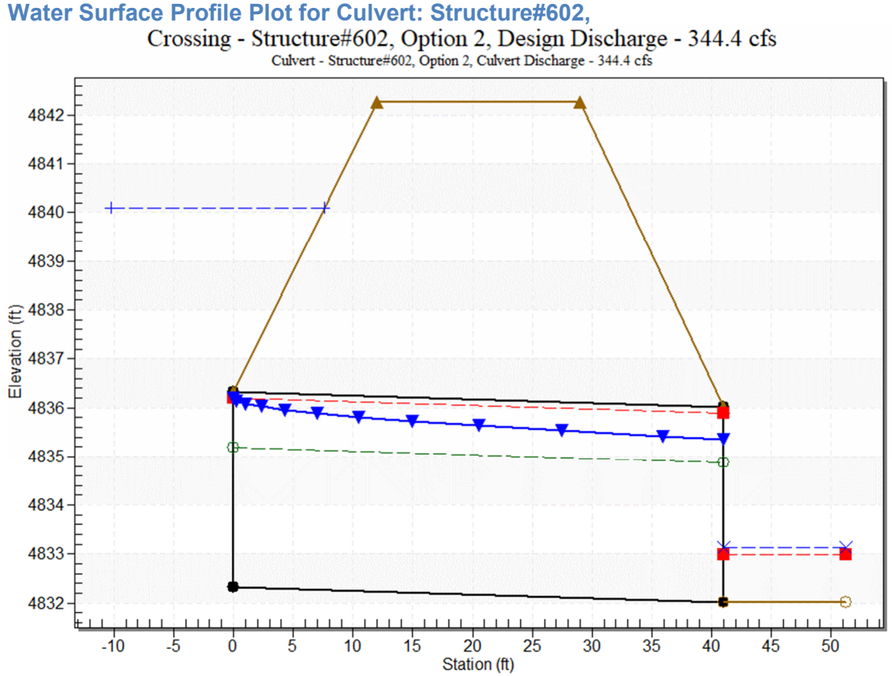
Table 17 - Culvert Summary Table: Structure#602,

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	17.62 cfs	17.62 cfs	4833.24	0.91	0.230	1-S2n	0.40	0.53	0.41	0.21	5.38	1.52
100 Year	145.90 cfs	145.90 cfs	4836.00	3.67	2.390	1-S2n	1.56	2.18	1.79	0.70	10.16	3.16
100-YR, L_613	344.40 cfs	344.40 cfs	4840.10	7.77	6.528	5-S2n	2.84	3.86	3.34	1.12	12.90	4.12

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4832.33 ft,
Outlet Elevation (invert): 4832.02 ft
Culvert Length: 41.00 ft,
Culvert Slope: 0.0076

Water Surface Profile Plot for Culvert: Structure#602,



Tailwater Data for Crossing: Structure#602,

Table 18 - Downstream Channel Rating Curve (Crossing: Structure#602,)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
17.62	4832.23	0.21	1.52	0.25	0.61
145.90	4832.72	0.70	3.16	0.83	0.73
344.40	4833.14	1.12	4.12	1.33	0.78

Tailwater Channel Data - Structure#602,

Tailwater Channel : Trapezoidal Channel
Bottom Width: 52.00 ft
Side Slope (H:V): 20.00 (_:1)
Channel Slope: 0.0190
Channel Manning's n: 0.0450
Channel Invert Elevation: 4832.02 ft

Roadway Data for Crossing: Structure#602,

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4842.26 ft
Roadway Surface: Paved
Roadway Top Width: 17.00 ft

Culvert Data: Structure#603,

Site Data - Structure#603,

Site Data : Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4918.96 ft
Outlet Station: 234.00 ft
Outlet Elevation: 4917.04 ft
Number of Barrels: 1

Culvert Data Summary - Structure#603,

Barrel Shape: Concrete Box
Barrel Span: 7.00 ft
Barrel Rise: 3.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)
Inlet Depression: None

Table 15 - Culvert Summary Table: Structure#603,

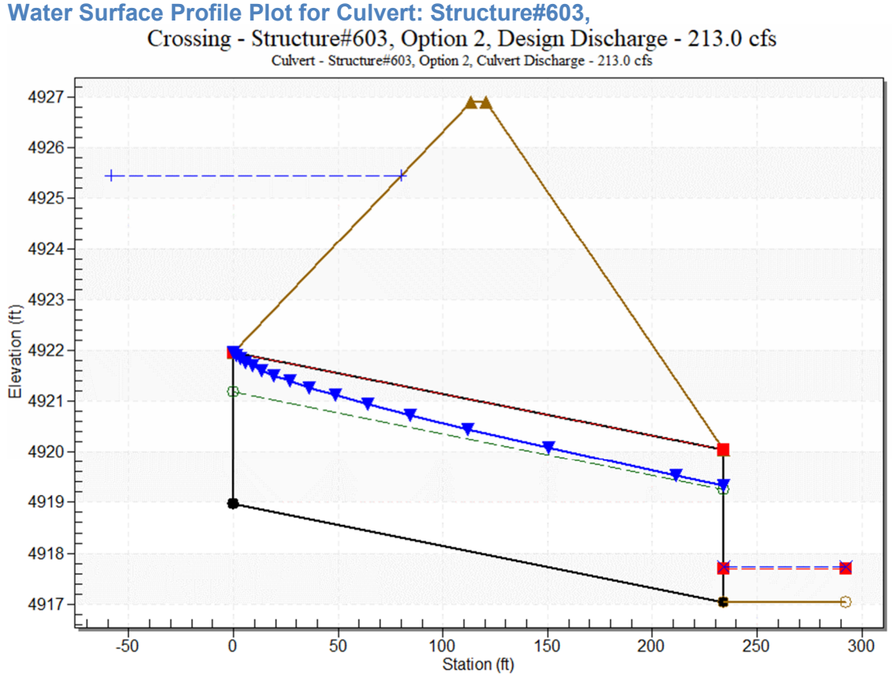
Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	78.44 cfs	78.44 cfs	4921.61	2.65	0.173	1-S2n	1.11	1.57	1.11	0.38	10.06	2.88
100-YR,	213.03 cfs	213.03 cfs	4925.44	6.47	4.936	5-S2n	2.21	3.00	2.29	0.70	13.29	4.27

L_613

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4918.96 ft,
Outlet Elevation (invert): 4917.04 ft
Culvert Length: 234.01 ft,
Culvert Slope: 0.0082

Water Surface Profile Plot for Culvert: Structure#603,



Tailwater Data for Crossing: Structure#603,

Table 16 - Downstream Channel Rating Curve (Crossing: Structure#603,)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
78.44	4917.42	0.38	2.88	0.67	0.82
213.03	4917.74	0.70	4.27	1.21	0.91

Tailwater Channel Data - Structure#603,

Tailwater Channel : Trapezoidal Channel
Bottom Width: 70.00 ft
Side Slope (H:V): 2.00 (_:1)
Channel Slope: 0.0278
Channel Manning's n: 0.0450
Channel Invert Elevation: 4917.04 ft

Roadway Data for Crossing: Structure#603,

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4926.90 ft
Roadway Surface: Gravel
Roadway Top Width: 7.00 ft

Culvert Data: Structure#702

Site Data - Structure#702

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4867.00 ft
Outlet Station: 97.00 ft
Outlet Elevation: 4862.00 ft
Number of Barrels: 1

Culvert Data Summary - Structure#702

Barrel Shape: Circular
Barrel Diameter: 4.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall
Inlet Depression: None

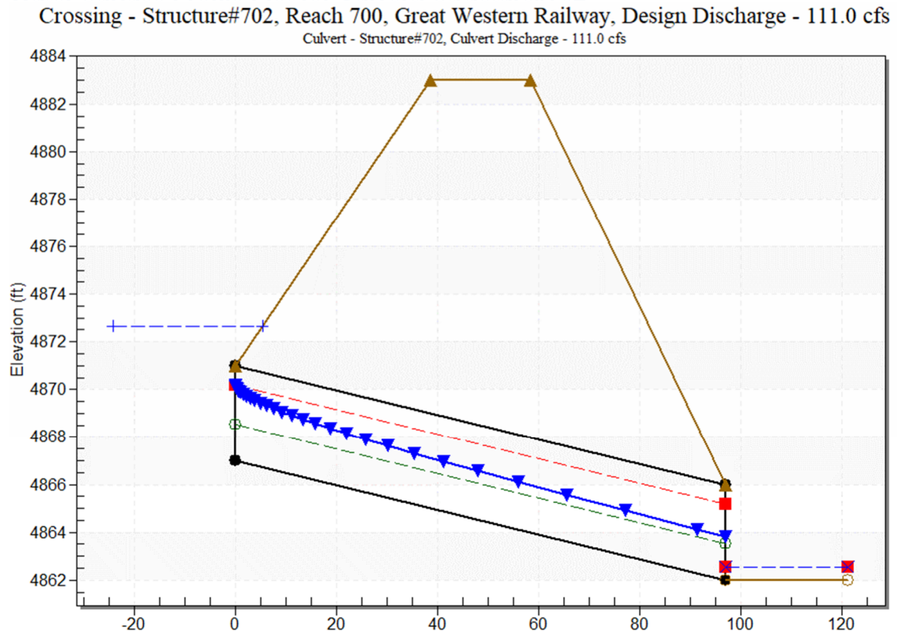
Table 1 - Culvert Summary Table: Structure#702

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	24.91 cfs	24.91 cfs	4868.96	1.96	0.0*	1-S2n	0.72	1.47	0.76	0.23	14.91	2.12
100 Year	111.00 cfs	111.00 cfs	4872.67	5.67	0.901	5-S2n	1.54	3.18	1.82	0.56	19.98	3.78

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4867.00 ft,
Outlet Elevation (invert): 4862.00 ft
Culvert Length: 97.13 ft,
Culvert Slope: 0.0515

Water Surface Profile Plot for Culvert: Structure#702



Tailwater Data for Crossing: Structure#702, Reach 700

Table 2 - Downstream Channel Rating Curve (Crossing: Structure#702, Reach 700)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
24.91	4862.23	0.23	2.12	0.43	0.79
111.00	4862.56	0.56	3.78	1.05	0.91

Tailwater Channel Data - Structure#702, Reach 700

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 50.00 ft
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.0300
Channel Manning's n: 0.0450
Channel Invert Elevation: 4862.00 ft

Roadway Data for Crossing: Structure#702, Reach 700

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4883.00 ft
Roadway Surface: Gravel
Roadway Top Width: 20.00 ft

Culvert Data: Structure#704

Site Data - Structure#704

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4890.00 ft
Outlet Station: 89.00 ft
Outlet Elevation: 4888.00 ft
Number of Barrels: 2

Culvert Data Summary - Structure#704

Barrel Shape: Circular
Barrel Diameter: 4.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall
Inlet Depression: None

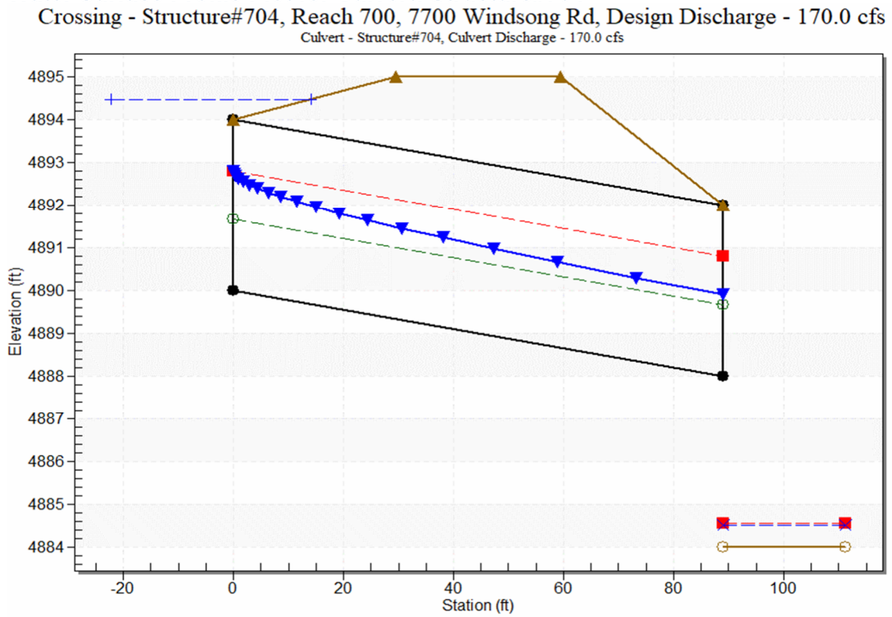
Table 5 - Culvert Summary Table: Structure#704

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	24.91 cfs	24.91 cfs	4891.39	1.39	0.0*	1-S2n	0.63	1.03	0.64	0.16	9.50	2.09
100 Year	170.00 cfs	170.00 cfs	4894.48	4.48	2.124	5-S2n	1.67	2.79	1.90	0.51	14.43	4.45

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4890.00 ft,
Outlet Elevation (invert): 4888.00 ft
Culvert Length: 89.02 ft,
Culvert Slope: 0.0225

Water Surface Profile Plot for Culvert: Structure#704



Tailwater Data for Crossing: Structure#704, Reach 700

Table 6 - Downstream Channel Rating Curve (Crossing: Structure#704, Reach 700)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
24.91	4884.16	0.16	2.09	0.28	0.92
170.00	4884.51	0.51	4.45	0.89	1.11

Tailwater Channel Data - Structure#704, Reach 700

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 73.00 ft
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.0280
Channel Manning's n: 0.0350
Channel Invert Elevation: 4884.00 ft

Roadway Data for Crossing: Structure#704, Reach 700

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4897.00 ft
Roadway Surface: Paved
Roadway Top Width: 25.30 ft

Culvert Data: Structure#801

Site Data - Structure#801

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4960.15 ft
Outlet Station: 74.00 ft
Outlet Elevation: 4960.01 ft
Number of Barrels: 2

Culvert Data Summary - Structure#801

Barrel Shape: Concrete Box
Barrel Span: 9.00 ft
Barrel Rise: 4.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall
Inlet Depression: None

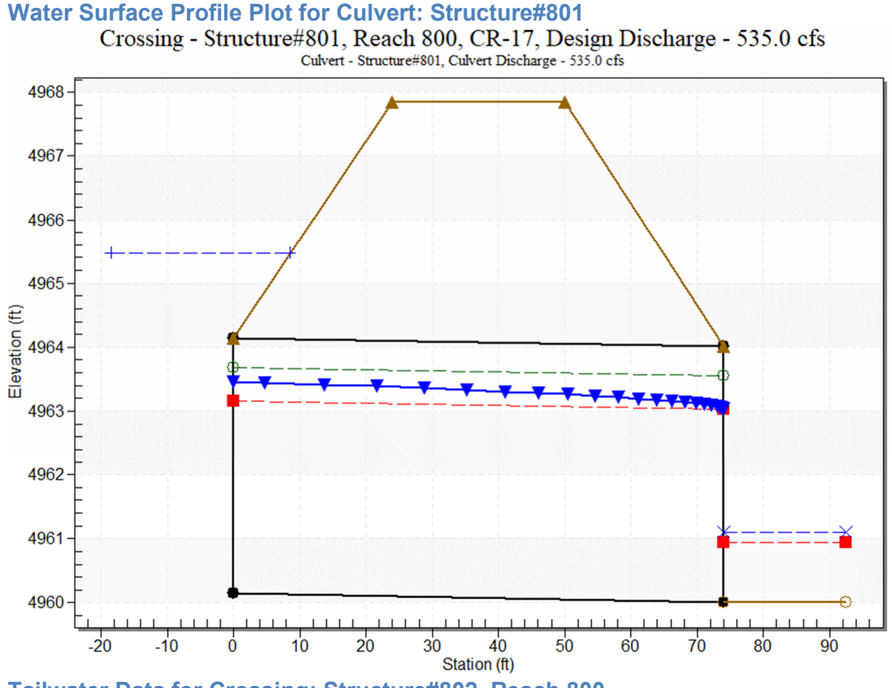
Table 7 - Culvert Summary Table: Structure#801

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	18.94 cfs	18.94 cfs	4960.71	0.56	0.560	2-M2c	0.39	0.33	0.33	0.15	3.24	1.25
100 Year	535.00 cfs	535.00 cfs	4965.47	5.32	5.188	7-M2c	3.54	3.02	3.02	1.08	9.85	4.45

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4960.15 ft,
Outlet Elevation (invert): 4960.01 ft
Culvert Length: 74.00 ft,
Culvert Slope: 0.0018

Water Surface Profile Plot for Culvert: Structure#801



Tailwater Data for Crossing: Structure#802, Reach 800

Table 8 - Downstream Channel Rating Curve (Crossing: Structure#802, Reach 800)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
18.94	4960.16	0.15	1.25	0.17	0.58
535.00	4961.09	1.08	4.45	1.25	0.79

Tailwater Channel Data - Structure#801, Reach 800

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 100.00 ft
Side Slope (H:V): 10.00 (_:1)
Channel Slope: 0.0185
Channel Manning's n: 0.0450
Channel Invert Elevation: 4960.01 ft

Roadway Data for Crossing: Structure#801, Reach 800

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4967.84 ft
Roadway Surface: Paved
Roadway Top Width: 26.00 ft

Culvert Data: Structure#804

Site Data - Structure#804

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4889.00 ft
Outlet Station: 90.00 ft
Outlet Elevation: 4881.00 ft
Number of Barrels: 1

Culvert Data Summary - Structure#804

Barrel Shape: Concrete Box
Barrel Span: 6.00 ft
Barrel Rise: 5.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0130
Culvert Type: Straight
Inlet Configuration: Square Edge (30-75º flare) Wingwall
Inlet Depression: None

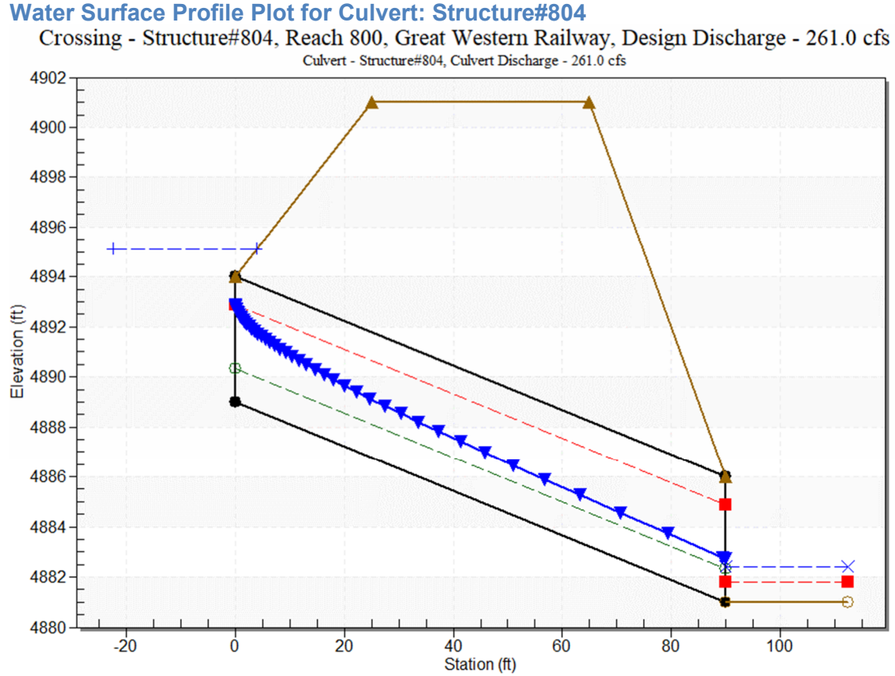
Table 9 - Culvert Summary Table: Structure#804

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	126.99 cfs	126.99 cfs	4892.50	3.50	0.0*	1-S2n	0.83	2.41	0.96	0.92	22.06	2.04
100 Year	261.00 cfs	261.00 cfs	4895.10	6.10	0.0*	5-S2n	1.34	3.89	1.74	1.41	25.06	2.68

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4889.00 ft,
Outlet Elevation (invert): 4881.00 ft
Culvert Length: 90.35 ft,
Culvert Slope: 0.0889

Water Surface Profile Plot for Culvert: Structure#804



Tailwater Data for Crossing: Structure#804, Reach 800

Table 10 - Downstream Channel Rating Curve (Crossing: Structure#804, Reach 800)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
126.99	4881.92	0.92	2.04	0.63	0.38
261.00	4882.41	1.41	2.68	0.97	0.41

Tailwater Channel Data - Structure#804, Reach 800

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 65.00 ft
Side Slope (H:V): 3.00 (_:1)
Channel Slope: 0.0110
Channel Manning's n: 0.0700
Channel Invert Elevation: 4881.00 ft

Roadway Data for Crossing: Structure#804, Reach 800

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4901.00 ft
Roadway Surface: Gravel
Roadway Top Width: 40.00 ft

Culvert Data: Structure#805

Site Data - Structure#805

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4892.00 ft
Outlet Station: 62.00 ft
Outlet Elevation: 4890.00 ft
Number of Barrels: 2

Culvert Data Summary - Structure#805

Barrel Shape: Concrete Box
Barrel Span: 8.00 ft
Barrel Rise: 3.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall
Inlet Depression: None

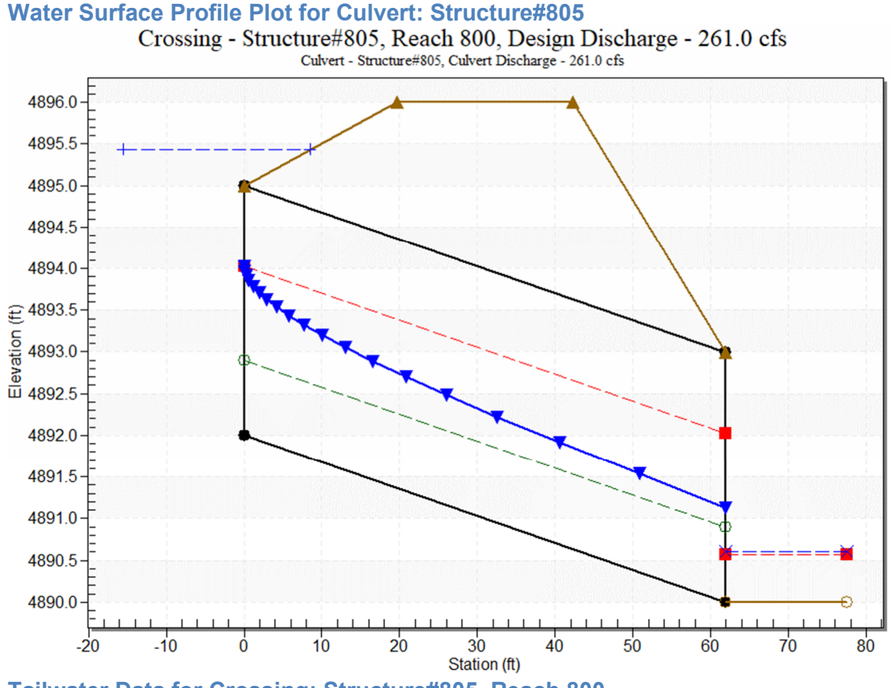
Table 11 - Culvert Summary Table: Structure#805

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	126.99 cfs	126.99 cfs	4894.07	2.07	0.0*	1-S2n	0.57	1.25	0.65	0.40	12.28	2.93
100 Year	261.00 cfs	261.00 cfs	4895.43	3.43	0.816	5-S2n	0.90	2.02	1.13	0.61	14.44	3.88

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4892.00 ft,
Outlet Elevation (invert): 4890.00 ft
Culvert Length: 62.03 ft,
Culvert Slope: 0.0323

Water Surface Profile Plot for Culvert: Structure#805



Tailwater Data for Crossing: Structure#805, Reach 800

Table 12 - Downstream Channel Rating Curve (Crossing: Structure#805, Reach 800)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
126.99	4890.40	0.40	2.93	0.69	0.83
261.00	4890.61	0.61	3.88	1.06	0.89

Tailwater Channel Data - Structure#805, Reach 800

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 107.00 ft
Side Slope (H:V): 6.00 (_:1)
Channel Slope: 0.0280
Channel Manning's n: 0.0450
Channel Invert Elevation: 4890.00 ft

Roadway Data for Crossing: Structure#805, Reach 800

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4896.00 ft
Roadway Surface: Gravel
Roadway Top Width: 22.60 ft

Culvert Data: Structure#807

Site Data - Structure#807

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4917.00 ft
Outlet Station: 80.00 ft
Outlet Elevation: 4916.00 ft
Number of Barrels: 1

Culvert Data Summary - Structure#807

Barrel Shape: Concrete Box
Barrel Span: 12.00 ft
Barrel Rise: 4.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (30-75º flare) Wingwall
Inlet Depression: None

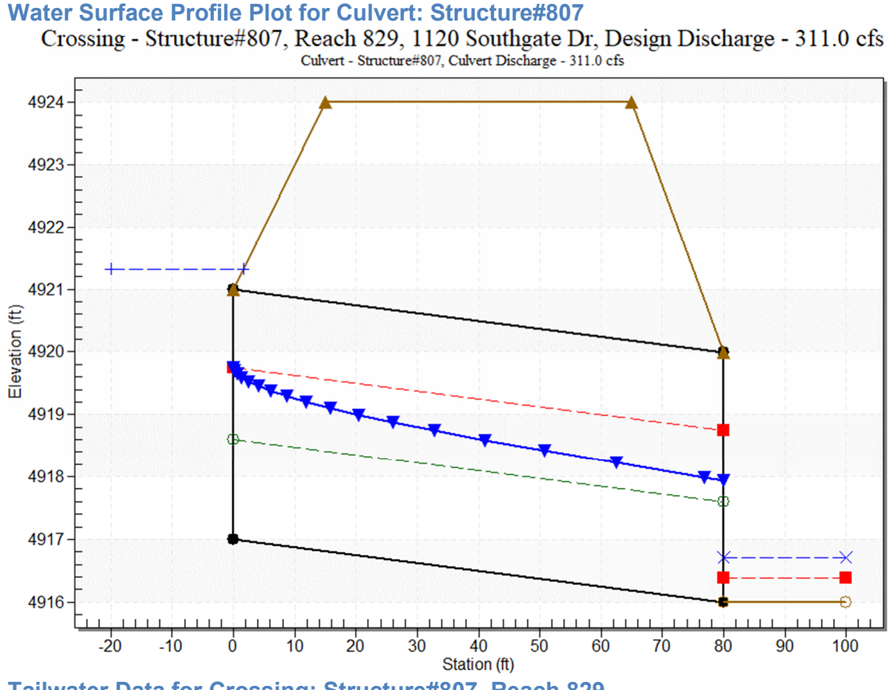
Table 15 - Culvert Summary Table: Structure#807

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	63.00 cfs	63.00 cfs	4918.44	1.44	0.0*	1-S2n	0.58	0.95	0.61	0.27	8.64	0.98
100 Year	311.00 cfs	311.00 cfs	4921.32	4.32	2.792	5-S2n	1.60	2.75	1.94	0.71	13.33	1.84

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4917.00 ft,
Outlet Elevation (invert): 4916.00 ft
Culvert Length: 80.01 ft,
Culvert Slope: 0.0125

Water Surface Profile Plot for Culvert: Structure#807



Tailwater Data for Crossing: Structure#807, Reach 829

Table 16 - Downstream Channel Rating Curve (Crossing: Structure#807, Reach 829)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
63.00	4916.27	0.27	0.98	0.09	0.33
311.00	4916.71	0.71	1.84	0.22	0.39

Tailwater Channel Data - Structure#807, Reach 829

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 235.00 ft
Side Slope (H:V): 5.00 (_:1)
Channel Slope: 0.0050
Channel Manning's n: 0.0450
Channel Invert Elevation: 4916.00 ft

Roadway Data for Crossing: Structure#807, Reach 829

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4924.00 ft
Roadway Surface: Paved
Roadway Top Width: 50.00 ft

Culvert Data: Structure#808

Site Data - Structure#808

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4942.00 ft
Outlet Station: 527.00 ft
Outlet Elevation: 4932.00 ft
Number of Barrels: 1

Culvert Data Summary - Structure#808

Barrel Shape: Concrete Box
Barrel Span: 12.00 ft
Barrel Rise: 4.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall
Inlet Depression: None

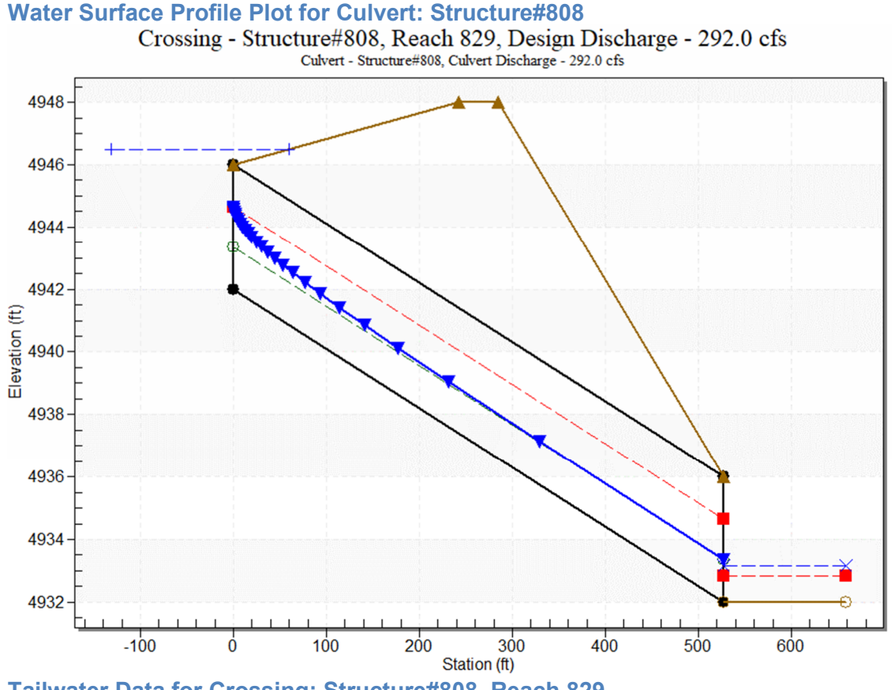
Table 17 - Culvert Summary Table: Structure#808

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	36.03 cfs	36.03 cfs	4943.10	1.10	0.0*	1-S2n	0.36	0.65	0.36	0.33	8.38	1.64
100 Year	292.00 cfs	292.00 cfs	4946.49	4.49	0.0*	5-S2n	1.34	2.64	1.36	1.16	17.89	3.60

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4942.00 ft,
Outlet Elevation (invert): 4932.00 ft
Culvert Length: 527.09 ft,
Culvert Slope: 0.0190

Water Surface Profile Plot for Culvert: Structure#808



Tailwater Data for Crossing: Structure#808, Reach 829

Table 18 - Downstream Channel Rating Curve (Crossing: Structure#808, Reach 829)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
36.03	4932.33	0.33	1.64	0.23	0.51
292.00	4933.16	1.16	3.60	0.79	0.62

Tailwater Channel Data - Structure#808, Reach 829

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 64.00 ft
Side Slope (H:V): 5.40 (_:1)
Channel Slope: 0.0110
Channel Manning's n: 0.0450
Channel Invert Elevation: 4932.00 ft

Roadway Data for Crossing: Structure#808, Reach 829

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4948.00 ft
Roadway Surface: Paved
Roadway Top Width: 43.00 ft

Culvert Data: Structure#809

Site Data - Structure#809

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4958.00 ft
Outlet Station: 304.00 ft
Outlet Elevation: 4948.00 ft
Number of Barrels: 2

Culvert Data Summary - Structure#809

Barrel Shape: Concrete Box
Barrel Span: 10.00 ft
Barrel Rise: 4.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (90º) Headwall
Inlet Depression: None

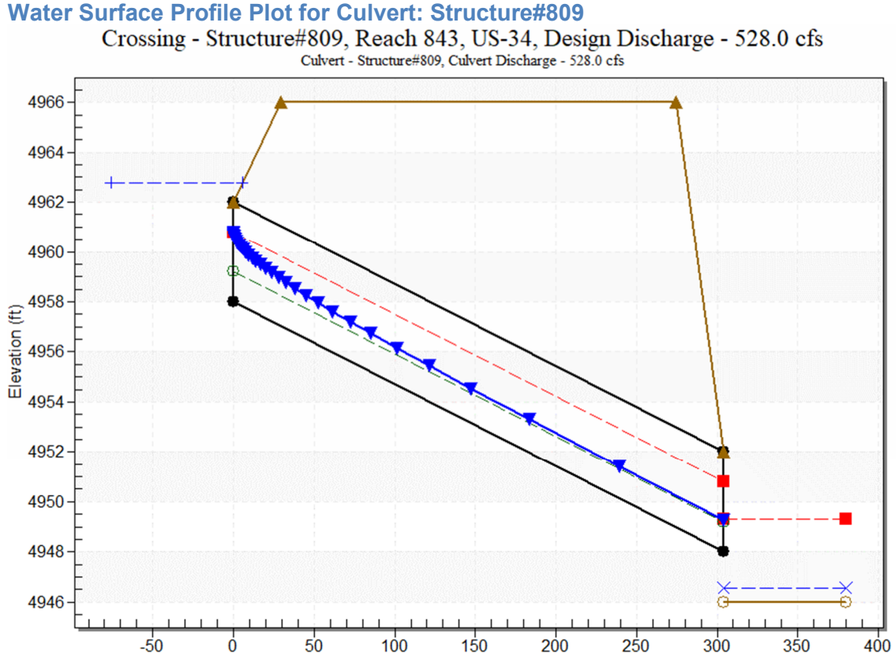
Table 19 - Culvert Summary Table: Structure#809

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 Year	36.03 cfs	36.03 cfs	4958.77	0.77	0.0*	1-S2n	0.22	0.47	0.22	0.11	8.12	21.45
100 Year	528.00 cfs	528.00 cfs	4962.76	4.76	0.0*	5-S2n	1.20	2.79	1.26	0.56	21.01	61.42

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 4958.00 ft,
Outlet Elevation (invert): 4948.00 ft
Culvert Length: 304.16 ft,
Culvert Slope: 0.0329

Water Surface Profile Plot for Culvert: Structure#809



Tailwater Data for Crossing: Structure#809, Reach 843

Table 20 - Downstream Channel Rating Curve (Crossing: Structure#809, Reach 843)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
36.03	4946.11	0.11	21.45	34.03	11.45
528.00	4946.56	0.56	61.42	174.16	14.49

Tailwater Channel Data - Structure#809, Reach 843

Tailwater Channel Option: Rectangular Channel
Bottom Width: 15.40 ft
Channel Slope: 5.0000
Channel Manning's n: 0.0350
Channel Invert Elevation: 4946.00 ft

Roadway Data for Crossing: Structure#809, Reach 843

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 4966.00 ft
Roadway Surface: Paved
Roadway Top Width: 245.00 ft

Culvert Data: Structure#1002

Site Data - Structure#1002

Site Data Option: Culvert Invert Data
Inlet Station: 123.00 ft
Inlet Elevation: 4772.00 ft
Outlet Station: 0.00 ft
Outlet Elevation: 4771.50 ft
Number of Barrels: 3

Culvert Data Summary - Structure#1002

Barrel Shape: Concrete Box
Barrel Span: 11.00 ft
Barrel Rise: 9.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (30-75º flare) Wingwall
Inlet Depression: None

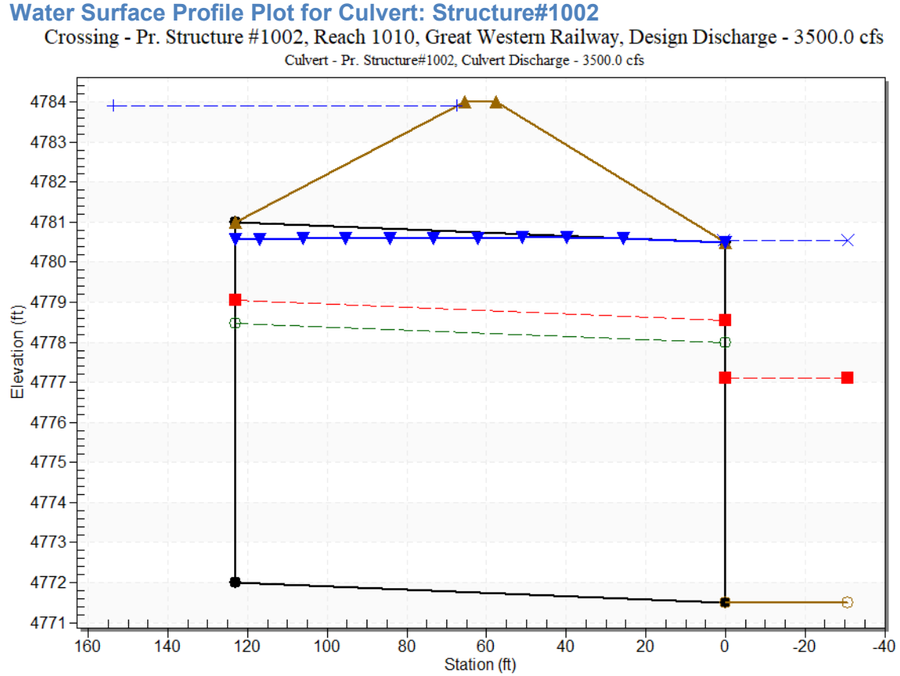
Culvert Summary Table: Structure#1002

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
Option2_100-Year	2004.70	2004.70	4780.25	7.50	8.247	0.92	1-S1t	4.28	4.86	6.66	6.66	9.13
Option4_100-Year	3500.00	3500.00	4783.90	11.47	11.903	1.32	1-S1f	6.48	7.04	9.00	9.03	11.78
Overtopping	5250.00	3480.38	4786.03	11.41	14.032	1.56	4-FFf	6.45	7.02	9.00	11.22	11.72

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4772.00 ft
Outlet Elevation (invert): 4771.50 ft
Culvert Length: 123.00 ft
Culvert Slope: 0.00 ft/ft

Water Surface Profile Plot for Culvert: Structure#1002



Tailwater Data for Crossing: Structure#1002, Reach 1010

Downstream Channel Rating Curve (Crossing: Structure#1002, Reach 1010)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
2004.70	4778.16	6.66	5.65	2.08	0.43
3500.00	4780.53	9.03	6.67	2.82	0.45

Tailwater Channel Data - Structure#1002, Reach 1010

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 40.00 ft
a_side Slope (H:V): 2.00 (_:1)
Channel Slope: 0.01 ft/ft
Channel Manning's n: 0.0550
Channel Invert Elevation: 4771.50 ft

Roadway Data for Crossing: Structure#1002, Reach 1010

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 200.00 ft
Crest Elevation: 4784.00 ft
Roadway Surface: Gravel
Roadway Top Width: 8.00 ft

Culvert Data: Structure#1003

Site Data - Structure#1003

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4807.90 ft
Outlet Station: 113.00 ft
Outlet Elevation: 4807.47 ft
Number of Barrels: 2

Culvert Data Summary - Structure#1003

Barrel Shape: Concrete Box
Barrel Span: 12.00 ft
Barrel Rise: 9.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0130
Culvert Type: Straight
Inlet Configuration: Square Edge (90 & 15º flare) Wingwall
Inlet Depression: None

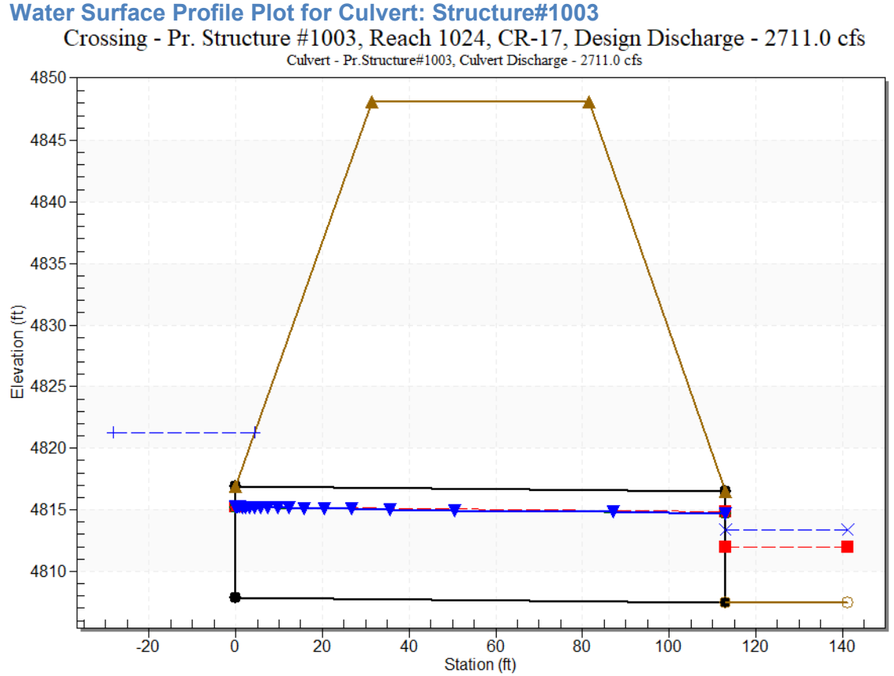
Culvert Summary Table: Structure#1003

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
Option2_100-Year	1264.00	1264.00	4815.36	7.46	4.868	0.83	1-S2n	4.11	4.42	4.15	3.95	12.68
Option4_100-Year	2711.00	2711.00	4821.24	13.34	11.796	1.48	5-S2n	7.24	7.35	7.24	5.94	15.60
Overtopping	6777.50	6124.70	4849.15	41.25	29.697	4.58	4-FFf	9.00	9.00	9.00	9.44	28.36

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4807.90 ft
Outlet Elevation (invert): 4807.47 ft
Culvert Length: 113.00 ft
Culvert Slope: 0.00 ft/ft

Water Surface Profile Plot for Culvert: Structure#1003



Tailwater Data for Crossing: Structure#1003, Reach 1024

Downstream Channel Rating Curve (Crossing: Structure#1003, Reach 1024)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
1264.00	4811.42	3.95	5.73	2.52	0.57
2711.00	4813.41	5.94	7.16	3.78	0.61

Tailwater Channel Data - Structure#1003, Reach 1024

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 40.00 ft
a_side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.01 ft/ft
Channel Manning's n: 0.0550
Channel Invert Elevation: 4807.47 ft

Roadway Data for Crossing: Structure#1003, Reach 1024

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 200.00 ft
Crest Elevation: 4848.10 ft
Roadway Surface: Paved
Roadway Top Width: 50.00 ft

Culvert Data: Structure#1005

Site Data - Structure#1005

Site Data Option: Culvert Invert Data
Inlet Station: 149.00 ft
Inlet Elevation: 4851.00 ft
Outlet Station: 100.00 ft
Outlet Elevation: 4850.50 ft
Number of Barrels: 2

Culvert Data Summary - Structure#1005

Barrel Shape: Concrete Box
Barrel Span: 10.00 ft
Barrel Rise: 7.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (30-75º flare) Wingwall
Inlet Depression: None

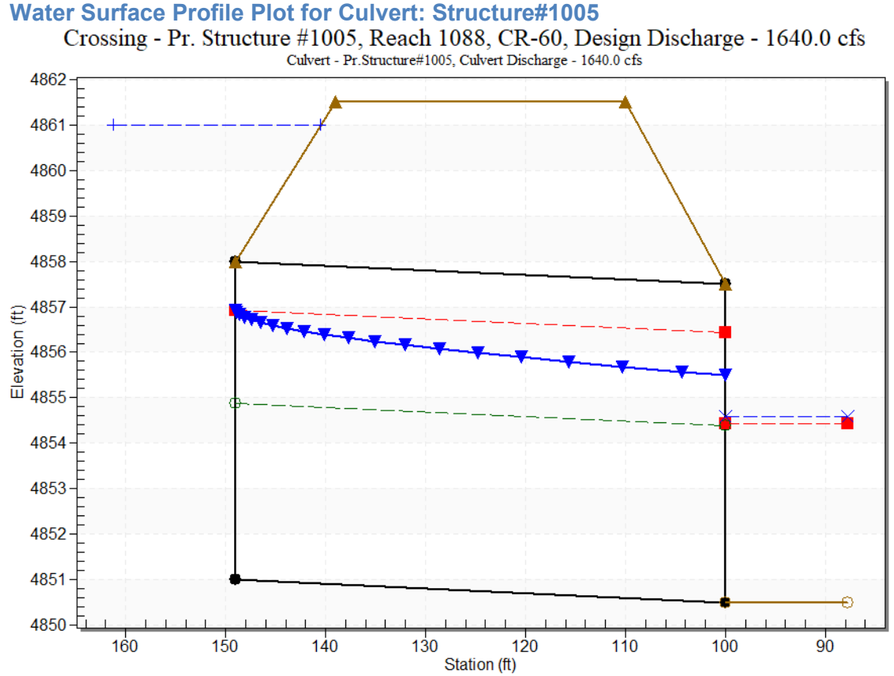
Culvert Summary Table: Structure#1005

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	HW / D (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
Option4_100-Year	901.00	901.00	4857.13	6.13	4.430	0.88	1-S2n	2.54	3.98	3.23	3.01	13.97	7.46
Option2_100-Year	1112.24	1112.24	4858.13	7.13	5.528	1.02	5-S2n	2.94	4.58	3.76	3.36	14.77	7.92
Concept Design_100-Year	1640.00	1640.00	4860.98	9.98	9.116	1.43	5-S2n	3.88	5.93	5.00	4.09	16.40	8.82
Overtopping	2186.67	1766.68	4861.79	10.79	9.772	1.54	5-S2n	4.10	6.23	5.28	4.72	16.74	9.54

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4851.00 ft
Outlet Elevation (invert): 4850.50 ft
Culvert Length: 49.00 ft
Culvert Slope: 0.01 ft/ft

Water Surface Profile Plot for Culvert: Structure#1005



Tailwater Data for Crossing: Structure#1005, Reach 1088

Downstream Channel Rating Curve (Crossing: Structure#1005, Reach 1088)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
901.00	4853.51	3.01	7.46	3.27	0.89
1112.24	4853.86	3.36	7.92	3.65	0.90
1640.00	4854.59	4.09	8.82	4.44	0.93

Tailwater Channel Data - Structure#1005, Reach 1088

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 25.00 ft
a_side Slope (H:V): 5.00 (_:1)
Channel Slope: 0.02 ft/ft
Channel Manning's n: 0.0440
Channel Invert Elevation: 4850.50 ft

Roadway Data for Crossing: Structure#1005, Reach 1088

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 1000.00 ft
Crest Elevation: 4861.50 ft
Roadway Surface: Gravel
Roadway Top Width: 29.00 ft

Culvert Data: Ex. Structure#1103

Site Data – Ex. Structure#1103

Site Data Option: Culvert Invert Data
Inlet Station: 193.00 ft
Inlet Elevation: 4878.00 ft
Outlet Station: 0.00 ft
Outlet Elevation: 4876.50 ft
Number of Barrels: 2

Culvert Data Summary – Ex. Structure#1103

Barrel Shape: Elliptical
Barrel Span: 68.00 in
Barrel Rise: 43.00 in
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall
Inlet Depression: None

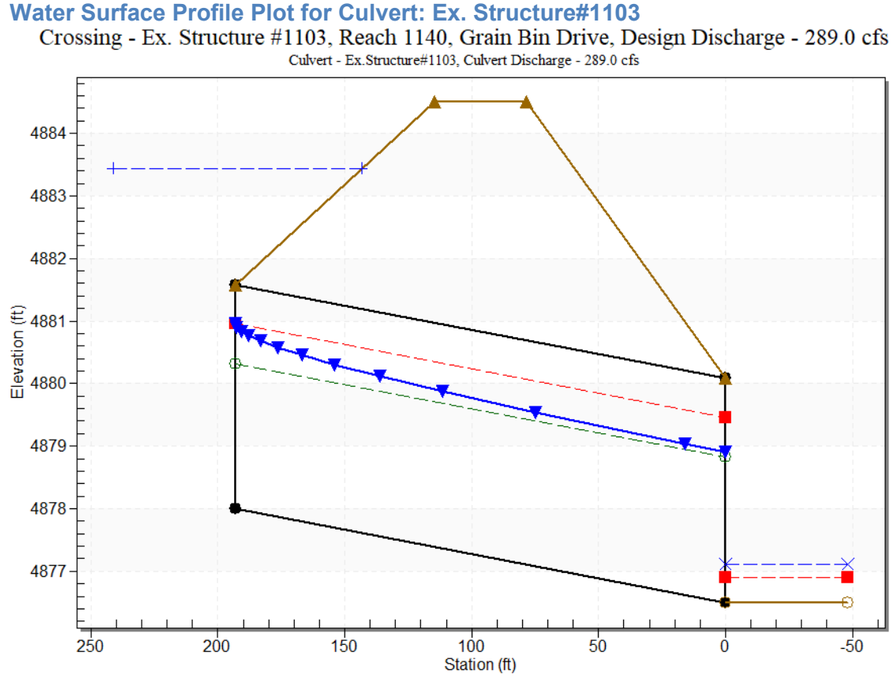
Culvert Summary Table: Ex. Structure#1103

Names	Discharge (cfs)	Discharge (cfs)	Elevation (ft)	Control Depth (ft)	Control Depth (ft)	Type	Depth (ft)	Depth (ft)	Depth (ft)	Depth (ft)	Velocity (ft/s)	Velocity (ft/s)
Option2_100-Year	286.00	286.00	4883.37	5.37	4.393	5-S2n	2.30	2.94	2.38	0.60	12.47	2.31
Option_4100-Year	289.00	289.00	4883.43	5.43	4.456	5-S2n	2.32	2.96	2.40	0.60	12.51	2.32
Overtopping	433.50	341.32	4884.61	6.61	5.623	5-S2n	2.61	3.17	2.69	0.77	13.06	2.71

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4878.00 ft
Outlet Elevation (invert): 4876.50 ft
Culvert Length: 193.01 ft
Culvert Slope: 0.01 ft/ft

Water Surface Profile Plot for Culvert: Ex. Structure#1103



Tailwater Data for Crossing: Ex. Structure#1103, Reach 1140

Downstream Channel Rating Curve (Crossing: Structure#1103, Reach 1140)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
286.00	4877.10	2.31	0.60	0.56	0.53
289.00	4877.10	2.32	0.60	0.57	0.53

Tailwater Channel Data – Ex. Structure#1103, Reach 1140

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 200.00 ft
Side Slope (H:V): 10.00 (_:1)
Channel Slope: 0.01 ft/ft
Channel Manning's n: 0.0550
Channel Invert Elevation: 4876.50 ft

Roadway Data for Crossing: Ex. Structure#1103, Reach 1140

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 1000.00 ft
Crest Elevation: 4884.50 ft
Roadway Surface: Paved
Roadway Top Width: 36.00 ft

Culvert Data: Structure#1301

Site Data - Structure#1301

Site Data Option: Culvert Invert Data
Inlet Station: 48.00 ft
Inlet Elevation: 4892.00 ft
Outlet Station: 0.00 ft
Outlet Elevation: 4891.00 ft
Number of Barrels: 3

Culvert Data Summary - Structure#1301

Barrel Shape: Concrete Box
Barrel Span: 10.00 ft
Barrel Rise: 4.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (30-75º flare) Wingwall
Inlet Depression: None

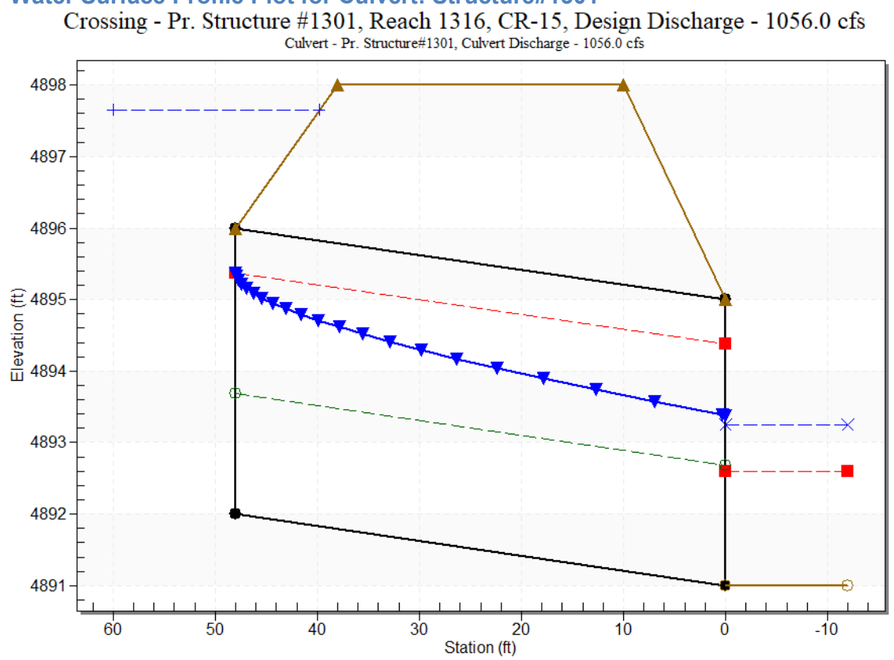
Culvert Summary Table: Structure#1301

Names	Discharge (cfs)	Discharge (cfs)	Elevation (ft)	Control Depth (ft)	Control Depth (ft)	Type	Depth (ft)	Depth (ft)	Depth (ft)	Depth (ft)	Velocity (ft/s)	Velocity (ft/s)
Option4_100-Year	958.00	958.00	4897.14	5.14	4.091	5-S2n	1.58	3.16	2.20	2.12	14.49	4.68
Option2_100-Year	1056.00	1056.00	4897.65	5.65	4.521	5-S2n	1.68	3.38	2.37	2.25	14.83	4.85
Overtopping	1584.00	1169.13	4898.29	6.29	5.054	5-S2n	1.80	3.61	2.57	2.86	15.18	5.63

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4892.00 ft
Outlet Elevation (invert): 4891.00 ft
Culvert Length: 48.01 ft
Culvert Slope: 0.02 ft/ft

Water Surface Profile Plot for Culvert: Structure#1301



Tailwater Data for Crossing: Structure#1301, Reach 1316

Downstream Channel Rating Curve (Crossing: Structure#1301, Reach 1316)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
958.00	4893.12	4.68	2.12	1.60	0.58
1056.00	4893.25	4.85	2.25	1.70	0.59

Tailwater Channel Data - Structure#1301, Reach 1316

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 90.00 ft
Side Slope (H:V): 3.00 (_:1)
Channel Slope: 0.01 ft/ft
Channel Manning's n: 0.0550
Channel Invert Elevation: 4891.00 ft

Roadway Data for Crossing: Structure#1301, Reach 1316

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 1000.00 ft
Crest Elevation: 4898.00 ft
Roadway Surface: Gravel
Roadway Top Width: 28.00 ft

Culvert Data: Structure#1004

Site Data – Ex. Structure#1004

Site Data Option: Culvert Invert Data
Inlet Station: 143.00 ft
Inlet Elevation: 4843.00 ft
Outlet Station: 100.00 ft
Outlet Elevation: 4842.00 ft
Number of Barrels: 2

Culvert Data Summary – Structure#1004

Barrel Shape: Concrete Box
Barrel Span: 10.00 ft
Barrel Rise: 7.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (30-75º flare) Wingwall
Inlet Depression: None

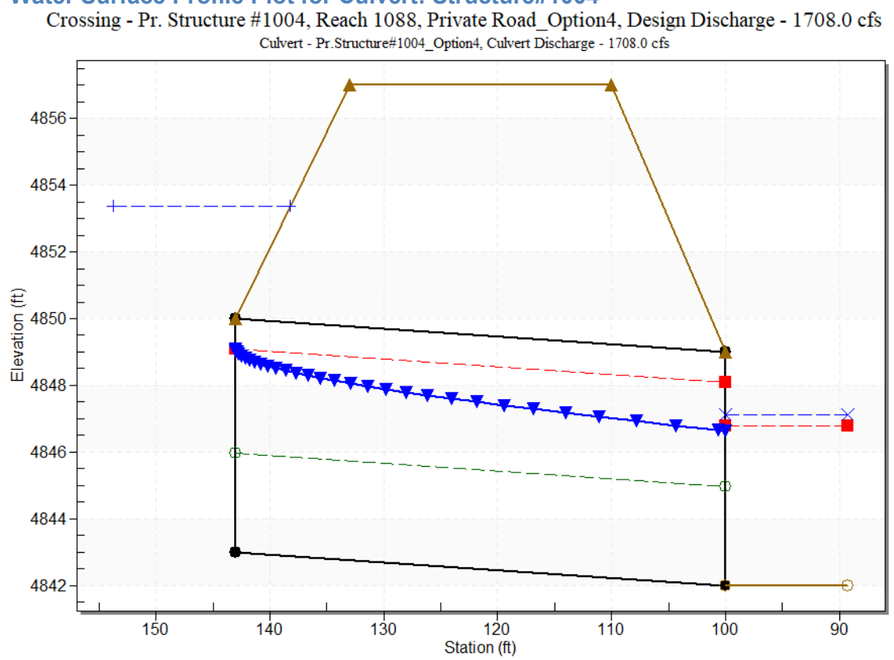
Culvert Summary Table: Structure#1004

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	HW / D (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
Low Flow	10.00	10.00	4843.30	0.30	0.0*	0.04	1-S2n	0.09	0.20	0.09	0.28	5.88	1.71
Option4_100-Year	1708.00	1708.00	4853.37	10.37	8.942	1.48	5-S2n	2.98	6.10	4.64	5.12	18.42	9.43
Overtopping	2562.00	2226.74	4857.23	14.23	11.769	2.03	5-S2n	3.60	7.00	5.65	6.27	19.71	10.53

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4843.00 ft
Outlet Elevation (invert): 4842.00 ft
Culvert Length: 43.01 ft
Culvert Slope: 0.02 ft/ft

Water Surface Profile Plot for Culvert: Structure#1004



Tailwater Data for Crossing: Structure#1004, Reach 1088

Downstream Channel Rating Curve (Crossing: Structure#1004, Reach 1088)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
10.00	4842.28	0.28	1.71	0.41	0.58
1708.00	4847.12	5.12	9.43	7.45	0.88

Tailwater Channel Data – Structure#1004, Reach 1088

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 20.00 ft
a_side Slope (H:V): 3.00 (_:1)
Channel Slope: 0.02 ft/ft
Channel Manning's n: 0.0550
Channel Invert Elevation: 4842.00 ft

Roadway Data for Crossing: Structure#1004, Reach 1088

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 1000.00 ft
Crest Elevation: 4857.00 ft
Roadway Surface: Paved
Roadway Top Width: 23.00 ft

Culvert Data: Ex. Structure#1203

Site Data – Ex. Structure#1203

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4916.14 ft
Outlet Station: 200.92 ft
Outlet Elevation: 4915.00 ft
Number of Barrels: 3

Culvert Data Summary – Ex. Structure#1203

Barrel Shape: Circular
Barrel Diameter: 5.50 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Beveled Edge (1.5:1) (Ke=0.2)
Inlet Depression: None

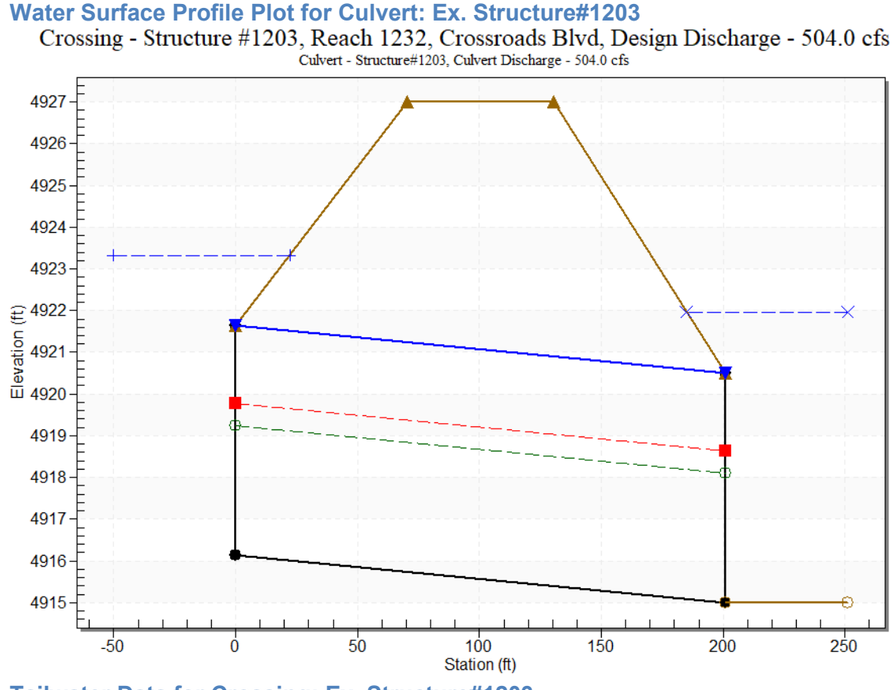
Culvert Summary Table: Ex. Structure#1203

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	HW / D (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5-Year	102.00	102.00	4922.03	2.11	5.886	1.07	4-FFf	1.31	1.58	5.50	6.97	1.43	0.00
100-Year	504.00	504.00	4923.33	5.35	7.188	1.31	4-FFf	3.11	3.62	5.50	6.97	7.07	0.00
Overtopping	1260.00	999.66	4927.31	9.47	11.172	2.03	4-FFf	5.50	4.95	5.50	6.97	14.03	0.00

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4916.14 ft
Outlet Elevation (invert): 4915.00 ft
Culvert Length: 200.92 ft
Culvert Slope: 0.01 ft/ft

Water Surface Profile Plot for Culvert: Ex. Structure#1203



Tailwater Data for Crossing: Ex. Structure#1203

Downstream Channel Rating Curve (Crossing: Structure#1204)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
1608.00	4777.38	5.88	5.28	1.84	0.42
9916.00	4787.09	15.59	8.94	4.86	0.48

Tailwater Channel Data – Ex. Structure#1203

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 40.00 ft
a_side Slope (H:V): 2.00 (_:1)
Channel Slope: 0.01 ft/ft
Channel Manning's n: 0.0550
Channel Invert Elevation: 4771.50 ft

Roadway Data for Crossing: Ex. Structure#1203

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 500.00 ft
Crest Elevation: 4927.00 ft
Roadway Surface: Paved
Roadway Top Width: 60.00 ft

Culvert Data: Ex. Structure#1204

Site Data – Ex. Structure#1204

Site Data Option: Culvert Invert Data
Inlet Station: 1090.00 ft
Inlet Elevation: 4939.05 ft
Outlet Station: 1000.00 ft
Outlet Elevation: 4938.69 ft
Number of Barrels: 1

Culvert Data Summary – Ex. Structure#1204

Barrel Shape: Concrete Box
Barrel Diameter: 6.50 ft
Barrel Material: Corrugated Steel
Embedment: 0.00 in
Barrel Manning's n: 0.0110
Culvert Type: Straight
Inlet Configuration: Thin Edge Projecting
Inlet Depression: None

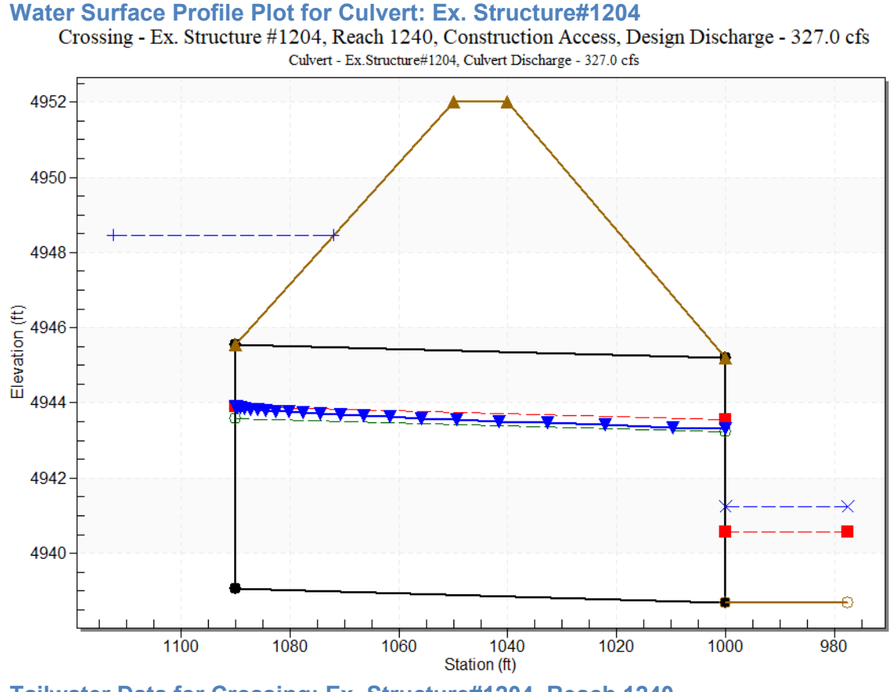
Culvert Summary Table: Ex. Structure#1204

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
Option4_100-Year	326.00	326.00	4948.43	9.38	7.582	5-S2n	4.52	4.85	4.61	2.56	12.97	4.52
Option1_100-Year	327.00	327.00	4948.46	9.41	7.608	5-S2n	4.53	4.85	4.61	2.56	12.98	4.52
Option2_100-Year	327.00	327.00	4948.46	9.41	7.608	5-S2n	4.53	4.85	4.61	2.56	12.98	4.52
Option3_100-Year	327.00	327.00	4948.46	9.41	7.608	5-S2n	4.53	4.85	4.61	2.56	12.98	4.52
Overtopping	490.50	427.83	4952.08	13.03	11.350	7-M2c	6.50	5.49	5.49	3.16	14.31	5.07

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4939.05 ft
Outlet Elevation (invert): 4938.69 ft
Culvert Length: 90.00 ft
Culvert Slope: 0.00 ft/ft

Water Surface Profile Plot for Culvert: Ex. Structure#1204



Tailwater Data for Crossing: Ex. Structure#1204, Reach 1240

Downstream Channel Rating Curve (Crossing: Structure#1204, Reach 1240)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
326.00	4841.25	4.52	2.56	0.80	0.58
327.00	4841.25	4.52	2.56	0.80	0.58

Tailwater Channel Data – Ex. Structure#1204, Reach 1240

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 18.00 ft
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.01 ft/ft
Channel Manning's n: 0.0350
Channel Invert Elevation: 4938.69 ft

Roadway Data for Crossing: Ex. Structure#1204, Reach 1240

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 1000.00 ft
Crest Elevation: 4952.00 ft
Roadway Surface: Gravel
Roadway Top Width: 10.00 ft

Culvert Data: Ex. Structure#1205

Site Data – Ex. Structure#1205

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 4939.69 ft
Outlet Station: 65.54 ft
Outlet Elevation: 4939.36 ft
Number of Barrels: 2

Culvert Data Summary – Ex. Structure#1205

Barrel Shape: Circular
Barrel Diameter: 4.50 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Beveled Edge (1.5:1)
Inlet Depression: None

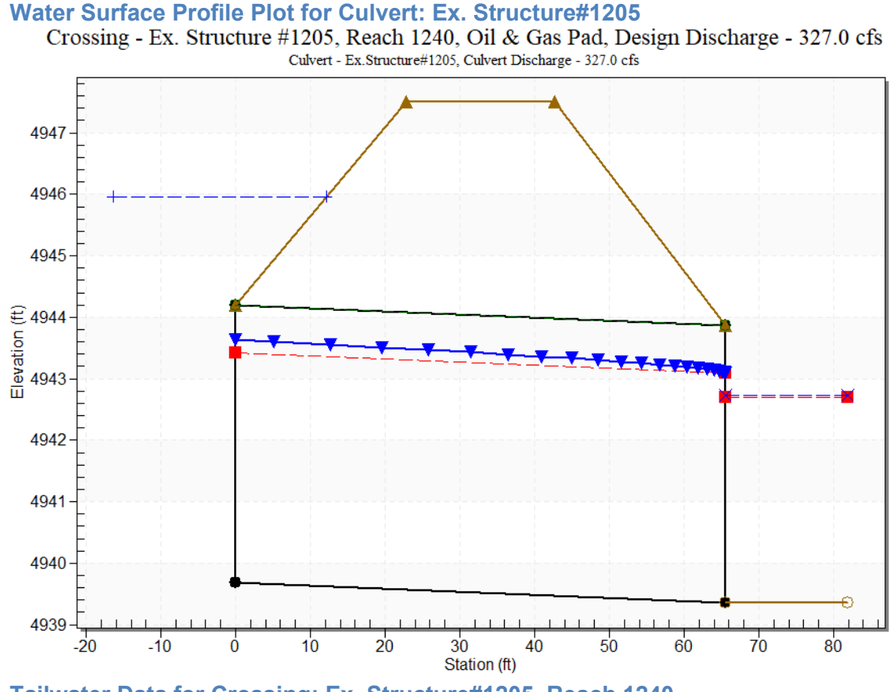
Culvert Summary Table: Ex. Structure#1205

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
Option4_100-Year	326.00	326.00	4945.94	6.25	6.213	7-M2c	4.50	3.73	3.73	3.36	11.57	7.21
Option1_100-Year	327.00	327.00	4945.95	6.26	6.227	7-M2c	4.50	3.73	3.73	3.37	11.59	7.21
Option2_100-Year	327.00	327.00	4945.95	6.26	6.227	7-M2c	4.50	3.73	3.73	3.37	11.59	7.21
Option3_100-Year	327.00	327.00	4945.95	6.26	6.227	7-M2c	4.50	3.73	3.73	3.37	11.59	7.21
Overtopping	490.50	417.80	4947.75	8.06	7.831	7-M2c	4.50	4.09	4.09	3.92	13.76	7.98

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4939.69 ft
Outlet Elevation (invert): 4939.36 ft
Culvert Length: 65.54 ft
Culvert Slope: 0.01 ft/ft

Water Surface Profile Plot for Culvert: Ex. Structure#1205



Tailwater Data for Crossing: Ex. Structure#1205, Reach 1240

Downstream Channel Rating Curve (Crossing: Structure#1205, Reach 1240)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
326.00	4942.72	7.21	3.36	3.15	0.98
327.00	4942.73	7.21	3.37	3.15	0.98

Tailwater Channel Data – Ex. Structure#1205, Reach 1240

Tailwater Channel Option: Triangular Channel
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.01 ft/ft
Channel Manning's n: 0.0350
Channel Invert Elevation: 4939.36 ft

Roadway Data for Crossing: Ex. Structure#1205, Reach 1240

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 200.00 ft
Crest Elevation: 4947.50 ft
Roadway Surface: Paved
Roadway Top Width: 20.00 ft

Culvert Data: Ex. Structure#1206

Site Data – Ex. Structure#1206

Site Data Option: Culvert Invert Data
Inlet Station: 61.00 ft
Inlet Elevation: 4953.50 ft
Outlet Station: 0.00 ft
Outlet Elevation: 4952.00 ft
Number of Barrels: 2

Culvert Data Summary – Ex. Structure#1206

Barrel Shape: Circular
Barrel Diameter: 4.50 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall
Inlet Depression: None

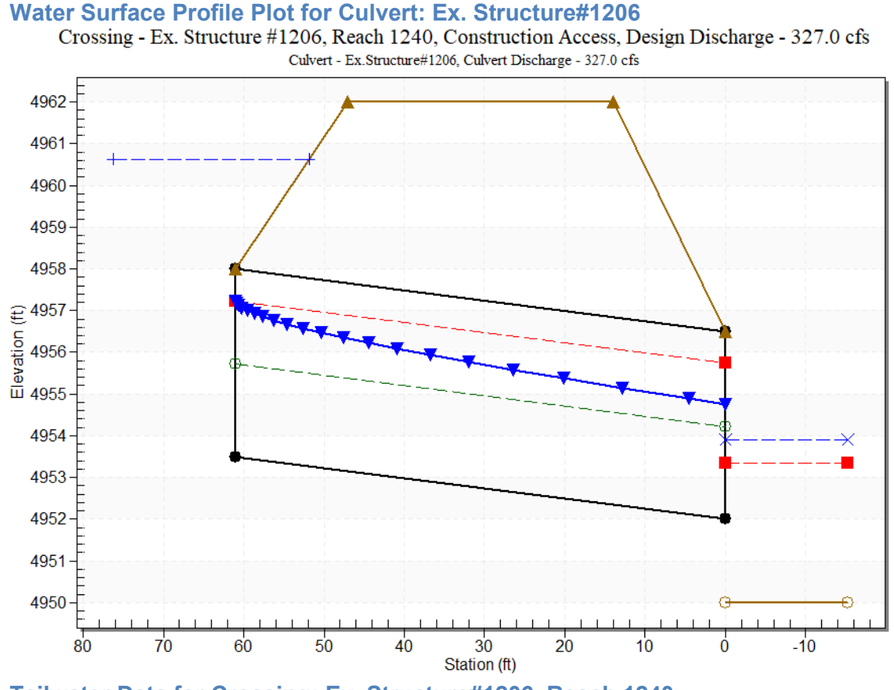
Culvert Summary Table: Ex. Structure#1206

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
Option4_100-Year	326.00	326.00	4960.60	7.10	5.416	5-S2n	2.22	3.73	2.76	3.90	15.97	5.36
Option1_100-Year	327.00	327.00	4960.63	7.13	5.436	5-S2n	2.22	3.73	2.76	3.90	15.98	5.36
Option2_100-Year	327.00	327.00	4960.63	7.13	5.436	5-S2n	2.22	3.73	2.76	3.90	15.98	5.36
Option3_100-Year	327.00	327.00	4960.63	7.13	5.436	5-S2n	2.22	3.73	2.76	3.90	15.98	5.36
Overtopping	408.75	378.75	4962.05	8.55	6.512	5-S2n	2.42	3.96	3.01	4.25	16.72	5.67

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4953.50 ft
Outlet Elevation (invert): 4952.00 ft
Culvert Length: 61.02 ft
Culvert Slope: 0.02 ft/ft

Water Surface Profile Plot for Culvert: Ex. Structure#1206



Tailwater Data for Crossing: Ex. Structure#1206, Reach 1240

Downstream Channel Rating Curve (Crossing: Structure#1206, Reach 1240)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
326.00	4953.90	5.36	3.90	1.22	0.68
327.00	4953.90	5.36	3.90	1.22	0.68

Tailwater Channel Data – Ex. Structure#1206, Reach 1240

Tailwater Channel Option: Triangular Channel
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.01 ft/ft
Channel Manning's n: 0.0300
Channel Invert Elevation: 4950.00 ft

Roadway Data for Crossing: Ex. Structure#1206, Reach 1240

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 1000.00 ft
Crest Elevation: 4962.00 ft
Roadway Surface: Gravel
Roadway Top Width: 33.00 ft

Culvert Data: Ex. Structure#1207

Site Data – Ex. Structure#1207

Site Data Option: Culvert Invert Data
Inlet Station: 1000.00 ft
Inlet Elevation: 4962.85 ft
Outlet Station: 1208.00 ft
Outlet Elevation: 4961.81 ft
Number of Barrels: 2

Culvert Data Summary – Ex. Structure#1207

Barrel Shape: Circular
Barrel Diameter: 5.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall
Inlet Depression: None

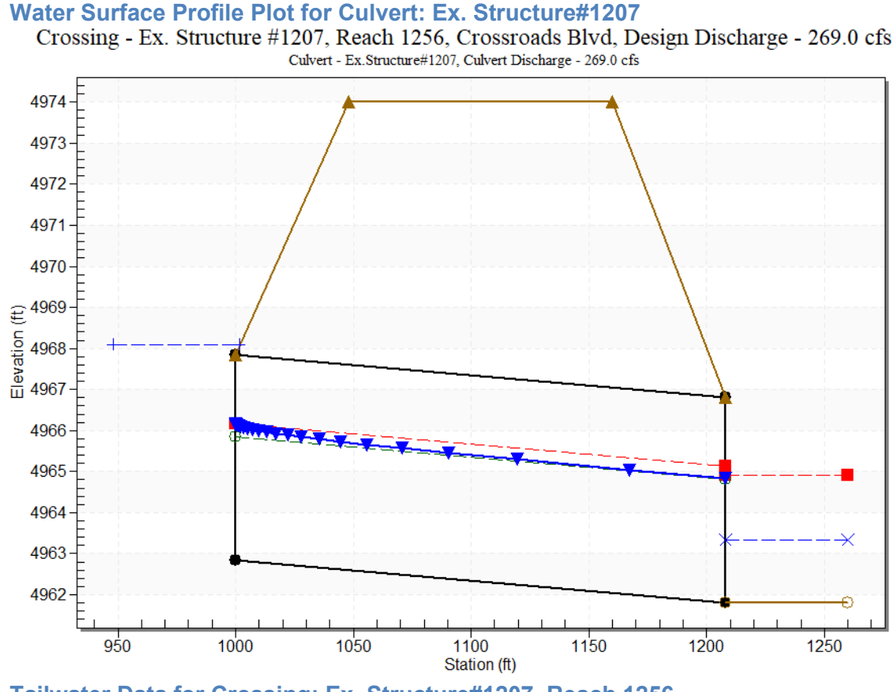
Culvert Summary Table: Ex. Structure#1207

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
Option4_100-Year	268.00	268.00	4968.07	5.22	3.825	5-S2n	3.00	3.31	3.01	1.53	10.84	28.69
Option1_100-Year	269.00	269.00	4968.08	5.23	3.843	5-S2n	3.00	3.32	3.02	1.53	10.85	28.72
Option2_100-Year	269.00	269.00	4968.08	5.23	3.843	5-S2n	3.00	3.32	3.02	1.53	10.85	28.72
Option3_100-Year	269.00	269.00	4968.08	5.23	3.843	5-S2n	3.00	3.32	3.02	1.53	10.85	28.72
Overtopping	605.25	554.29	4974.07	11.22	10.402	7-M2c	5.00	4.57	4.57	2.07	14.72	35.17

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4962.85 ft
Outlet Elevation (invert): 4961.81 ft
Culvert Length: 208.00 ft
Culvert Slope: 0.00 ft/ft

Water Surface Profile Plot for Culvert: Ex. Structure#1207



Tailwater Data for Crossing: Ex. Structure#1207, Reach 1256

Downstream Channel Rating Curve (Crossing: Structure#1207, Reach 1256)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
268.00	4963.34	28.69	1.53	47.68	5.78
269.00	4963.34	28.72	1.53	47.75	5.79

Tailwater Channel Data – Ex. Structure#1207, Reach 1256

Tailwater Channel Option: Triangular Channel
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.50 ft/ft
Channel Manning's n: 0.0300
Channel Invert Elevation: 4961.81 ft

Roadway Data for Crossing: Ex. Structure#1207, Reach 1256

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 1000.00 ft
Crest Elevation: 4974.00 ft
Roadway Surface: Paved
Roadway Top Width: 112.00 ft

Culvert Data: Ex. Structure#1208

Site Data – Ex. Structure#1208

Site Data Option: Culvert Invert Data
Inlet Station: 100.00 ft
Inlet Elevation: 4970.50 ft
Outlet Station: 0.00 ft
Outlet Elevation: 4970.00 ft
Number of Barrels: 1

Culvert Data Summary – Ex. Structure#1208

Barrel Shape: Circular
Barrel Diameter: 5.50 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall
Inlet Depression: None

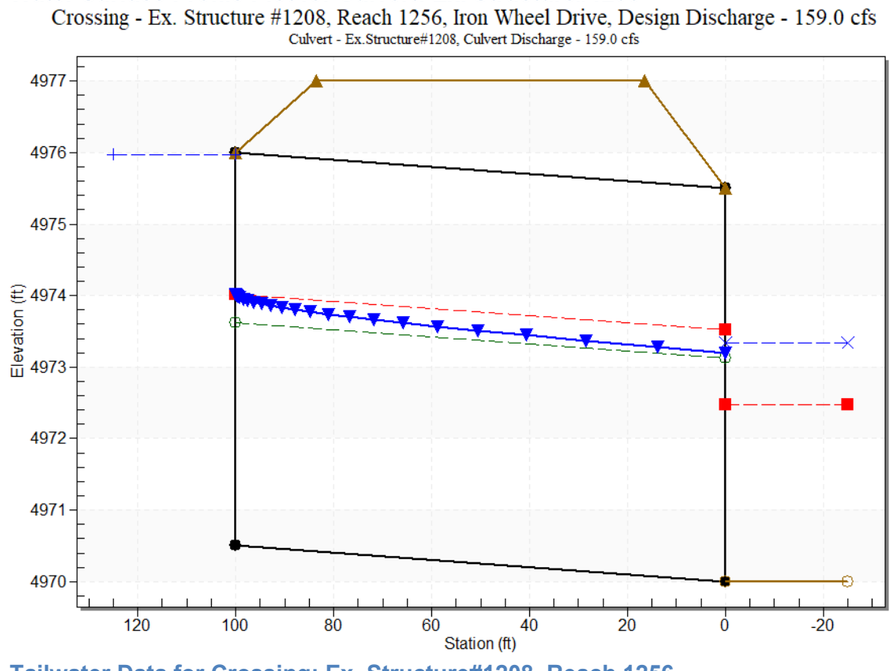
Culvert Summary Table: Ex. Structure#1208

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
Option1_100-Year	159.00	159.00	4975.97	5.47	4.254	1-S2n	3.12	3.52	3.20	3.34	11.09	4.46
Option2_100-Year	159.00	159.00	4975.97	5.47	4.254	1-S2n	3.12	3.52	3.20	3.34	11.09	4.46
Option3_100-Year	159.00	159.00	4975.97	5.47	4.254	1-S2n	3.12	3.52	3.20	3.34	11.09	4.46
Option4_100-Year	159.00	159.00	4975.97	5.47	4.254	1-S2n	3.12	3.52	3.20	3.34	11.09	4.46
Overtopping	238.50	201.32	4977.05	6.55	5.449	5-S2n	3.66	3.97	3.71	4.01	11.80	4.94

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 4970.50 ft
Outlet Elevation (invert): 4970.00 ft
Culvert Length: 100.00 ft
Culvert Slope: 0.01 ft/ft

Water Surface Profile Plot for Culvert: Ex. Structure#1208



Tailwater Data for Crossing: Ex. Structure#1208, Reach 1256

Downstream Channel Rating Curve (Crossing: Structure#1208, Reach 1256)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
159.00	4973.34	4.46	3.34	1.56	0.55

Tailwater Channel Data – Ex. Structure#1208, Reach 1256

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 4.00 ft
Side Slope (H:V): 2.00 (_:1)
Channel Slope: 0.01 ft/ft
Channel Manning's n: 0.0440
Channel Invert Elevation: 4970.00 ft

Roadway Data for Crossing: Ex. Structure#1208, Reach 1256

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 1000.00 ft
Crest Elevation: 4977.00 ft
Roadway Surface: Paved
Roadway Top Width: 67.00 ft

APPENDIX F-7
Master Plan Cost Estimate

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Concept Design**			
DRAINAGEWAY :	**Drainageway 100**			
REACH :	**100**			
JURISDICTION :	**Greeley**			
REACH ID:	**Concept Design 1-Reach100**	**Sabastian Ortega**	**DATE :**	**7/17/2025**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	**Box Height (ft)**	**No. of Barrels**	**Length (ft)**				
12	4	3	52	L.F.	$5,222.51	$271,570.00	Structure 101, Reach 100
6	5	1	295	L.F.	$1,247.27	$367,945.00	Structure 103, Reach 142
6	5	1	127	L.F.	$1,247.27	$158,404.00	Structure 104, Reach 134
Channel Improvements							
Excavation, Mid Range			20612	C.Y.	$48.00	$989,376.00	
Detention/Water Quality Facilities							
Detention (Complete-in-Place)							
Detention Facility 1 (Complete-in-Place)			5	AC-FT	$90,922.00	$454,610.00	Flood Control Detention 134
Detention Facility 2 (Complete-in-Place)			4	AC-FT	$90,922.00	$363,688.00	Flood Control Detention 150
Removals							
Removal of culvert pipe (48"<D<84")			526	L.F.	$100.00	$52,600.00	
Landscaping and Maintenance Improvements							
Reclamation & seeding (native grasses)			29	ACRE	$1,994.00	$57,228.00	Channels + 2 detetion ponds
Land Acquisition							
Easement/ROW Acquisition			28.70	ACRE	$19,551.00	$561,114.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains			$0.00	
Concrete Box Culverts			$797,919.00	
Hydraulic Structures			$0.00	
Channel Improvements			$989,376.00	
Detention/Water Quality Facilities			$818,298.00	
Removals			$52,600.00	
Landscaping and Maintenance Improvements			$57,228.00	
Special Items (User Defined)			$0.00	
Subtotal Capital Improvement Costs			**$2,715,421.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$135,771.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	

Stormwater Management/Erosion Control	5%		$135,771.00
Subtotal Additional Capital Improvement Costs			**$271,542.00**
Land Acquisition Costs			
ROW/Easements			$561,114.00
Subtotal Land Acquisition Costs			**$561,114.00**
Other Costs (percentage of Capital Improvement Costs)			
Engineering	15%		$448,044.00
Legal/Administrative	5%		$149,348.00
Contract Admin/Construction Management	10%		$298,696.00
Contingency	25%		$746,741.00
Subtotal Other Costs			**$1,642,829.00**
Total Capital Improvement Costs			**$5,190,906.00**

Master Plan Operation and Maintenance Cost Summary				
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, e	474	L.F.	$2.00	$948.00
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	7450	L.F.	$4.00	$29,800.00
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal, st	1.9	ACRE	$2,991.00	$5,683.00
Total Annual Operation and Maintenance Cost				**$36,431.00**
Effective Interest Rate				0.00%
Total Operation and Maintenance Costs Over 50 Years				**$1,821,550.00**

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$2,986,963.00
ROW/Easements	$561,114.00
Engineering	$448,044.00
Legal/Administrative	$149,348.00
Contract Admin/Construction Management	$298,696.00
Contingency	$746,741.00
Total Capital Improvement Costs	$5,190,906.00
Total Annual Operation and Maintenance Cost	$36,431.00
Total Operation and Maintenance Costs Over 50 Years	$1,821,550.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Concept Design**			
DRAINAGEWAY :	**Drainageway 200**			
REACH :	**200**			
JURISDICTION :	**Greeley**			
REACH ID:	**Concept Design 2-Reach200**	**Sabastian Ortega**	**DATE :**	**7/17/2025**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	**Box Height (ft)**	**No. of Barrels**	**Length (ft)**				
8	6	2	30	L.F.	$3,013.18	$91,812.00	Structure 201, Reach 200
4	3	2	145	L.F.	$1,543.46	$223,801.00	Structure 202, Reach 260
4	3	2	327	L.F.	$1,543.46	$504,710.00	Structure 203, Reach 260
Channel Improvements							
Excavation, Mid Range			7703	C.Y.	$48.00	$369,744.00	
Detention/Water Quality Facilities							
Detention (Complete-in-Place)							
Detention Facility 1 (Complete-in-Place)			7	AC-FT	$90,922.00	$636,454.00	Flood Control Detention 268
Detention Facility 2 (Complete-in-Place)			10	AC-FT	$90,922.00	$909,220.00	Flood Control Detention 248
Removals							
Removal of culvert pipe (48"<D<84")			422	L.F.	$100.00	$42,200.00	
Landscaping and Maintenance Improvements							
Reclamation & seeding (native grasses)			30	ACRE	$1,994.00	$59,820.00	
Land Acquisition							
Easement/ROW Acquisition			29.90	ACRE	$19,551.00	$584,575.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains			$0.00	
Concrete Box Culverts			$820,323.00	
Hydraulic Structures			$0.00	
Channel Improvements			$369,744.00	
Detention/Water Quality Facilities			$1,545,674.00	
Removals			$42,200.00	
Landscaping and Maintenance Improvements			$59,820.00	
Special Items (User Defined)			$0.00	
Subtotal Capital Improvement Costs			**$2,837,761.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$141,888.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	

Stormwater Management/Erosion Control	5%		$141,888.00	
Subtotal Additional Capital Improvement Costs			**$283,776.00**	
Land Acquisition Costs				
ROW/Easements			$584,575.00	
Subtotal Land Acquisition Costs			**$584,575.00**	
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%		$468,231.00	
Legal/Administrative	5%		$156,077.00	
Contract Admin/Construction Management	10%		$312,154.00	
Contingency	25%		$780,384.00	
Subtotal Other Costs			**$1,716,846.00**	
Total Capital Improvement Costs			**$5,422,958.00**	

Master Plan Operation and Maintenance Cost Summary					
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, e	95	L.F.	$2.00	$190.00	
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	11313	L.F.	$4.00	$45,252.00	
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal, st	2.9	ACRE	$2,991.00	$8,674.00	
Total Annual Operation and Maintenance Cost				**$54,116.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$2,705,800.00**	

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$3,121,537.00
ROW/Easements	$584,575.00
Engineering	$468,231.00
Legal/Administrative	$156,077.00
Contract Admin/Construction Management	$312,154.00
Contingency	$780,384.00
Total Capital Improvement Costs	$5,422,958.00
Total Annual Operation and Maintenance Cost	$54,116.00
Total Operation and Maintenance Costs Over 50 Years	$2,705,800.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Concept Design**			
DRAINAGEWAY :	**Drainageway 500**			
REACH :	**500**			
JURISDICTION :	**Greeley**			
REACH ID:	**Concept Design 5-Reach500**	**Sabastian Ortega**	**DATE :**	**7/17/2025**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	**Box Height (ft)**	**No. of Barrels**	**Length (ft)**				
8	5	2	88	L.F.	$2,854.02	$251,153.00	Structure 501, Reach 500
Detention/Water Quality Facilities							
Detention (Complete-in-Place)							
Detention Facility 1 (Complete-in-Place)			8	AC-FT	$90,922.00	$727,376.00	
Removals							
Removal of culvert pipe (48"<D<84")			88	L.F.	$100.00	$8,800.00	
Landscaping and Maintenance Improvements							
Reclamation & seeding (native grasses)			1	ACRE	$1,994.00	$1,994.00	
Land Acquisition							
Easement/ROW Acquisition			1.30	ACRE	$19,551.00	$25,416.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains			$0.00	
Concrete Box Culverts			$251,153.00	
Hydraulic Structures			$0.00	
Channel Improvements			$0.00	
Detention/Water Quality Facilities			$727,376.00	
Removals			$8,800.00	
Landscaping and Maintenance Improvements			$1,994.00	
Special Items (User Defined)			$0.00	
Subtotal Capital Improvement Costs			**$989,323.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$49,466.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$49,466.00	
Subtotal Additional Capital Improvement Costs			**$98,932.00**	
Land Acquisition Costs				
ROW/Easements			$25,416.00	
Subtotal Land Acquisition Costs			**$25,416.00**	
Other Costs (percentage of Capital Improvement Costs)				

Engineering	15%			$163,238.00	
Legal/Administrative	5%			$54,413.00	
Contract Admin/Construction Management	10%			$108,826.00	
Contingency	25%			$272,064.00	
Subtotal Other Costs				**$598,541.00**	
Total Capital Improvement Costs				**$1,712,212.00**	

Master Plan Operation and Maintenance Cost Summary					
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, e	88	L.F.	$2.00	$176.00	
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal, st	1	ACRE	$2,991.00	$2,991.00	
Total Annual Operation and Maintenance Cost				**$3,167.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$158,350.00**	

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$1,088,255.00
ROW/Easements	$25,416.00
Engineering	$163,238.00
Legal/Administrative	$54,413.00
Contract Admin/Construction Management	$108,826.00
Contingency	$272,064.00
Total Capital Improvement Costs	$1,712,212.00
Total Annual Operation and Maintenance Cost	$3,167.00
Total Operation and Maintenance Costs Over 50 Years	$158,350.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Concept Design**			
DRAINAGEWAY :	**Drainageway 600**			
REACH :	**600**			
JURISDICTION :	**Greeley**			
REACH ID:	**Concept Design 6-Reach600**	**Sabastian Ortega**	**DATE :**	**7/17/2025**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	**Box Height (ft)**	**No. of Barrels**	**Length (ft)**				
8	4	2	120	L.F.	$2,694.85	$323,382.00	Structure 601, Reach 600
8	6	1	41	L.F.	$1,506.59	$61,770.00	Structure 602, Reach 600
6	5	1	234	L.F.	$1,247.27	$291,862.00	Structure 603, Reach 614
Channel Improvements							
Excavation, Mid Range			4000	C.Y.	$48.00	$192,000.00	
Detention/Water Quality Facilities							
Detention (Complete-in-Place)							
Detention Facility 1 (Complete-in-Place)			7	AC-FT	$90,922.00	$636,454.00	
Removals							
Removal of culvert pipe (48"<D<84")			396	L.F.	$100.00	$39,600.00	
Landscaping and Maintenance Improvements							
Reclamation & seeding (native grasses)			7	ACRE	$1,994.00	$13,958.00	
Land Acquisition							
Easement/ROW Acquisition			6.90	ACRE	$19,551.00	$134,902.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains			$0.00	
Concrete Box Culverts			$677,014.00	
Hydraulic Structures			$0.00	
Channel Improvements			$192,000.00	
Detention/Water Quality Facilities			$636,454.00	
Removals			$39,600.00	
Landscaping and Maintenance Improvements			$13,958.00	
Special Items (User Defined)			$0.00	
Subtotal Capital Improvement Costs			**$1,559,026.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$77,951.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$77,951.00	

Subtotal Additional Capital Improvement Costs				**$155,902.00**
Land Acquisition Costs				
ROW/Easements				$134,902.00
Subtotal Land Acquisition Costs				**$134,902.00**
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%			$257,239.00
Legal/Administrative	5%			$85,746.00
Contract Admin/Construction Management	10%			$171,493.00
Contingency	25%			$428,732.00
Subtotal Other Costs				**$943,210.00**
Total Capital Improvement Costs				**$2,793,040.00**

Master Plan Operation and Maintenance Cost Summary				
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, e	515	L.F.	$2.00	$1,030.00
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	1991	L.F.	$4.00	$7,964.00
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal, st	1.3	ACRE	$2,991.00	$3,888.00
Total Annual Operation and Maintenance Cost				**$12,882.00**
Effective Interest Rate				0.00%
Total Operation and Maintenance Costs Over 50 Years				**$644,100.00**

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$1,714,928.00
ROW/Easements	$134,902.00
Engineering	$257,239.00
Legal/Administrative	$85,746.00
Contract Admin/Construction Management	$171,493.00
Contingency	$428,732.00
Total Capital Improvement Costs	$2,793,040.00
Total Annual Operation and Maintenance Cost	$12,882.00
Total Operation and Maintenance Costs Over 50 Years	$644,100.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Concept Design**			
DRAINAGEWAY :	**Drainageway 700**			
REACH :	**700**			
JURISDICTION :	**Greeley**			
REACH ID:	**Concept Design 7-Reach700**	**Sabastian Ortega**	**DATE :**	**7/17/2025**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Pipe Culverts and Storm Drains							
Circular Pipes							
Diameter (in)	**Length (ft)**	**No. of Barrels**					
48-inch	97	1	97	L.F.	$287.00	$27,839.00	Structure 702
48-inch	89	2	178	L.F.	$287.00	$51,086.00	Structure 704
Channel Improvements							
Soil Riprap, Type M			291	C.Y.	$140.00	$40,740.00	The outlet will need riprap
Detention/Water Quality Facilities							
Detention (Complete-in-Place)							
Detention Facility 1 (Complete-in-Place)			6.5	AC-FT	$90,922.00	$590,993.00	
Removals							
Removal of culvert pipe (D<48")			186	L.F.	$40.00	$7,440.00	
Landscaping and Maintenance Improvements							
Reclamation & seeding (native grasses)			1.3	ACRE	$1,994.00	$2,592.00	
Land Acquisition							
Easement/ROW Acquisition			1.30	ACRE	$19,551.00	$25,416.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains			$78,925.00	
Concrete Box Culverts			$0.00	
Hydraulic Structures			$0.00	
Channel Improvements			$40,740.00	
Detention/Water Quality Facilities			$590,993.00	
Removals			$7,440.00	
Landscaping and Maintenance Improvements			$2,592.00	
Special Items (User Defined)			$0.00	
Subtotal Capital Improvement Costs			**$720,690.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$36,035.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$36,035.00	
Subtotal Additional Capital Improvement Costs			**$72,070.00**	

Land Acquisition Costs				
ROW/Easements				$25,416.00
Subtotal Land Acquisition Costs				**$25,416.00**
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%			$118,914.00
Legal/Administrative	5%			$39,638.00
Contract Admin/Construction Management	10%			$79,276.00
Contingency	25%			$198,190.00
Subtotal Other Costs				**$436,018.00**
Total Capital Improvement Costs				**$1,254,194.00**

Master Plan Operation and Maintenance Cost Summary				
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, e	359	L.F.	$2.00	$718.00
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal, st	1.3	ACRE	$2,991.00	$3,888.00
Total Annual Operation and Maintenance Cost				**$4,606.00**
Effective Interest Rate				0.00%
Total Operation and Maintenance Costs Over 50 Years				**$230,300.00**

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$792,760.00
ROW/Easements	$25,416.00
Engineering	$118,914.00
Legal/Administrative	$39,638.00
Contract Admin/Construction Management	$79,276.00
Contingency	$198,190.00
Total Capital Improvement Costs	$1,254,194.00
Total Annual Operation and Maintenance Cost	$4,606.00
Total Operation and Maintenance Costs Over 50 Years	$230,300.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Concept Design**			
DRAINAGEWAY :	**Drainageway 800**			
REACH :	**800**			
JURISDICTION :	**Greeley**			
REACH ID:	**Concept Design 8-Reach800**	**Sabastian Ortega**	**DATE :**	**7/17/2025**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	**Box Height (ft)**	**No. of Barrels**	**Length (ft)**				
6	5	1	90	L.F.	$1,247.27	$112,254.00	Structure 804
8	3	2	62	L.F.	$2,494.54	$154,662.00	Structure 805
12	4	1	80	L.F.	$1,740.84	$139,267.00	Structure 807
12	4	1	527	L.F.	$1,740.84	$917,421.00	Structure 808
9	4	2	74	L.F.	$2,888.76	$213,768.00	Structure 801
10	4	1	304	L.F.	$1,542.53	$468,930.00	Structure 809
Channel Improvements							
Soil Riprap, Type M			561	C.Y.	$140.00	$78,540.00	
Detention/Water Quality Facilities							
Detention (Complete-in-Place)							
Detention Facility 1 (Complete-in-Place)			43	AC-FT	$90,922.00	$3,918,738.00	
Detention Facility 2 (Complete-in-Place)			17	AC-FT	$90,922.00	$1,545,674.00	
Detention Facility 3 (Complete-in-Place)			2	AC-FT	$90,922.00	$218,213.00	
Removals							
Removal of culvert pipe (D<48")			62	L.F.	$40.00	$2,480.00	Based on Existing
Removal of culvert pipe (48"<D<84")			905	L.F.	$100.00	$90,500.00	
Concrete Box Culvert			170	L.F./CELL	$199.00	$33,830.00	Based on Existing
Landscaping and Maintenance Improvements							
Reclamation & seeding (native grasses)			10	ACRE	$1,994.00	$20,339.00	
Land Acquisition							
Easement/ROW Acquisition			10.60	ACRE	$19,551.00	$207,241.00	

Master Plan Capital Improvement Cost Summary		
Capital Improvement Costs		
Pipe Culverts and Storm Drains	$0.00	
Concrete Box Culverts	$2,006,302.00	
Hydraulic Structures	$0.00	
Channel Improvements	$78,540.00	
Detention/Water Quality Facilities	$5,682,625.00	
Removals	$126,810.00	
Landscaping and Maintenance Improvements	$20,339.00	
Special Items (User Defined)	$0.00	

Subtotal Capital Improvement Costs				**$7,914,616.00**
Additional Capital Improvement Costs				
Dewatering		L.S.		$0.00
Mobilization	5%			$395,731.00
Traffic Control		L.S.		$0.00
Utility Coordination/Relocation		L.S.		$0.00
Stormwater Management/Erosion Control	5%			$395,731.00
Subtotal Additional Capital Improvement Costs				**$791,462.00**
Land Acquisition Costs				
ROW/Easements				$207,241.00
Subtotal Land Acquisition Costs				**$207,241.00**
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%			$1,305,912.00
Legal/Administrative	5%			$435,304.00
Contract Admin/Construction Management	10%			$870,608.00
Contingency	25%			$2,176,520.00
Subtotal Other Costs				**$4,788,344.00**
Total Capital Improvement Costs				**$13,701,663.00**

Master Plan Operation and Maintenance Cost Summary				
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, e	1273	L.F.	$2.00	$2,546.00
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal, st	10.6	ACRE	$2,991.00	$31,705.00
Total Annual Operation and Maintenance Cost				**$34,251.00**
Effective Interest Rate				0.00%
Total Operation and Maintenance Costs Over 50 Years				**$1,712,550.00**

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$8,706,078.00
ROW/Easements	$207,241.00
Engineering	$1,305,912.00
Legal/Administrative	$435,304.00
Contract Admin/Construction Management	$870,608.00
Contingency	$2,176,520.00
Total Capital Improvement Costs	$13,701,663.00
Total Annual Operation and Maintenance Cost	$34,251.00
Total Operation and Maintenance Costs Over 50 Years	$1,712,550.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Concept Design**			
DRAINAGEWAY :	**Drainageway 1000**			
REACH :	**1000**			
JURISDICTION :	**Greeley**			
REACH ID:	**Concept Design 10-Reach1000**	**Sabastian Ortega**	**DATE :**	**7/17/2025**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	**Box Height (ft)**	**No. of Barrels**	**Length (ft)**				
11	9	3	123	L.F.	$7,111.67	$874,736.00	Structure 1002
12	9	2	113	L.F.	$5,122.42	$578,834.00	Structure 1003
10	7	2	43	L.F.	$3,990.06	$171,573.00	Structure 1004
10	7	2	49	L.F.	$3,990.06	$195,513.00	Structure 1005
Hydraulic Structures							
Sloping Drop Structures							
Height (ft)	**Bottom Width (ft)**	**Yn (ft)**					
2.5	78	1.6	2	EA	$222,773.26	$445,547.00	L_1030 100yr Discharge=2710. Width=Discharge/35
3	49	1.1	1	EA	$146,937.13	$146,937.00	L_1042 100yr Discharge=1717. Width=Discharge/35
3	47	2.8	2	EA	$175,983.46	$351,967.00	L_1046 100yr Discharge=1644. Width=Discharge/35
3	47	2.9	1	EA	$177,993.60	$177,994.00	L_1048 100yr Discharge=1644. Width=Discharge/35
1	100	1.9	1	EA	$251,881.45	$251,881.00	L_1006 100yr Discharge=3509. Width=Discharge/35
3	100	3.3	1	EA	$321,064.02	$321,064.00	L_1004 100yr Discharge=4340. max channel width
Channel Improvements							
Excavation, Mid Range			147007	C.Y.	$48.00	$7,056,352.00	
Detention/Water Quality Facilities							
Detention (Complete-in-Place)							
Detention Facility 1 (Complete-in-Place)			80	AC-FT	$90,922.00	$7,273,760.00	
Removals							
Removal of culvert pipe (D>84")			172	L.F.	$150.00	$25,800.00	
Concrete Box Culvert			92	L.F./CELL	$199.00	$18,308.00	
Landscaping and Maintenance Improvements							
Reclamation & seeding (native grasses)			58	ACRE	$1,994.00	$115,652.00	
Special Items (User Defined)							
Bridge maintenance	**<----User Defined Items**		1	EA	$10,000.00	$10,000.00	Structure 1001, 30' width
Land Acquisition							
Easement/ROW Acquisition			58.00	ACRE	$19,551.00	$1,133,958.00	

Master Plan Capital Improvement Cost Summary		
Capital Improvement Costs		
Pipe Culverts and Storm Drains	$0.00	
Concrete Box Culverts	$1,820,656.00	

Hydraulic Structures			$1,695,390.00	
Channel Improvements			$7,056,352.00	
Detention/Water Quality Facilities			$7,273,760.00	
Removals			$44,108.00	
Landscaping and Maintenance Improvements			$115,652.00	
Special Items (User Defined)			$10,000.00	
Subtotal Capital Improvement Costs			**$18,015,918.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$900,796.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$900,796.00	
Subtotal Additional Capital Improvement Costs			**$1,801,592.00**	
Land Acquisition Costs				
ROW/Easements			$1,133,958.00	
Subtotal Land Acquisition Costs			**$1,133,958.00**	
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%		$2,972,627.00	
Legal/Administrative	5%		$990,876.00	
Contract Admin/Construction Management	10%		$1,981,751.00	
Contingency	25%		$4,954,378.00	
Subtotal Other Costs			**$10,899,632.00**	
Total Capital Improvement Costs			**$31,851,100.00**	

Master Plan Operation and Maintenance Cost Summary					
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, e	408	L.F.	$2.00	$816.00	
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)	8	EA	$997.00	$7,976.00	
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	12301	L.F.	$4.00	$49,204.00	
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal, st	9	ACRE	$2,991.00	$26,919.00	
Total Annual Operation and Maintenance Cost				**$84,915.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$4,245,750.00**	

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$19,817,510.00
ROW/Easements	$1,133,958.00
Engineering	$2,972,627.00
Legal/Administrative	$990,876.00
Contract Admin/Construction Management	$1,981,751.00
Contingency	$4,954,378.00
Total Capital Improvement Costs	$31,851,100.00
Total Annual Operation and Maintenance Cost	$84,915.00
Total Operation and Maintenance Costs Over 50 Years	$4,245,750.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Concept Design**			
DRAINAGEWAY :	**Drainageway 1100**			
REACH :	**1100**			
JURISDICTION :	**Greeley**			
REACH ID:	**Concept Design 11-Reach1100**	**Sabastian Ortega**	**DATE :**	**7/17/2025**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Hydraulic Structures							
Sloping Drop Structures							
Height (ft)	**Bottom Width (ft)**	**Yn (ft)**					
5	5.5	2.2	2	EA	$66,433.11	$132,866.00	L_1151 100yr Discharge=184. Width=Discharge/35
4	5.5	2.2	1	EA	$62,318.85	$62,319.00	L_1151 100yr Discharge=184. Width=Discharge/35
3	8	2	2	EA	$60,550.24	$121,100.00	L_1147 100yr Discharge=271. Width=Discharge/35
Channel Improvements							
Excavation, Mid Range			7000	C.Y.	$48.00	$336,000.00	
Landscaping and Maintenance Improvements							
Reclamation & seeding (native grasses)			6	ACRE	$1,994.00	$11,964.00	
Land Acquisition							
Easement/ROW Acquisition			6.00	ACRE	$19,551.00	$117,306.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains			$0.00	
Concrete Box Culverts			$0.00	
Hydraulic Structures			$316,285.00	
Channel Improvements			$336,000.00	
Detention/Water Quality Facilities			$0.00	
Removals			$0.00	
Landscaping and Maintenance Improvements			$11,964.00	
Special Items (User Defined)			$0.00	
Subtotal Capital Improvement Costs			**$664,249.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$33,212.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$33,212.00	
Subtotal Additional Capital Improvement Costs			**$66,424.00**	
Land Acquisition Costs				
ROW/Easements			$117,306.00	
Subtotal Land Acquisition Costs			**$117,306.00**	
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%		$109,601.00	

Legal/Administrative	5%			$36,534.00	
Contract Admin/Construction Management	10%			$73,067.00	
Contingency	25%			$182,668.00	
Subtotal Other Costs				**$401,870.00**	
Total Capital Improvement Costs				**$1,249,849.00**	

Master Plan Operation and Maintenance Cost Summary					
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**	
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)	5	EA	$997.00	$4,985.00	
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	2025	L.F.	$4.00	$8,100.00	
Total Annual Operation and Maintenance Cost				**$13,085.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$654,250.00**	

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$730,673.00
ROW/Easements	$117,306.00
Engineering	$109,601.00
Legal/Administrative	$36,534.00
Contract Admin/Construction Management	$73,067.00
Contingency	$182,668.00
Total Capital Improvement Costs	$1,249,849.00
Total Annual Operation and Maintenance Cost	$13,085.00
Total Operation and Maintenance Costs Over 50 Years	$654,250.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Concept Design**			
DRAINAGEWAY :	**Drainagrway 1200**			
REACH :	**1200**			
JURISDICTION :	**Greeley**			
REACH ID:	**Concept Design 12-Reach1200**	**Sabastian Ortega**	**DATE :**	**7/17/2025**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Hydraulic Structures							
Sloping Drop Structures							
Height (ft)	**Bottom Width (ft)**	**Yn (ft)**					
5	9	4.1	2	EA	$120,178.15	$240,356.00	L_1239 100yr Discharge=326. Width=Discharge/35
Channel Improvements							
Excavation, Mid Range			4622	C.Y.	$48.00	$221,856.00	
Landscaping and Maintenance Improvements							
Reclamation & seeding (native grasses)			2	ACRE	$1,994.00	$3,190.00	
Land Acquisition							
Easement/ROW Acquisition			1.60	ACRE	$19,551.00	$31,282.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains			$0.00	
Concrete Box Culverts			$0.00	
Hydraulic Structures			$240,356.00	
Channel Improvements			$221,856.00	
Detention/Water Quality Facilities			$0.00	
Removals			$0.00	
Landscaping and Maintenance Improvements			$3,190.00	
Special Items (User Defined)			$0.00	
Subtotal Capital Improvement Costs			**$465,402.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$23,270.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$23,270.00	
Subtotal Additional Capital Improvement Costs			**$46,540.00**	
Land Acquisition Costs				
ROW/Easements			$31,282.00	
Subtotal Land Acquisition Costs			**$31,282.00**	
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%		$76,791.00	
Legal/Administrative	5%		$25,597.00	
Contract Admin/Construction Management	10%		$51,194.00	

Contingency	25%			$127,986.00	
Subtotal Other Costs				**$281,568.00**	
Total Capital Improvement Costs				**$824,792.00**	

Master Plan Operation and Maintenance Cost Summary					
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**	
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)	2	EA	$997.00	$1,994.00	
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	960	L.F.	$4.00	$3,840.00	
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal, st	13.1	ACRE	$2,991.00	$39,182.00	
Total Annual Operation and Maintenance Cost				**$45,016.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$2,250,800.00**	

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$511,942.00
ROW/Easements	$31,282.00
Engineering	$76,791.00
Legal/Administrative	$25,597.00
Contract Admin/Construction Management	$51,194.00
Contingency	$127,986.00
Total Capital Improvement Costs	$824,792.00
Total Annual Operation and Maintenance Cost	$45,016.00
Total Operation and Maintenance Costs Over 50 Years	$2,250,800.00

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	**Greeley - Comprehensive Drainage Plan Oklahoma & South Basins Concept Design**			
DRAINAGEWAY :	**Drainageway 1300**			
REACH :	**1300**			
JURISDICTION :	**Greeley**			
REACH ID:	**Concept Design 13-Reach1300**	**Sabastian Ortega**	**DATE :**	**7/17/2025**

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Concrete Box Culverts							
Box Culvert Pipe							
Individual Box Span (ft)	**Box Height (ft)**	**No. of Barrels**	**Length (ft)**				
10	4	3	48	L.F.	$4,627.60	$222,125.00	Structure 1301, Reach 1316
Detention/Water Quality Facilities							
Detention (Complete-in-Place)							
Detention Facility 1 (Complete-in-Place)			43	AC-FT	$90,922.00	$3,909,646.00	
Removals							
Removal of culvert pipe (D<48")			48	L.F.	$40.00	$1,920.00	
Landscaping and Maintenance Improvements							
Reclamation & seeding (native grasses)			5	ACRE	$1,994.00	$10,169.00	
Land Acquisition							
Easement/ROW Acquisition			5.10	ACRE	$19,551.00	$99,710.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains			$0.00	
Concrete Box Culverts			$222,125.00	
Hydraulic Structures			$0.00	
Channel Improvements			$0.00	
Detention/Water Quality Facilities			$3,909,646.00	
Removals			$1,920.00	
Landscaping and Maintenance Improvements			$10,169.00	
Special Items (User Defined)			$0.00	
Subtotal Capital Improvement Costs			**$4,143,860.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$207,193.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$207,193.00	
Subtotal Additional Capital Improvement Costs			**$414,386.00**	
Land Acquisition Costs				
ROW/Easements			$99,710.00	
Subtotal Land Acquisition Costs			**$99,710.00**	
Other Costs (percentage of Capital Improvement Costs)				

Engineering	15%			$683,737.00	
Legal/Administrative	5%			$227,912.00	
Contract Admin/Construction Management	10%			$455,825.00	
Contingency	25%			$1,139,562.00	
Subtotal Other Costs				**$2,507,036.00**	
Total Capital Improvement Costs				**$7,164,992.00**	

Master Plan Operation and Maintenance Cost Summary					
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, e	48	L.F.	$2.00	$96.00	
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal, st	78.1	ACRE	$2,991.00	$233,597.00	
Total Annual Operation and Maintenance Cost				**$233,693.00**	
Effective Interest Rate				0.00%	
Total Operation and Maintenance Costs Over 50 Years				**$11,684,650.00**	

Summary for Tabulation (Does Not Print)	
Capital Improvement Costs	$4,558,246.00
ROW/Easements	$99,710.00
Engineering	$683,737.00
Legal/Administrative	$227,912.00
Contract Admin/Construction Management	$455,825.00
Contingency	$1,139,562.00
Total Capital Improvement Costs	$7,164,992.00
Total Annual Operation and Maintenance Cost	$233,693.00
Total Operation and Maintenance Costs Over 50 Years	$11,684,650.00

APPENDIX G – MASTER PLAN MAPS

Click here for Figure G-1: Major Drainageway 100 (GOS)
Click here for Figure G-2: Major Drainageway 200, 300 (GOS)
Click here for Figure G-3: Major Drainageway 500, 600, 800 (GOS)
Click here for Figure G-4: Major Drainageway 700, 800 (GO)
Click here for Figure G-5: Major Drainageway 900, 1000, 1100, 1200, 1300 (GOR)

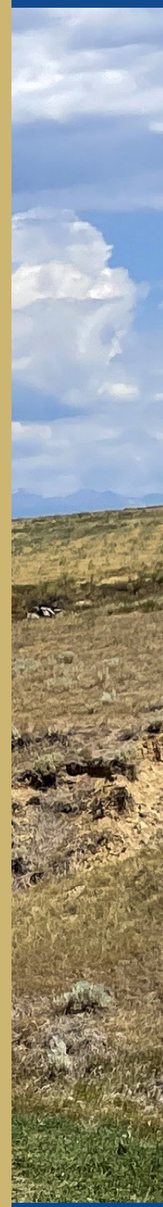
APPENDIX H – FUNDING SOURCES
(Funding sources were not included with this study)











Sponsor: City of Greeley Colorado

Consultant: Matrix