EPC STORMWATER REVIEW COMMENTS
IN ORANGE BOXES WITH BLACK TEXT

TRI-STATE GENERATION & TRANSMISSION, INC.

ROLLING MEADOWS SUBSTATION
FINAL DRAINAGE REPORT

PCD FILE #
PPR2619

June 22, 2026

Prepared by:

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TRI-STATE GENERATION & TRANSMISSION, INC.

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Design Engineer's Statement:

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the County for drainage reports and said report is in conformity with the applicable master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

_____ _____

David Schieldt
Registered Professional Engineer
State of Colorado No. 47195

Date

Owner/Developer's Statement:

I, the owner/developer have read and will comply with all of the requirements specified in this drainage report and plan.

_____ _____

H. Steven Gray
Vice President, Land, Water, and Environmental Resources
Tri-State Generation and Transmission Association
1100 W. 116th Ave
Westminster, CO 80234

Date

El Paso County:

Filed in accordance with the requirements of the Drainage Criteria Manual, Volumes 1 and 2, El Paso County Engineering Criteria Manual and Land Development Code as amended.

_____ _____

Joshua J. Palmer, P.E.
County Engineer / ECM Administrator

Date

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Move drawings to end of report

1.0 General Location and Description

Tri-State Generation and Transmission (TSGT) in coordination with Del-Mont Consultants, Inc. (DMC) is in the process of designing a new substation yard. The scope of work includes the construction of the substation yard, driveway, detention pond and swales, installation of new perimeter fence, and the addition of high voltage electrical equipment and facilities. The purpose of this report is to present the findings from the hydrologic and hydraulic analyses that were performed on the existing property as well as present the results from a detailed analysis performed on the proposed improvements to the property.

1.1 Site Location

The proposed substation yard is located on a 5.95-acre parcel owned by TSGT, situated in the N ½ of Section 12, Township 15 South, Range 61 West, 6th Principal Meridian in El Paso County, Colorado. The substation site is accessed from Bradley Road. The site is in the Jimmy Camp Creek Drainage Basin.

1.2 Site Description

The site naturally drains to the south and is currently covered in various grasses. There are currently no features on the site to provide water quality or quantity treatment for discharge from the site. Site layout details will be discussed in more detail in **Section 2**.

There are currently no developments on the properties neighboring the site. No wetlands are present on the site and the site is located within the Zone AE 100 year floodplain per FIRM Map Number 08041C0790G.

Include a copy of the floodplain map in the appendix.

2.0 Drainage Basins and Sub-Basins

The property functions as one drainage basin, flowing to the south, ultimately flowing into the Jimmy Camp Creek. Proposed conditions produce several smaller sub-basins and will be discussed in detail in the following sections.

2.1 Existing Drainage Sub-Basins

The existing site was analyzed as one basin. A map illustrating the delineation of the existing property can be found in **Appendix C**. There are no developments on the neighboring properties. **Table 2-1** presents the existing basin and its corresponding acreage.

Table 2-1: Existing Basin Acreages

Sub-Basin	Total Area (Acres)
Existing	4.76

The entire basin (5.95 acres) needs to be analyzed. If the remaining acre goes a different way, it needs to be it's own basin.

Currently, the existing subbasin experiences unrestricted overland flow with no drainage detention measures in place. The existing site has experienced preliminary rough grading and all water remains within the existing basin.

2.2 Proposed Drainage Sub-Basins

The proposed conditions will produce several different sub-basins. The proposed site is divided into 9 different sub-basins. The substation yard accounts for 3 of the basins (Y 1-3), which were broken out separately to size the subdrain pipes. Areas outside of the substation make up 4 basins (P 1-4).

These basins still need to be included in the hydrology calculations and discussed.

The access driveway and surrounding area on the west side of the site will be excluded (EXCL-1) per ECM Appendix I.7.1.C.1.a, as this area is less than totals less than 1 acre and is not practical to capture. The area west and south of the EDB embankment (EXCL-2) will be excluded per EPC ECM Appendix I.7.1.B.7 as this area is undeveloped land that will remain undeveloped.

A map illustrating the delineation of the sub-basins can be found in **Appendix C**.

Storm water will be routed through the detention basins via buried subdrains and overland flow. The disturbed areas of the proposed basins will be reseeded. **Table 2-2** presents the proposed sub-basins and their corresponding acreages.

Table 2-2: Proposed Sub-Basin Acreages

Sub-Basin	Total Area (Acres)
Y1	0.43
Y2	0.61
Y3	0.72
P1	0.63
P2	0.97
P3	0.72
P4	0.68

Basins EXCL-1 & 2 need to be included

3.0 Drainage Design Criteria

3.1 Methodology

The hydrologic/hydraulic analysis of the site was performed using the Autodesk Storm and Sanitary analysis utilizing the Rational Method model for a 5-year and a 100-year rainfall event. Runoff Coefficients were obtained from El Paso County Drainage Criteria Manual Volume 1 Update, Chapter 6, Section 3.1, Table 6-6. Rainfall Intensity was obtained from EPC DCM Volume 1 Update, Figure 6-5. Modeling results are presented in **Appendix B**.

The Mile High Flood District *Detention Basin Design Workbook* was utilized to determine the required water quality capture volume (WQCV) and detention and to aid in the design the outlet structure. The spreadsheets/worksheets can be found in **Appendix A** and are discussed in more detail in **Section 4.0**.

Include a copy of this information in the appendix

Soil data was obtained from the SCS soils survey for El Paso County and identifies hydrologic soil group B for the site.

The described methods/tools used in the analysis, are in accordance with common engineering practices and guidelines.

3.2 Land Cover Hydrologic Properties

Runoff Coefficients and Percent Impervious numbers, for hydrologic soil group B, were assigned to the various land cover types found on the project, both existing and proposed, and are presented in **Table 3-1**. Runoff coefficients were obtained from Table 6-6, Section 3-1, EPC DCM Volume 1 Update.

Table 3-1: Land Cover Hydrologic Properties

Land Cover Type	Percent Impervious	Runoff Coefficient 5 Year	Runoff Coefficient 100 Year
Gravel	80	0.59	0.70
Historical Flow Analysis	2	0.09	0.36
Pond	100	0.90	0.96

3.3 Weighted Design Values

Utilizing the land cover hydrologic properties presented above, a weighted Runoff Coefficient and Percent Impervious value was calculated for each of the sub-basins, presented in **Section 2.0** to be used for analysis. **Table 3-2** presents the weighted design values for existing conditions and **Table 3-3** presents the weighted design values for proposed conditions. Detailed calculations can be found in **Appendix A**.

Table 3-2: Existing Sub-Basin Weighted Design Values

Sub-Basin	Total Area (Acres)	Weighted Percent Impervious	Weighted Runoff Coefficient 5 year	Weighted Runoff Coefficient 100 year
Existing	4.81	2%	0.09	0.36

Table 3-3: Proposed Sub-Basin Weighted Design Values

Sub-Basin	Total Area (Acres)	Weighted Percent Impervious	Weighted Runoff Coefficient 5 year	Weighted Runoff Coefficient 100 year
Y1	0.43	80%	0.59	0.70
Y2	0.61	80%	0.59	0.70
Y3	0.72	80%	0.59	0.70
P1	0.63	14%	0.17	0.41
P2	0.97	2%	0.09	0.36
P3	0.72	13%	0.16	0.41
P4	0.73	100%	0.90	0.96
EXCL-1	0.80	2%	0.09	0.36
EXCL-2	0.52	2%	0.09	0.36

4.0 Drainage Facility Design

4.1 Historical Drainage

Per common practice, the 100-year historical discharge value for the site shall be used to determine the allowable discharge from the site for the proposed conditions. Values presented in **Table 3-2** were used in the model to calculate a historical discharge rate for the existing property. **Table 4-1** presents the discharge rate for the existing property for both the 5-year and 100-year 1-hour storm events although the design is based on the 100-year discharge values.

Table 4-1: Existing Property Discharge Values

Sub-Basin	5-Year Discharge (CFS)	100-Year Discharge (CFS)
Existing	2.63	10.25

Flows do not match with information in SWMM model. Please revise

4.2 Proposed Drainage

Values presented in **Table 3-3** were utilized in the model to calculate the runoff for the proposed conditions. The Mile High Flood District *Detention Basin Design Workbook* was utilized to determine the WQCV in conjunction with the model to size the detention pond (EDB-1). Once the pond was sized, the Mile High Flood District *Detention Basin Design Workbook* was utilized to estimate required orifice sizes in the outlet structure to provide water quality treatment. The model was then used to verify all design elements of the pond and the outlet structure to ensure the pond not only retained the correct WQCV but to also discharge at or less than the required 100-year historic discharge rate presented in **Table 4-1** as well as drain the pond in less than the allowable time per State Requirements**.** The spreadsheet showing the detailed calculations can be found in **Appendix A.** The design of the outlet structure is detailed in the grading drawings.

What is the bottom width?

Provide a calculation showing what max capacity of the swale is.

The two drainage swales that will route flows from basin P1 and P2 were not analyzed as the contributing areas are extremely small. These swales are designed as a flat-bottom swale with 4:1 side slopes, a minimum depth of 1 foot, and a flow line slope of 0.5%. The swale has a max flow capacity 20cfs, which will easily convey the negligible run-on flows.

The proposed detention pond (EDB-1) was designed to provide water quality treatment as well as detain the 100-year storm event while maintaining the required 1-foot of freeboard. The proposed detention pond stage-storage curve is presented in **Table 4-2**. The emergency spillway has been designed to convey the 100 year storm event.

Table 4-2: Detention Pond Stage-Storage Table

Elevation	Surface Area (Sq. Ft.)
5808.02 (Top of Micropool)	10
5808.35 (Trickle Channel Invert)	10
5809.35	4,853
5810.35 (Weir)	13,958
5810.85 (Emergency Spillway)	17,074
5811.35	19,848
5812.35 (Top of Bank)	24,447

The model of the proposed site conditions was utilized to calculate discharge flow rates from the outlet structure in order to size the pond discharge culvert. **Table 4-3** presents the hydraulic capacity of the culvert and the required capacity to discharge flow from the outlet structure for the 100-year event. Hydraulic calculations for the remainder of the piping systems and corresponding capacities are found in **Appendix B.**

Table 4-3: Outlet Pipe Hydraulic Capacity (100-year event)

Drainage Feature	Pipe Diameter (in)	Total Capacity (cfs)	Required Flow Capacity (cfs)	Remaining Capacity (cfs)
Pond Outlet	18	6.45	0.08	6.37

Table 4-4 presents the discharge rates for the proposed sub-basins for both the 5-year and 100-year 1-hour storm events prior to detention. This discharge value represents the flow rate that the pond is receiving. The discharge from the pond and other basins (total discharge from site) is summarized in **Table 5-1.**

Table 4-4: Proposed Sub-Basin Discharge Values (Pre-Detention)

Sub-Basin	5-Year Discharge (CFS)	100-Year Discharge (CFS)
Y1	1.05	1.76
Y2	1.49	2.49
Y3	1.75	2.94
P1	0.41	0.74
P2	0.36	0.61
P3	0.48	0.80
P4	2.71	4.55

*Values from SSA Model

Utilizing the flow rates presented above, the model was utilized to analyze the flow path of water through the piping and pond system. With the installation of the outlet structure, the pond was designed to pass both the 5-year and 100-year events, treat the required WQCV, and slowly release the water in the required length of time after the end of an event set forth by the State. The entire substation drains to the pond and the discharge rate leaving the pond is presented in **Table 5-1.**

Table 4-5 presents the hydraulic capacity of the subdrain pipes and the required capacity for the 100-year 1-hour storm event. These values were obtained from the SSA drainage model. A model schematic identifying each pipe can be found in **Appendix C**.

Table 4-5: Subdrain Pipe Hydraulic Capacity (100-year event)

Subdrain ID	Pipe Diameter (in)	Total Capacity (cfs)	Peak Flow Capacity (cfs)	Remaining Capacity (cfs)
01-12-NP	12	3.33	0.74	2.59
02-12-P	12	2.55	1.71	0.84
03-15-NP	15	4.81	2.42	2.39
04-15-P	15	4.11	3.48	0.63
05-15-NP	15	6.02	4.64	1.38
06-12-P	12	3.07	2.90	0.17
07-12-NP	12	5.13	2.89	2.24

Indicate the pond and subdrain system will be private and maintained by owner

5.0 Conclusions

5.1 Drainage Concept

The drainage design has been prepared using sound engineering judgement and practices and will provide an effective means of controlling runoff on the project site as well as protect the site from damage. The design has been completed according to common engineering practices and will result in no downstream impacts to any people or structures. Historic flow paths, discharge rates, and water quality have been maintained or improved.

5.2 Compliance with Common Practices

Per common practices, the historical discharge rate from the 100-year storm shall be utilized to determine the allowable discharge rate for the proposed improvements. To demonstrate compliance with this requirement, both the existing and proposed conditions were combined into one overall sub-basin. **Table 5-1** presents the overall discharge rates for the overall basin.

Table 5-1: Overall Basin Discharge Values (Post Detention)

Basin	5-Year Discharge (CFS)		100-Year Discharge (CFS)	
	Existing	Proposed	Existing	Proposed
Total	8.26	0.10	13.85	3.40

*Value from MHFD-Detention Spreadsheet (Appendix A)

The pond outlet structure was sized so the proposed flows of the 5-year and 100-year storm events are less than the existing flows of the same storm events.

The detention pond was also sized according to UDFCD requirements to treat the WQCV, detain the 100-year event, maintain 1 foot of freeboard, and maintain historical discharge patterns resulting in no downstream impacts.

Inspections of the pond and outlet structure will be conducted by the owner on an annual basis as well as after large storm events. If deficiencies are identified or if maintenance is required, maintenance of the outlet structure will be performed by the owner of the property in an effort to return the structure to its original level of functionality. Maintenance may involve cleaning of sediment and debris from the facility, maintaining vegetation growth around the structure, and performing any additional maintenance required.

It should be noted that the use of forebays was also analyzed. Because this site has 4 locations of inflow into the detention basin, multiple forebays would be required. WQCVs for the subbasins emptying into the detention basin were calculated along with weighted imperviousness and weighted runoff coefficients for these subbasins. This information was then inputted into the UDFCD's Extended Detention Basin (EDB) Design Procedure Form to size forebays. Due to the smaller size of these subbasins, the required minimum forebay volume was recommended as 0% of the WQCV. It was then decided that forebays would not be necessary for this project. Forebay calculations have been included for reference in Appendix D

Appendix only has design of 4 forebays and only 2 seem to be shown on plans. Please include design calculations for all forebays. If forebays are not provided, then at least riprap outlet protection should be installed at end of pipes. Please include calcuations for these designs.

5.3 Four Step Process

The "Four Step Process" as recommended by the Urban Drainage Flood Control District has been addressed as follows:

Step 1 - Runoff Reduction

Runoff Reduction will be achieved by be maintaining all perviousness in all areas not routed through the EDB. Any disturbance in these areas, including the construction of the swales, shall be reseeded and stabilized.

Step 2 – Stabilized Drainageways

All swales proposed on the site will be stabilized with grass cover and the use of Rip-Rap armoring will be implemented in areas of higher concentration and/or velocity. Riprap sizing and pond outlet swale calculations can be found in **Appendix A**.

Step 3 – Provide Water Quality Capture Volume

In this section, specify if the full disturbance area gets to the proposed EDB-1 or if any exclusions apply. See Appendix I.6 for PCM exclusions.

The detention pond and outlet structure on site have been designed to achieve WQCV. The Mile High Flood District *Detention Basin Design Workbook* was utilized to determine the required water quality capture volume (WQCV) and to aid in the design of the outlet structure. The spreadsheets/worksheets can be found in **Appendix A** and are discussed in more detail in **Section 4.0**. The design was then analyzed with Autodesk Storm and Sanitary analysis utilizing the Rational Method model for a 5-year and a 100-year rainfall event. Modeling results are presented in **Appendix B**.

Step 4 – Consider Need for Industrial and Commercial BMPs

The site has low potential for industrial pollution upon the completion of construction. The improved areas of the site that could see vehicular traffic are all routed through the detention pond system where it receives water quality treatment. The electrical equipment found inside of the yard also utilizes local containment basins to prevent the spilling of contaminants within the yard.

Address drainage and bridge fees

5.4 Cost Estimate

Line Item Description	Quantity	U.O.M.	Labor	CFM	Labor & Materials
D50=6" Rip Rap	98	SY	$ 61.56	$ 40.29	$ 9,981.30
18" RCP Concrete Pipe	46	LF	$ 123.47	$ 48.28	$ 7,900.50
18" RCP Concrete Pipe w/ Flared End Section	1	EA	$ 1,262.59	$ 759.20	$ 2,021.79
6' Concrete Trickle Channel	254	LF	$ 20.80	$ 5.20	$ 6,604.00
Concrete Outlet Structure, 5' X 6'-6" X 6'-8"	1	EA	$10,324.00	$ 830.00	$ 11,154.00
EDB Access Road	99	CY	$ 50.34	$ 21.88	$ 7,149.78
				TOTAL:	$ 44,811.37

6.0 References

United States Department of Agriculture Natural Resources Conservation Service. Web Soil Survey

Mile High Flood District and Flood Control District. *Detention Basin Design Workbook,* Version 4.04, February 2021.

Urban Drainage and Flood Control District. *Urban Storm Drainage Criteria Manual,* Volume *1-3*, June 2001.

El Paso County, Colorado, *Drainage Criteria Manual*, Volume 1-2, October 31, 2018

El Paso County, Colorado, *Engineering Criteria Manual,* December 13, 2016

Yeh and Associates, Inc. *Geotechnical Engineering Study, Rolling Meadows Substation. Yeh Project Number 221-290.* November 11, 2021

Appendix A

Site Specific Physical Design Properties

Rolling Meadows Substation Drainage Design

Existing Conditions-100 Year

Area Name	Total Area (sf)	(acres)	Flow Length	Slope (%)	TOC (min)
Ex	207320.088	4.76	300	2.0%	18.41

TOC Calculated using equation 5.5.1.2 from WCECC

Land Cover Type	Percent Impervious	Runoff Coefficient
Historical Flow Analysis	2%	0.36
Packed Gravel	40%	0.5
Pond	100%	0.96

Please use equations 6-8 & 6-9 from Chapter 6 of the City of Colorado Springs Drainage Criteria Manual to determine Time of Concentration for Basins

Runoff Coefficient and Imperviousness Analysis

Ex

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
Native	4.76	0.36	1.71	2%	10%
		sum	1.71		10%
Total Area (ac)	**4.759**	Weighted	0.36		2%
Weighted Runoff Coefficient	**0.36**				
Weighted Percent Impervious	**2%**				

Rolling Meadows Substation Drainage Design

Existing Conditions-5 Year

Area Name	Total Area (sf)	(acres)	Flow Length	Slope (%)	TOC (min)
Ex	207320.088	4.76	300	2.0%	25.38

TOC Calculated using equation 5.5.1.2 from WCECC

Land Cover Type	Percent Impervious	Runoff Coefficient
Historical Flow Analysis	2%	0.08
Gravel	40%	0.3
Pond	100%	0.9

Should be 0.09, as shown in report narrative. Revise all 5-year Coefficient & Impervious sheets as necessary

Runoff Coefficient and Imperviousness Analysis

Ex-1

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
Existing Site	4.76	0.08	0.38	2%	10%
		sum	0.38		10%
Total Area (ac)	**4.76**	Weighted	0.08		2%
Weighted Runoff Coefficient	**0.08**				
Weighted Percent Impervious	**2%**				

Rolling Meadows Substation Drainage Design

Proposed Conditions-100 Year

Area Name	Total Area (sf)	(acres)	Flow Length	Slope (%)	TOC (min)
Y1	18832.55	0.43	50	1.00%	5.11
Y2	26554.27	0.61	50	1.00%	5.11
Y3	31214.27	0.72	50	1.00%	5.11
P1	27283.48	0.63	50	1.00%	8.76
P2	42442.99	0.97	50	3.00%	8.53
P3	31278.32	0.72	50	3.00%	9.77
P4	31878.69	0.73	50	3.00%	6.57

Include EXCL1 & 2

TOC Calculated using equation 5.5.1.2 from WCECC

Land Cover Type	Percent Impervious	Runoff Coefficient
Historical Flow Analysis	2%	0.36
Packed Gravel	80%	0.7
Pond/Swale	100%	0.96

Runoff Coefficient and Imperviousness Analysis

Y1

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
Substation Yard (Gravel)	0.43	0.7	0.30	80%	34.6%
Native	0.00	0.36	0.00	2%	0.0%
Pond	0.00	0.96	0.00	100%	0.0%
		sum	0.30		34.6%
Total Area (ac)	**0.43**	Weighted	0.70		80%
Weighted Runoff Coefficient	**0.70**				
Weighted Percent Impervious	**80%**				

Y2

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
Substation Yard (Gravel)	0.61	0.7	0.43	80%	48.8%
Native	0.00	0.36	0.00	2%	0.0%
Pond	0.00	0.96	0.00	100%	0.0%
		sum	0.43		48.8%
Total Area (ac)	**0.61**	Weighted	0.70		80%
Weighted Runoff Coefficient	**0.70**				
Weighted Percent Impervious	**80%**				

Y3

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
Substation Yard (Gravel)	0.72	0.7	0.50	80%	57.3%
Native	0.00	0.36	0.00	2%	0.0%
Pond	0.00	0.96	0.00	100%	0.0%
		sum	0.50		57.3%
Total Area (ac)	**0.72**	Weighted	0.70		80%
Weighted Runoff Coefficient	**0.70**				
Weighted Percent Impervious	**80%**				

P1

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
Driving Surface (Gravel)	0.10	0.7	0.07	80%	8.0%
Native	0.53	0.36	0.19	2%	1.1%
Pond	0.00	0.96	0.00	100%	0.0%
		sum	0.26		9.1%
Total Area (ac)	**0.63**	Weighted	0.41		14%
Weighted Runoff Coefficient	**0.41**				
Weighted Percent Impervious	**14%**				

P2

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
Driving Surface (Gravel)	0.00	0.7	0.00	80%	0.0%
Native	0.97	0.36	0.35	2%	1.9%
Pond	0.00	0.96	0.00	100%	0.0%
		sum	0.35		1.9%
Total Area (ac)	**0.97**	Weighted	0.36		2%
Weighted Runoff Coefficient	**0.36**				
Weighted Percent Impervious	**2%**				

P3

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
Driving Surface (Gravel)	0.10	0.7	0.07	80%	8.0%
Native	0.62	0.36	0.22	2%	1.2%
Pond	0.00	0.96	0.00	100%	0.0%
		sum	0.29		9.2%
Total Area (ac)	**0.72**	Weighted	0.41		13%
Weighted Runoff Coefficient	**0.41**				
Weighted Percent Impervious	**13%**				

P4

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
Driving Surface (Gravel)	0.00	0.7	0.00	80%	0.0%
Native	0.00	0.36	0.00	2%	0.0%
Pond	0.73	0.96	0.70	100%	73.2%
		sum	0.70		73.2%
Total Area (ac)	**0.73**	Weighted	0.96		100%
Weighted Runoff Coefficient	**0.96**				
Weighted Percent Impervious	**100%**				

Composite

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
Driving Surface (Gravel)	1.96	0.7	1.37	80%	156.7%
Native	2.12	0.36	0.76	2%	4.2%
Pond	0.73	0.96	0.70	100%	73.2%
		sum	2.84		234.1%
Total Area (ac)	**4.81**	Weighted	0.59		49%
Weighted Runoff Coefficient	**0.59**				
Weighted Percent Impervious	**49%**				

Rolling Meadows Substation Drainage Design

Proposed Conditions-5 Year

Area Name	Total Area (sf)	(acres)	Flow Length	Slope (%)	TOC (min)
Y1	18832.55	0.43	50	1.0%	6.51
Y2	26554.27	0.61	50	1.0%	6.51
Y3	31214.27	0.72	50	1.0%	6.51
P1	27283.48	0.63	50	1.0%	11.87
P2	42442.99	0.97	50	3.0%	9.77
P3	31278.32	0.72	50	3.0%	9.77
P4	31878.69	0.73	50	3.0%	8.97

TOC Calculated using equation 5.5.1.2 from WCECC

Land Cover Type	Percent Impervious	Runoff Coefficient
Historical Flow Analysis	2%	0.09
Gravel	80%	0.59
Pond	100%	0.9

Runoff Coefficient and Imperviousness Analysis

Y1

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
Substation Yard (Gravel)	0.43	0.59	0.26	80%	34.6%
Native	0.00	0.09	0.00	2%	0.0%
Pond	0.00	0.9	0.00	100%	0.0%
		sum	0.26		34.6%
Total Area (ac)	**0.43**	Weighted	0.59		80%
Weighted Runoff Coefficient	**0.59**				
Weighted Percent Impervious	**80%**				

Y2

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
Substation Yard (Gravel)	0.61	0.59	0.36	80%	48.8%
Native	0.00	0.09	0.00	2%	0.0%
Pond	0.00	0.9	0.00	100%	0.0%
		sum	0.36		48.8%
Total Area (ac)	**0.61**	Weighted	0.59		80%
Weighted Runoff Coefficient	**0.59**				
Weighted Percent Impervious	**80%**				

Y3

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
Substation Yard (Gravel)	0.72	0.59	0.42	80%	57.3%
Native	0.00	0.09	0.00	2%	0.0%
Pond	0.00	0.9	0.00	100%	0.0%
		sum	0.42		57.3%
Total Area (ac)	**0.72**	Weighted	0.59		80%
Weighted Runoff Coefficient	**0.59**				
Weighted Percent Impervious	**80%**				

P1

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
Driving Surface (Gravel)	0.10	0.59	0.06	80%	8.0%
Native	0.53	0.09	0.05	2%	1.1%
Pond	0.00	0.9	0.00	100%	0.0%
		sum	0.11		9.1%
Total Area (ac)	**0.63**	Weighted	0.17		14%
Weighted Runoff Coefficient	**0.17**				
Weighted Percent Impervious	**14%**				

P2

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
Driving Surface (Gravel)	0.00	0.59	0.00	80%	0.0%
Native	0.97	0.09	0.09	2%	1.9%
Pond	0.00	0.9	0.00	100%	0.0%
		sum	0.09		1.9%
Total Area (ac)	**0.97**	Weighted	0.09		2%
Weighted Runoff Coefficient	**0.09**				
Weighted Percent Impervious	**2%**				

Missing P3 & P4.
Please include

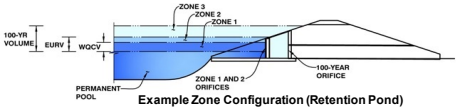
Move all pond and storm drain calculations after hydrology calculations

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.07 (June 2025)

Project: ROLLING MEADOWS SUBSTATION

Basin ID: EDB-1



Example Zone Configuration (Retention Pond)

Watershed Information

Selected SCM Type =	EDB	
Watershed Area =	4.81	acres
Watershed Length =	625	ft
Watershed Length to Centroid =	75	ft
Watershed Slope =	0.020	ft/ft
Watershed Imperviousness =	49.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	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) =	0.082	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.252	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.218	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.312	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.395	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	0.508	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	0.598	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	0.714	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	0.947	acre-feet		inches
Approximate 2-yr Detention Volume =	0.189	acre-feet		
Approximate 5-yr Detention Volume =	0.260	acre-feet		
Approximate 10-yr Detention Volume =	0.346	acre-feet		
Approximate 25-yr Detention Volume =	0.379	acre-feet		
Approximate 50-yr Detention Volume =	0.396	acre-feet		
Approximate 100-yr Detention Volume =	0.443	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.082	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.170	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.192	acre-feet
Total Detention Basin Volume =	0.443	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

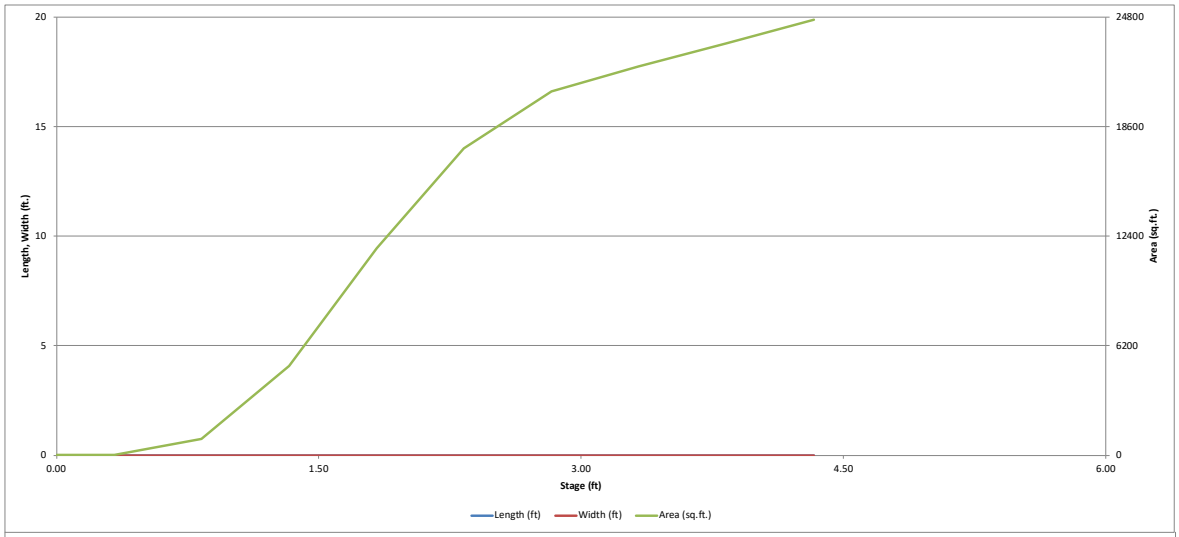
This is not the full disturbance area. The pond should treat the entire disturbed area or exclusions should be identified that apply to the untreated areas.

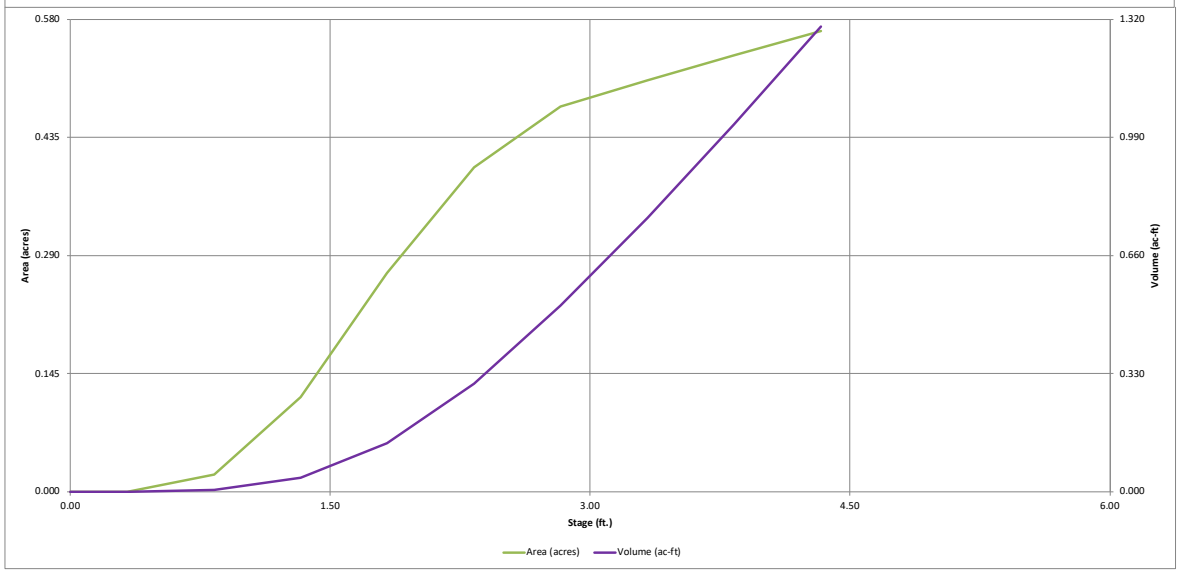
Depth Increment = ft

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	--	--	--	10	0.000		
5808.353 (TC)	--	0.33	--	--	--	10	0.000	3	0.000
5808.853	--	0.83	--	--	--	917	0.021	235	0.005
5809.353	--	1.33	--	--	--	5,052	0.116	1,727	0.040
5809.853	--	1.83	--	--	--	11,717	0.269	5,919	0.136
5810.353 (Weir)	--	2.33	--	--	--	17,359	0.399	13,188	0.303
5810.853 (SW)	--	2.83	--	--	--	20,610	0.473	22,681	0.521
5811.353	--	3.33	--	--	--	22,010	0.505	33,336	0.765
5811.853	--	3.83	--	--	--	23,327	0.536	44,670	1.025
5812.353	--	4.33	--	--	--	24,671	0.566	56,669	1.301

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.07 (June 2025)





✓ = calcs match details in plans

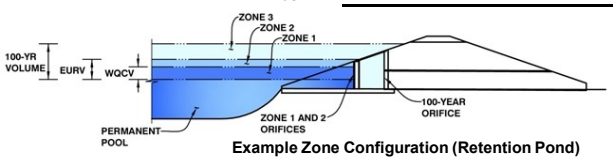
X = calcs do not match details in plans

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.07 (June 2025)

Project: ROLLING MEADOWS SUBSTATION

Basin ID: EDB-1



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.60	0.082	Orifice Plate
Zone 2 (EURV)	2.20	0.170	Orifice Plate
Zone 3 (100-year)	2.67	0.192	Weir&Pipe (Restrict)
Total (all zones)		0.443	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration SCM)

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 SCM)

Centroid of Lowest Orifice =	✓ 0.00	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 =	✓ 2.33	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 (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	✓ 0.75	✓ 1.25	✓ 1.50	✓ 1.75			
Orifice Area (sq. inches)	✓ 0.31	✓ 0.31	✓ 0.79	✓ 0.79	✓ 0.79			

	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	ft²
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 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	✓ 2.33	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	2.83	N/A	feet
Overflow Weir Front Edge Length =	✓ 4.00	N/A	feet	Overflow Weir Slope Length =	2.55	N/A	feet
Overflow Weir Grate Slope =	X 5.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	13.77	N/A	
Horiz. Length of Weir Sides =	✓ 2.50	N/A	feet	Overflow Grate Open Area w/o Debris =	7.10	N/A	ft²
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	3.55	N/A	ft²
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 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	✓ 0.58	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.52	N/A	ft²
Outlet Pipe Diameter =	✓ 18.00	N/A	inches	Outlet Orifice Centroid =	0.29	N/A	feet
Restrictor Plate Height Above Pipe Invert =	X 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=	✓ 2.83	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.49	feet
Spillway Crest Length =	X 15.00	feet	Stage at Top of Freeboard =	4.32	feet
Spillway End Slopes =	✓ 4.00	H:V	Basin Area at Top of Freeboard =	0.57	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	1.30	acre-ft

Calculated Parameters for Spillway

Routed Hydrograph Results

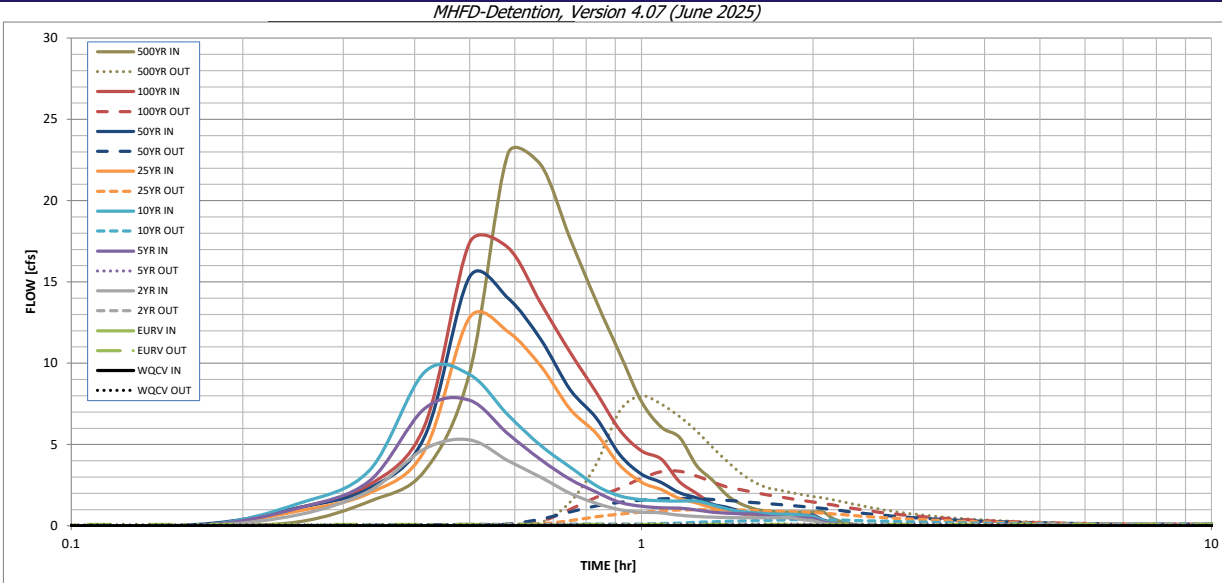
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

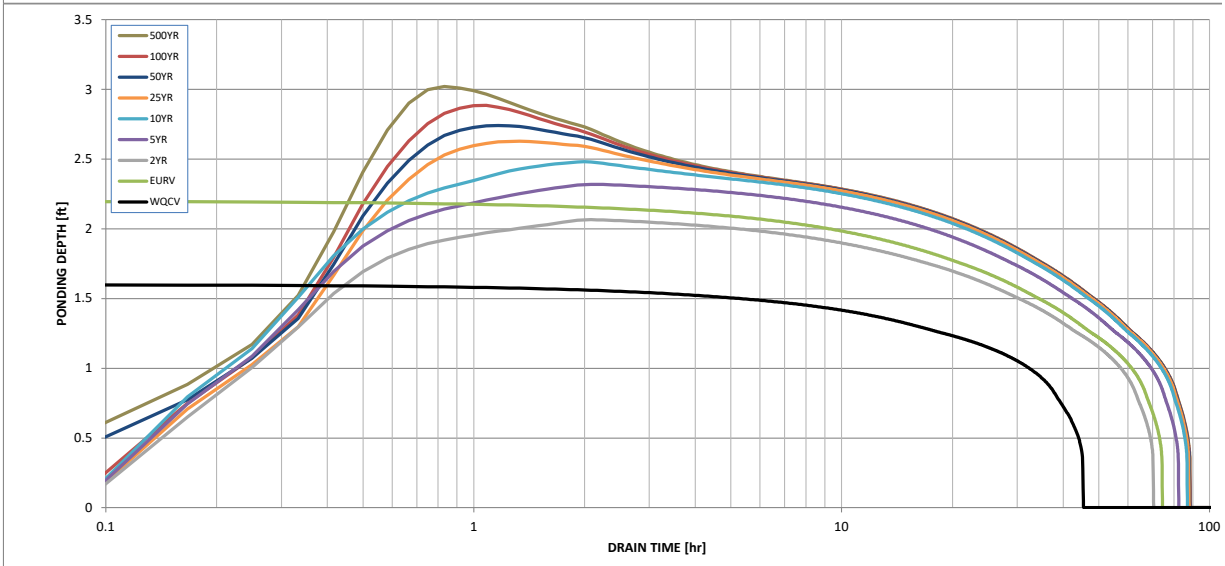
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.082	0.252	0.218	0.312	0.395	0.508	0.598	0.714	0.947
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.218	0.312	0.395	0.508	0.598	0.714	0.947
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	1.1	2.8	4.1	6.6	8.3	10.4	14.4
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.23	0.59	0.86	1.37	1.72	2.17	3.00
Peak Inflow Q (cfs) =	N/A	N/A	5.3	7.7	9.5	12.8	15.3	17.4	22.9
Peak Outflow Q (cfs) =	0.0	0.1	0.1	0.1	0.4	1.0	1.7	3.4	8.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.0	0.1	0.2	0.2	0.3	0.6
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.0	0.1	0.2	0.4	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) =	41	65	62	71	74	72	71	69	64
Time to Drain 99% of Inflow Volume (hours) =	**44**	70	67	78	81	81	80	79	78
Maximum Ponding Depth (ft) =	1.60	2.20	2.06	2.32	2.48	2.63	2.74	2.88	3.02
Area at Maximum Ponding Depth (acres) =	0.20	0.36	0.33	0.39	0.42	0.44	0.46	0.48	0.48
Maximum Volume Stored (acre-ft) =	0.082	0.253	0.205	0.295	0.360	0.425	0.479	0.544	0.607

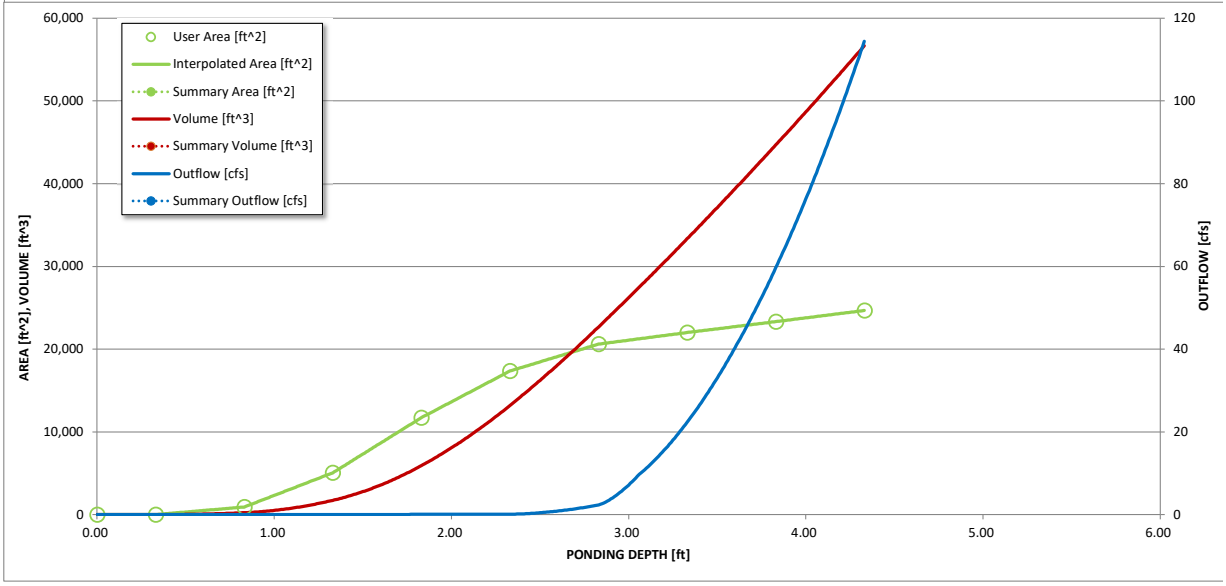
The emergency spillway shouldn't be activated in the 100-yr storm event, the pond outlet structure should be designed for the 100-yr.

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.07 (June 2025)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0	0.00	0.00	0.00	0.00	0.00	0.08	0.01	0.24
	0:15:00	0	0.00	0.67	1.10	1.36	0.91	1.11	1.11	1.51
	0:20:00	0	0.00	2.16	2.76	3.42	2.01	2.31	2.52	3.37
	0:25:00	0	0.00	4.73	7.21	9.46	4.63	5.48	6.15	9.43
	0:30:00	0	0.00	5.29	7.71	9.30	12.82	15.32	17.42	22.90
	0:35:00	0	0.00	4.01	5.66	6.82	11.94	14.01	17.11	22.18
	0:40:00	0	0.00	2.99	4.06	4.93	9.81	11.44	13.67	17.66
	0:45:00	0	0.00	2.00	2.85	3.62	7.17	8.38	10.67	13.79
	0:50:00	0	0.00	1.38	2.07	2.47	5.68	6.63	8.20	10.59
	0:55:00	0	0.00	1.00	1.45	1.84	3.73	4.38	5.89	7.65
	1:00:00	0	0.00	0.84	1.20	1.61	2.68	3.18	4.62	6.08
	1:05:00	0	0.00	0.79	1.12	1.54	2.22	2.67	4.10	5.44
	1:10:00	0	0.00	0.65	1.09	1.52	1.68	2.03	2.71	3.70
	1:15:00	0	0.00	0.58	0.97	1.52	1.41	1.71	2.00	2.81
	1:20:00	0	0.00	0.53	0.84	1.30	1.10	1.33	1.32	1.85
	1:25:00	0	0.00	0.51	0.78	1.03	0.95	1.13	0.96	1.33
	1:30:00	0	0.00	0.50	0.74	0.88	0.76	0.89	0.75	1.03
	1:35:00	0	0.00	0.49	0.72	0.79	0.66	0.77	0.66	0.91
	1:40:00	0	0.00	0.49	0.60	0.74	0.61	0.70	0.63	0.86
	1:45:00	0	0.00	0.49	0.53	0.71	0.59	0.67	0.62	0.84
	1:50:00	0	0.00	0.49	0.50	0.71	0.58	0.66	0.62	0.84
	1:55:00	0	0.00	0.38	0.48	0.67	0.58	0.66	0.62	0.84
	2:00:00	0	0.00	0.32	0.44	0.58	0.58	0.66	0.62	0.84
	2:05:00	0	0.00	0.17	0.24	0.31	0.31	0.35	0.34	0.45
	2:10:00	0	0.00	0.09	0.13	0.16	0.17	0.19	0.18	0.24
	2:15:00	0	0.00	0.04	0.06	0.08	0.08	0.09	0.09	0.12
	2:20:00	0	0.00	0.02	0.03	0.03	0.04	0.04	0.04	0.05
	2:25:00	0	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
	2:30:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:35:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:40:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:45:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.07 (June 2025)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Elevation [ft]	Area [ft ^{2}]	Area [acres]	Volume [ft ^{3}]	Volume [ac-ft]	Total Outflow [cfs]

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

Areas don't match with those shown on MHFD spreadsheet. Please verify correct area and revise as necessary

Detention Pond				Outlet Pipe Inv. Elev	Orifices				
Elevation	Depth	Area (FT^2)	Volume (FT^3)		Bottom Orifice CL	# Req'd	Sq. Inches Each	Dia. (In.)	Spacing (in)
5808.023	0	10	0	5807.77	5808.02	5	0.196	5/8	Varies
5808.853	0.83	910	382		5808.77		0.196	5/8	
5809.353	1.33	4853	1823		5809.27		0.785	1	
5809.853	1.83	10130	5568		5809.52		0.785	1	
5810.353	2.33	13958	11590		5809.77		0.785	1	
5810.853	2.83	17074	19348						
5811.353	3.33	19848	28579						
5811.853	3.83	22242	39101						
5812.353	4.33	24447	50774						

Basin Area (AC)	4.81
Imperviousness	49%

WQCV=a(0.91i^3-1.19i^2+0.78i)

WQCV (Basin-IN)	WQCV (FT^3)	WQCV (AC-FT)	WQCV Depth	WQCV WSEL	5 Year Depth	5 Year WSEL	100 Year Depth	100 Year WSEL
0.20	3553.90	0.082	1.63	5809.65	2.32	5810.34	2.88	5810.90

Storm Duration	5 Year Intensity	10 Year Intensity	100 Year Intensity
5	5.17	6.03	8.68
10	4.13	4.82	6.93
15	3.52	4.11	5.91
30	2.48	2.89	4.16
60	1.44	1.68	2.42

5 Year 1 Hour Depth	10 Year 1 Hour Depth	100 Year 1 Hour Depth
1.5	1.75	2.52

Rolling Meadows Spillway Calculations

3-14-2024

Is this also for the emergency spillway or something different?

Calculated by: Thayne Clement

Broad-Crested Weir Sizing		
Equation 5.10.2.3 WCECC: Q=C*L*H^(1.5)		
Solve For L: L=Q/(C*H^(1.5))		
Variable	Input	Units
Discharge Rate (Q)	3.66	cfs
Disharge Coefficient (C)	2.6	
Weir Height (H)	1.25	ft
Required Freeboard	1	ft
Width of Weir (L) - Required	11.26	ft
Width of Weir (L) - Provided	**12**	ft
100 Year Flow Depth	**0.24**	ft

Does not match with spillway design in MHFD spreadsheet. Please revise and ensure all calculations and plans match

Swale Disharge Flow Spread

Indicate which swale this is for

	5 Year Storm		100 Year Storm		Required D50 @ Specific Gravity 2.55
	Flow (cfs)	Velocity (ft/s)	Flow (cfs)	Velocity (ft/s)	
Pond Outlet	0.09	1.08	3.36	1.90	0.6

100 YR FLOW (CFS)	3.36
100 YR VELOCITY (FPS)	0.4
DIAMETER (FT)	1.8
TAILWATER DEPTH (FT)	0.49
FROUDE PARAMETER	0.77
EXPANSION FACTOR	4.50
EXPANSION ANGLE	0.11
RIPRAP D50 (IN)	1.829917

Provide design calculations for both swales discharging into pond

Spillway needs to be designed for full 100-year flow.

Emergency Spillway RipRap Sizing

Assume RipRap Specific Gravity 2.55

Variable	Input	Units
100 year Discharge Rate (Q)	3.36	cfs
Disharge Velocity (V)	#REF!	ft/s
Required D50 Value	#REF!	in
Provided D50 Value	6.00	in
Spillway Side Slope (X:1)	4	ft
100yr Flow Depth	0.49	ft
Spillway XS Area	#REF!	sqft

Fix information in table

Provide riprap sizing for level spreader

Det. Struct. Outlet RipRap Sizing

Izbash Formula: D50 = (V^2)/(2*32.2*(0.86^2)*(2.55-1))*12

Assume RipRap Specific Gravity 2.55

Variable	Input	Units
100 year Discharge Rate (Q)	0.08	cfs
Disharge Velocity (V)	0.05	ft/s
Required D50 Value	0.00	in
Provided D50 Value	6.00	in

Provide calculations for determining length and width for protection.

Spillway Geometry		
Pipe Diameter	18	in
Pipe XS Area	1.77	sqft

Per GEC plan details, there are several locations with outlet protection. Please ensure all pipes with outlet protection have design calculations provided.

Move to after Coefficient and Imperviousness sheets

Appendix B

Rational Method Modeling Results

Project Description

File Name	24028-5Y.SPF

Project Options

Flow Units	CFS
Elevation Type	Elevation
Hydrology Method	Rational
Time of Concentration (TOC) Method	User-Defined
Link Routing Method	Kinematic Wave
Enable Overflow Ponding at Nodes	YES
Skip Steady State Analysis Time Periods	NO

Analysis Options

Start Analysis On	00:00:00	0:00:00
End Analysis On	00:00:00	0:00:00
Start Reporting On	00:00:00	0:00:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:05:00	days hh:mm:ss
Routing Time Step	30	seconds

Number of Elements

	Qty
Rain Gages	0
Subbasins	8
Nodes	16
Junctions	13
Outfalls	2
Flow Diversions	0
Inlets	0
Storage Nodes	1
Links	20
Channels	0
Pipes	13
Pumps	0
Orifices	5
Weirs	2
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

Return Period	5 year(s)

Rolling Meadows Substation
5-Year Storm Event

Subbasin Summary

SN	Subbasin ID	Area (ac)	Weighted Runoff Coefficient	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	Ex	4.76	0.4200	0.69	0.29	1.38	8.26	0 00:10:00
2	P1	0.63	0.1700	0.69	0.12	0.07	0.44	0 00:10:00
3	P2	0.97	0.0900	0.69	0.06	0.06	0.36	0 00:10:00
4	P3	0.72	0.1600	0.69	0.11	0.08	0.48	0 00:10:00
5	P4	0.73	0.9000	0.69	0.62	0.45	2.71	0 00:10:00
6	Y1	0.43	0.5900	0.69	0.41	0.17	1.05	0 00:10:00
7	Y2	0.61	0.5900	0.69	0.41	0.25	1.49	0 00:10:00
8	Y3	0.72	0.5900	0.69	0.41	0.29	1.75	0 00:10:00

Include EXCL1 & 2

Rolling Meadows Substation
5-Year Storm Event

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft^2)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	1-Jun	Junction	5812.59	5815.82	0.00	6.00	0.00	1.45	5813.06	0.00	2.76	0 00:00	0.00	0.00
2	2-Jun	Junction	5811.19	5814.56	0.00	6.00	0.00	2.77	5811.79	0.00	2.77	0 00:00	0.00	0.00
3	3-Jun	Junction	5810.49	5810.38	0.00	6.00	0.00	2.76	5811.09	0.00	0.65	0 00:00	0.00	0.00
4	5-Jun	Junction	5811.49	5814.60	5811.49	6.00	0.00	1.73	5812.03	0.00	2.57	0 00:00	0.00	0.00
5	6-Jun	Junction	5813.17	5813.95	0.00	6.00	0.00	0.44	5813.42	0.00	0.75	0 00:00	0.00	0.00
6	7-Jun	Junction	5811.35	5812.35	0.00	6.00	0.00	0.36	5811.35	0.00	1.00	0 00:00	0.00	0.00
7	8-Jun	Junction	5808.00	5809.00	0.00	6.00	0.00	0.48	5808.00	0.00	1.00	0 00:00	0.00	0.00
8	9-Jun	Junction	5804.42	5809.00	0.00	6.00	0.00	0.05	5807.87	0.00	1.40	0 00:00	0.00	0.00
9	10-Jun	Junction	5804.00	5806.00	0.00	6.00	0.00	0.05	5807.64	0.00	1.40	0 00:00	0.00	0.00
10	11-Jun	Junction	5812.00	5818.00	5812.00	0.00	0.00	1.44	5812.51	0.00	5.49	0 00:00	0.00	0.00
11	12-Jun	Junction	5812.97	5815.57	0.00	0.00	0.00	1.75	5813.51	0.00	2.06	0 00:00	0.00	0.00
12	13-Jun	Junction	5813.82	5815.99	5813.82	0.00	0.00	1.05	5814.27	0.00	1.72	0 00:00	0.00	0.00
13	SD-N-Out	Junction	5809.62	5809.62	0.00	6.00	0.00	1.72	5810.11	0.00	0.60	0 00:00	0.00	0.00
14	Out-01	Outfall	5807.54					0.05	5807.54					
15	Out-02	Outfall	0.00					8.26	0.00					
16	EDB	Storage Node	5808.35	5812.35	0.00		0.00	7.92	5809.76				0.00	0.00

Rolling Meadows Substation
5-Year Storm Event

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Reported Condition
					(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
1	01-12-NP	Pipe	6-Jun	1-Jun	50.00	5813.17	5812.59	1.1600	12.000	0.0150	0.44	3.33	0.13	3.48	0.24	0.25	0.00	Calculated
2	02-12-P	Pipe	13-Jun	1-Jun	180.00	5813.49	5812.59	0.5000	12.000	0.0150	1.02	2.55	0.40	4.90	0.44	0.44	0.00	Calculated
3	03-15-NP	Pipe	1-Jun	11-Jun	80.00	5812.34	5811.94	0.5000	15.000	0.0150	1.44	4.81	0.30	3.44	0.47	0.38	0.00	Calculated
4	04-15-P	Pipe	11-Jun	2-Jun	150.00	5811.94	5811.19	0.5000	15.000	0.0150	1.43	4.11	0.35	3.09	0.51	0.41	0.00	Calculated
5	05-15-NP	Pipe	2-Jun	3-Jun	60.61	5811.19	5810.38	1.3400	15.000	0.0150	2.76	6.02	0.46	4.80	0.60	0.48	0.00	Calculated
6	06-12-P	Pipe	12-Jun	5-Jun	150.00	5812.97	5811.49	0.9900	12.000	0.0150	1.73	3.07	0.56	5.86	0.54	0.54	0.00	Calculated
7	07-12-NP	Pipe	5-Jun	SD-N-Out	64.51	5811.49	5809.71	2.7600	12.000	0.0150	1.72	5.13	0.34	5.89	0.40	0.40	0.00	Calculated
8	08-18-NP	Pipe	9-Jun	10-Jun	45.77	5807.77	5807.54	0.5000	18.000	0.0150	0.05	6.45	0.01	1.10	0.10	0.06	0.00	Calculated
9	Link-04	Pipe	7-Jun	EDB	130.91	0.00	0.00	0.0000	0.000	0.0150	0.36	0.00	0.01	0.00	0.10	0.06	0.00	Calculated
10	Link-05	Pipe	SD-N-Out	EDB	112.84	0.00	0.00	0.0000	0.000	0.0150	1.72	0.00	0.01	0.00	0.10	0.06	0.00	Calculated
11	Link-06	Pipe	3-Jun	EDB	93.80	0.00	0.00	0.0000	0.000	0.0150	2.76	0.00	0.01	0.00	0.10	0.06	0.00	Calculated
12	Link-07	Pipe	8-Jun	EDB	144.91	0.00	0.00	0.0000	0.000	0.0150	0.48	0.00	0.01	0.00	0.10	0.06	0.00	Calculated
13	Link-10	Pipe	10-Jun	Out-01	53.10	5804.00	5803.73	0.5100	0.000	0.0150	0.05	0.00	0.01	0.00	0.10	0.06	0.00	Calculated
14	Orifice-01	Orifice	EDB	9-Jun		5808.35	5804.42		0.625		0.01							
15	Orifice-02	Orifice	EDB	9-Jun		5808.35	5804.42		0.625		0.01							
16	Orifice-03	Orifice	EDB	9-Jun		5808.35	5804.42		1.000		0.02							
17	Orifice-04	Orifice	EDB	9-Jun		5808.35	5804.42		1.000		0.01							
18	Orifice-05	Orifice	EDB	9-Jun		5808.35	5804.42		1.000		0.00							
19	Spillway	Weir	EDB	10-Jun		5808.35	5804.00				0.00							
20	Weir-01	Weir	EDB	9-Jun		5808.35	5804.42				0.00							

Subbasin Hydrology

Subbasin : Ex

Input Data

Area (ac)	4.76
Weighted Runoff Coefficient	0.42

Runoff Coefficient

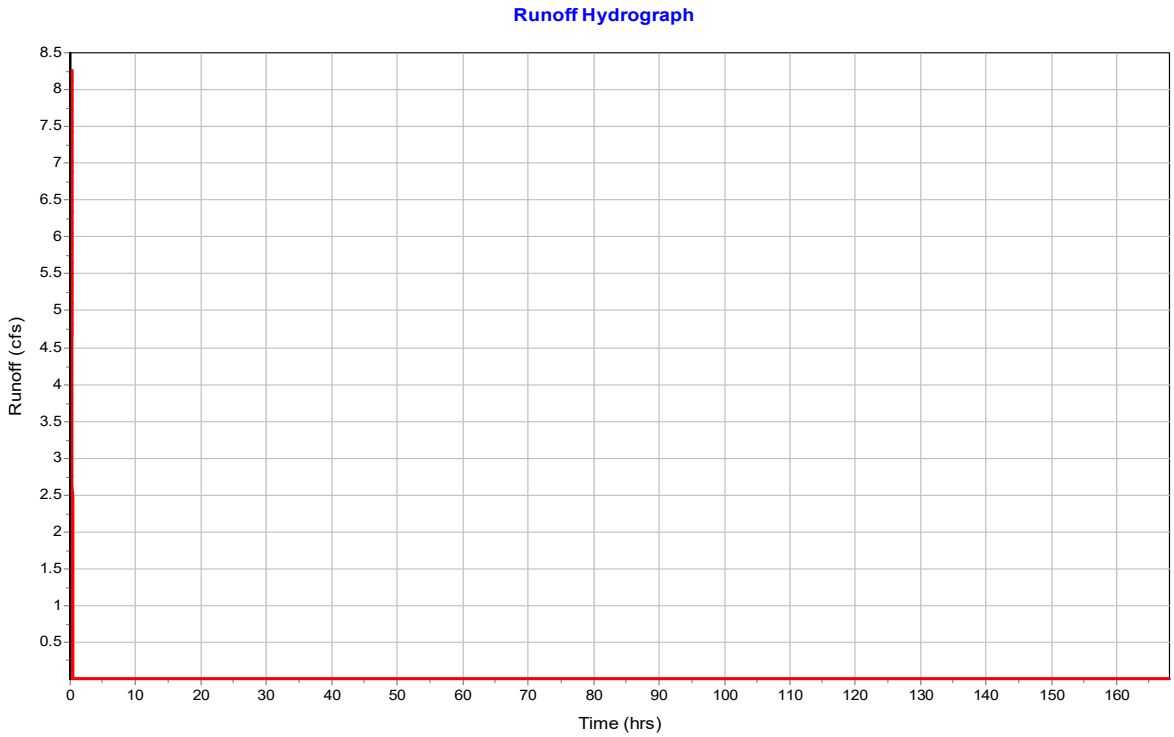
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	4.81	-	0.42
Composite Area & Weighted Runoff Coeff.	4.81		0.42

Subbasin Runoff Results

Total Rainfall (in)	0.69
Total Runoff (in)	0.29
Peak Runoff (cfs)	8.26
Rainfall Intensity	4.13
Weighted Runoff Coefficient	0.42
Time of Concentration (days hh:mm:ss)	0 00:10:00

Rolling Meadows Substation
5-Year Storm Event

Subbasin : Ex



Rolling Meadows Substation
5-Year Storm Event

Subbasin : P1

Input Data

Area (ac)	0.63
Weighted Runoff Coefficient	0.17

Runoff Coefficient

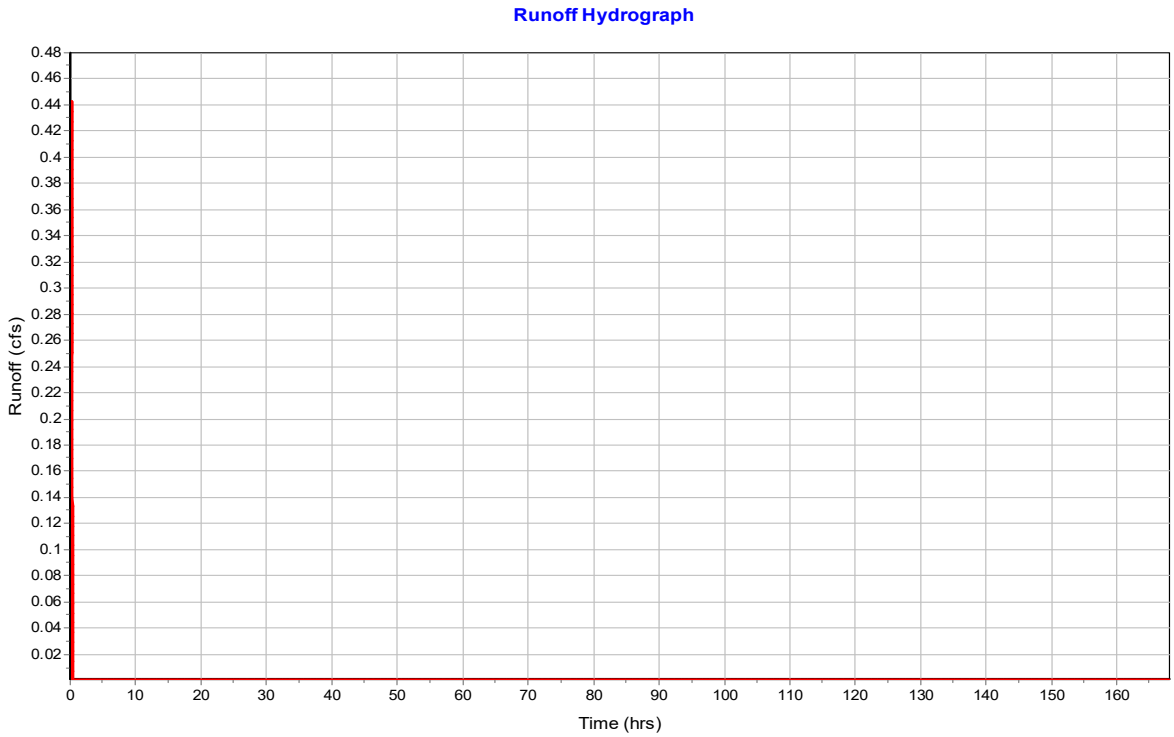
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.63	-	0.17
Composite Area & Weighted Runoff Coeff.	0.63		0.17

Subbasin Runoff Results

Total Rainfall (in)	0.69
Total Runoff (in)	0.12
Peak Runoff (cfs)	0.44
Rainfall Intensity	4.13
Weighted Runoff Coefficient	0.17
Time of Concentration (days hh:mm:ss)	0 00:10:00

Rolling Meadows Substation
5-Year Storm Event

Subbasin : P1



Rolling Meadows Substation
5-Year Storm Event

Subbasin : P2

Input Data

Area (ac)	0.97
Weighted Runoff Coefficient	0.09

Runoff Coefficient

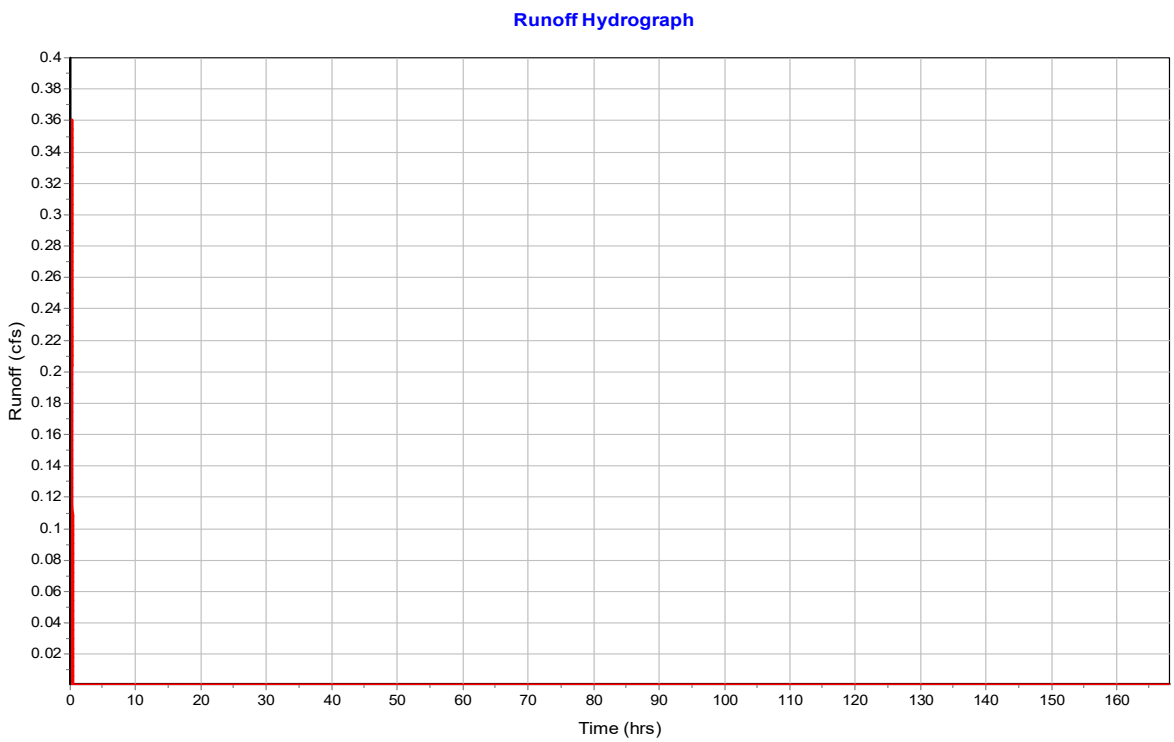
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.97	-	0.09
Composite Area & Weighted Runoff Coeff.	0.97		0.09

Subbasin Runoff Results

Total Rainfall (in)	0.69
Total Runoff (in)	0.06
Peak Runoff (cfs)	0.36
Rainfall Intensity	4.13
Weighted Runoff Coefficient	0.09
Time of Concentration (days hh:mm:ss)	0 00:10:00

Rolling Meadows Substation
5-Year Storm Event

Subbasin : P2



Rolling Meadows Substation
5-Year Storm Event

Subbasin : P3

Input Data

Area (ac)	0.72
Weighted Runoff Coefficient	0.16

Runoff Coefficient

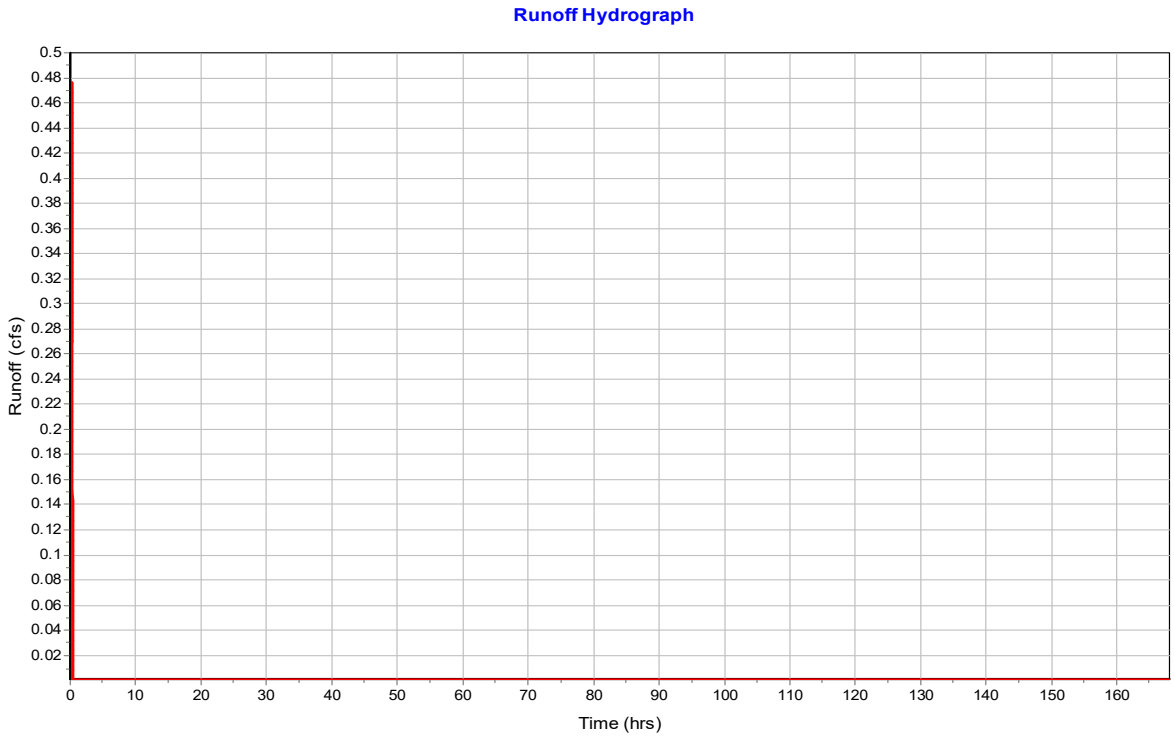
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.72	-	0.16
Composite Area & Weighted Runoff Coeff.	0.72		0.16

Subbasin Runoff Results

Total Rainfall (in)	0.69
Total Runoff (in)	0.11
Peak Runoff (cfs)	0.48
Rainfall Intensity	4.13
Weighted Runoff Coefficient	0.16
Time of Concentration (days hh:mm:ss)	0 00:10:00

Rolling Meadows Substation
5-Year Storm Event

Subbasin : P3



Rolling Meadows Substation
5-Year Storm Event

Subbasin : P4

Input Data

Area (ac) 0.73
Weighted Runoff Coefficient 0.9

Runoff Coefficient

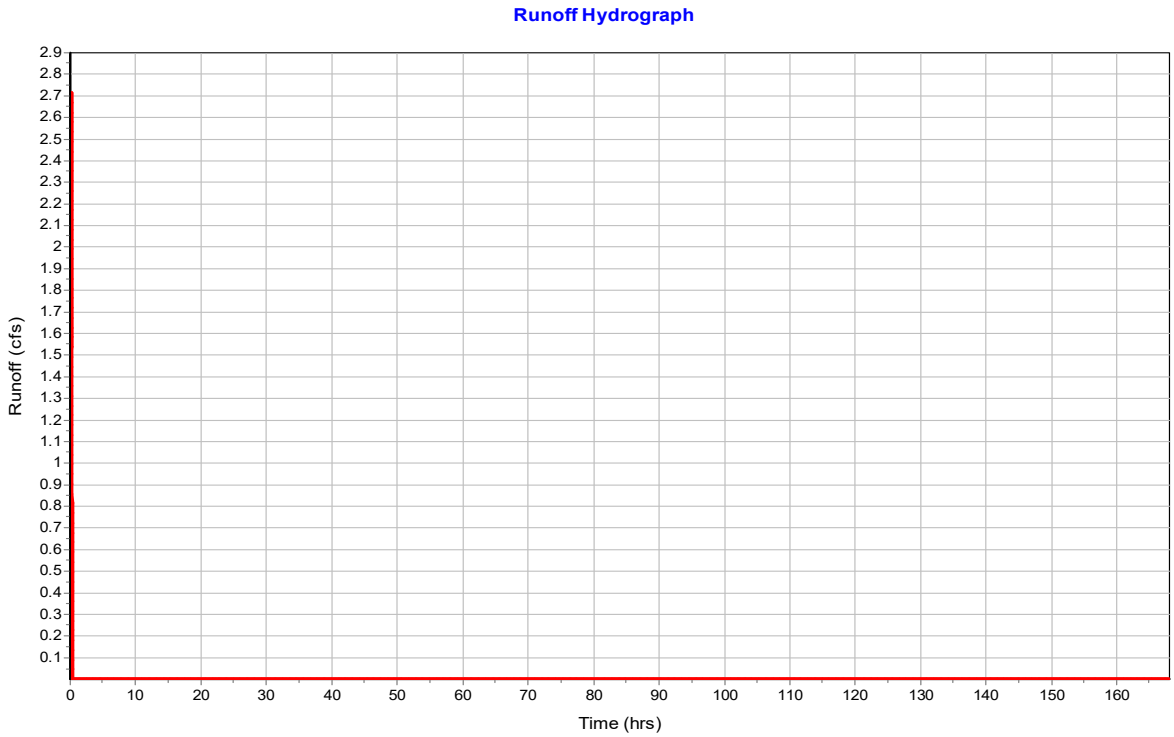
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.73	-	0.9
Composite Area & Weighted Runoff Coeff.	0.73		0.9

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.62
Peak Runoff (cfs) 2.71
Rainfall Intensity 4.13
Weighted Runoff Coefficient 0.9
Time of Concentration (days hh:mm:ss) 0 00:10:00

Rolling Meadows Substation
5-Year Storm Event

Subbasin : P4



Rolling Meadows Substation
5-Year Storm Event

Subbasin : Y1

Input Data

Area (ac)	0.43
Weighted Runoff Coefficient	0.59

Runoff Coefficient

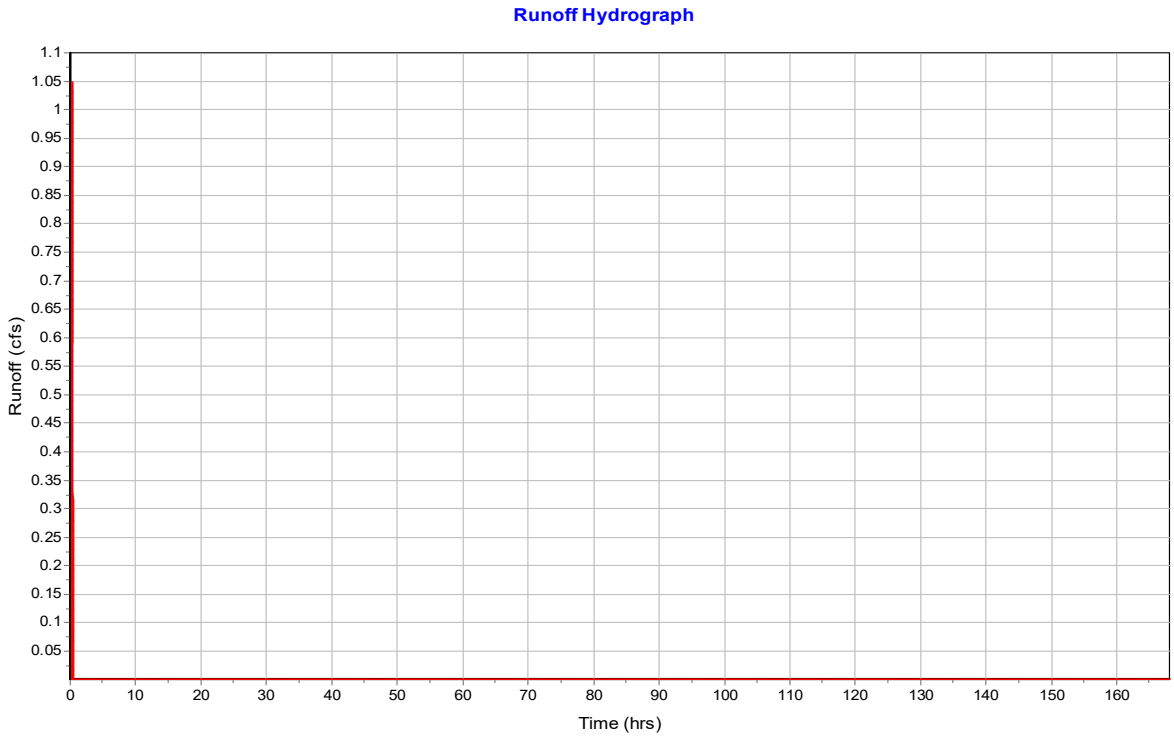
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.43	-	0.59
Composite Area & Weighted Runoff Coeff.	0.43		0.59

Subbasin Runoff Results

Total Rainfall (in)	0.69
Total Runoff (in)	0.41
Peak Runoff (cfs)	1.05
Rainfall Intensity	4.13
Weighted Runoff Coefficient	0.59
Time of Concentration (days hh:mm:ss)	0 00:10:00

Rolling Meadows Substation
5-Year Storm Event

Subbasin : Y1



Rolling Meadows Substation
5-Year Storm Event

Subbasin : Y2

Input Data

Area (ac)	0.61
Weighted Runoff Coefficient	0.59

Runoff Coefficient

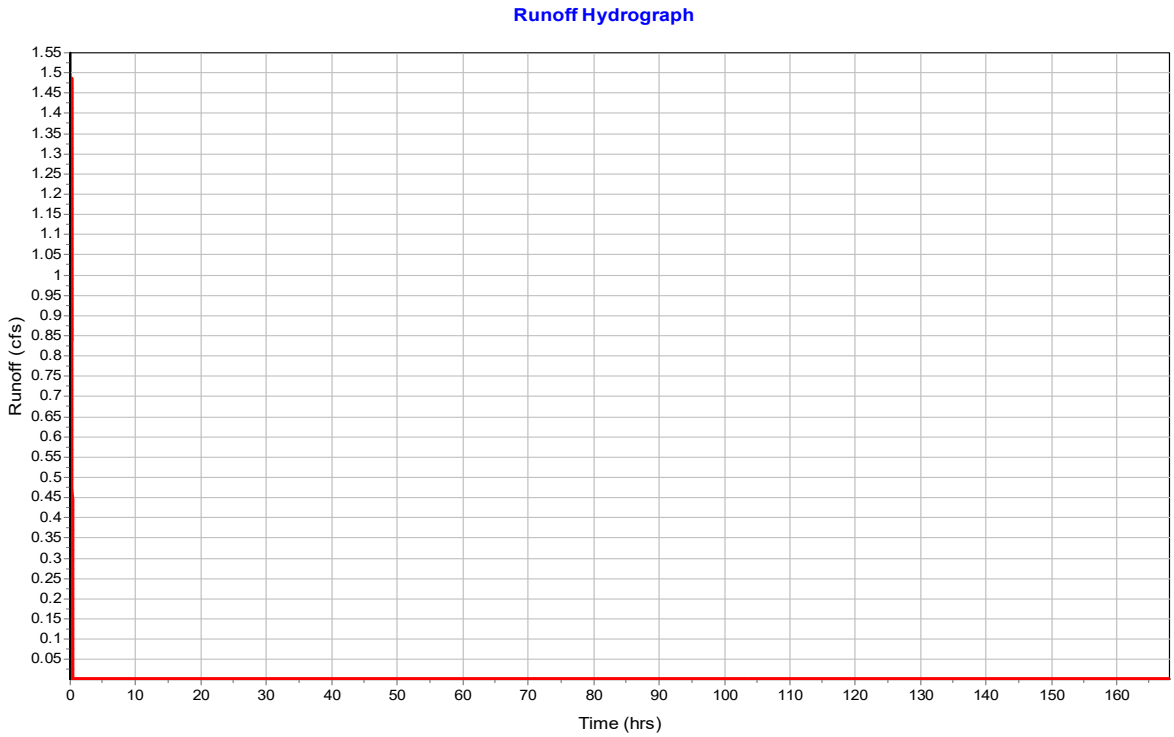
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.61	-	0.59
Composite Area & Weighted Runoff Coeff.	0.61		0.59

Subbasin Runoff Results

Total Rainfall (in)	0.69
Total Runoff (in)	0.41
Peak Runoff (cfs)	1.49
Rainfall Intensity	4.13
Weighted Runoff Coefficient	0.59
Time of Concentration (days hh:mm:ss)	0 00:10:00

Rolling Meadows Substation
5-Year Storm Event

Subbasin : Y2



Rolling Meadows Substation
5-Year Storm Event

Subbasin : Y3

Input Data

Area (ac)	0.72
Weighted Runoff Coefficient	0.59

Runoff Coefficient

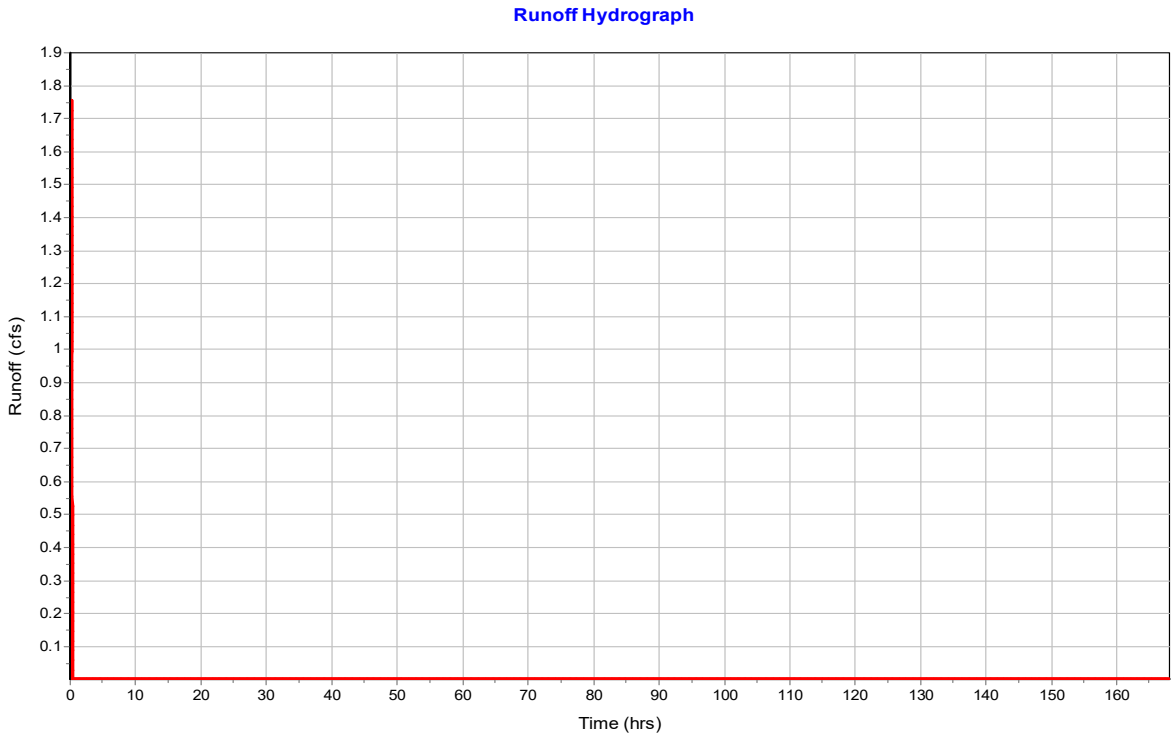
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	5	-	0.59
Composite Area & Weighted Runoff Coeff.	5		0.59

Subbasin Runoff Results

Total Rainfall (in)	0.69
Total Runoff (in)	0.41
Peak Runoff (cfs)	1.75
Rainfall Intensity	4.13
Weighted Runoff Coefficient	0.59
Time of Concentration (days hh:mm:ss)	0 00:10:00

Rolling Meadows Substation
5-Year Storm Event

Subbasin : Y3



Rolling Meadows Substation
5-Year Storm Event

Junction Input

SN	Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft^2)	Minimum Pipe Cover (in)
1	1-Jun	5812.59	5815.82	3.23	0.00	-5812.59	6.00	-5809.82	0.00	0.00
2	2-Jun	5811.19	5814.56	3.37	0.00	-5811.19	6.00	-5808.56	0.00	0.00
3	3-Jun	5810.49	5810.38	-0.11	0.00	-5810.49	6.00	-5804.38	0.00	0.00
4	5-Jun	5811.49	5814.60	3.11	5811.49	0.00	6.00	-5808.60	0.00	0.00
5	6-Jun	5813.17	5813.95	0.78	0.00	-5813.17	6.00	-5807.95	0.00	0.00
6	7-Jun	5811.35	5812.35	1.00	0.00	-5811.35	6.00	-5806.35	0.00	0.00
7	8-Jun	5808.00	5809.00	1.00	0.00	-5808.00	6.00	-5803.00	0.00	0.00
8	9-Jun	5804.42	5809.00	4.58	0.00	-5804.42	6.00	-5803.00	0.00	0.00
9	10-Jun	5804.00	5806.00	2.00	0.00	-5804.00	6.00	-5800.00	0.00	0.00
10	11-Jun	5812.00	5818.00	6.00	5812.00	0.00	0.00	-5818.00	0.00	0.00
11	12-Jun	5812.97	5815.57	2.60	0.00	-5812.97	0.00	-5815.57	0.00	0.00
12	13-Jun	5813.82	5815.99	2.17	5813.82	0.00	0.00	-5815.99	0.00	0.00
13	SD-N-Out	5809.62	5809.62	0.00	0.00	-5809.62	6.00	-5803.62	0.00	0.00

Rolling Meadows Substation
5-Year Storm Event

Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	1-Jun	1.45	0.00	5813.06	0.47	0.00	2.76	5812.59	0.00	0 00:10	0 00:00	0.00	0.00
2	2-Jun	2.77	1.49	5811.79	0.60	0.00	2.77	5811.19	0.00	0 00:10	0 00:00	0.00	0.00
3	3-Jun	2.76	0.00	5811.09	0.60	0.00	0.65	5810.49	0.00	0 00:11	0 00:00	0.00	0.00
4	5-Jun	1.73	0.00	5812.03	0.54	0.00	2.57	5811.49	0.00	0 00:10	0 00:00	0.00	0.00
5	6-Jun	0.44	0.44	5813.42	0.25	0.00	0.75	5813.17	0.00	0 00:10	0 00:00	0.00	0.00
6	7-Jun	0.36	0.36	5811.35	0.00	0.00	1.00	5811.35	0.00	0 00:00	0 00:00	0.00	0.00
7	8-Jun	0.48	0.48	5808.00	0.00	0.00	1.00	5808.00	0.00	0 00:00	0 00:00	0.00	0.00
8	9-Jun	0.05	0.00	5807.87	3.45	0.00	1.40	5807.79	3.37	0 00:24	0 00:00	0.00	0.00
9	10-Jun	0.05	0.00	5807.64	3.64	0.00	1.40	5807.56	3.56	0 00:24	0 00:00	0.00	0.00
10	11-Jun	1.44	0.00	5812.51	0.51	0.00	5.49	5812.00	0.00	0 00:10	0 00:00	0.00	0.00
11	12-Jun	1.75	1.75	5813.51	0.54	0.00	2.06	5812.97	0.00	0 00:10	0 00:00	0.00	0.00
12	13-Jun	1.05	1.05	5814.27	0.45	0.00	1.72	5813.82	0.00	0 00:10	0 00:00	0.00	0.00
13	SD-N-Out	1.72	0.00	5810.11	0.49	0.00	0.60	5809.71	0.09	0 00:10	0 00:00	0.00	0.00

Rolling Meadows Substation
5-Year Storm Event

Pipe Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate	No. of Barrels
1	01-12-NP	50.00	5813.17	0.00	5812.59	0.00	0.58	1.1600	CIRCULAR	12.000	12.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
2	02-12-P	180.00	5813.49	-0.33	5812.59	0.00	0.90	0.5000	CIRCULAR	12.000	12.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
3	03-15-NP	80.00	5812.34	-0.25	5811.94	-0.06	0.40	0.5000	CIRCULAR	15.000	15.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
4	04-15-P	150.00	5811.94	-0.06	5811.19	0.00	0.75	0.5000	CIRCULAR	15.000	15.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
5	05-15-NP	60.61	5811.19	0.00	5810.38	-0.11	0.81	1.3400	CIRCULAR	15.000	15.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
6	06-12-P	150.00	5812.97	0.00	5811.49	0.00	1.48	0.9900	CIRCULAR	12.000	12.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
7	07-12-NP	64.51	5811.49	0.00	5809.71	0.09	1.78	2.7600	CIRCULAR	12.000	12.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
8	08-18-NP	45.77	5807.77	3.35	5807.54	3.54	0.23	0.5000	CIRCULAR	18.000	18.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
9	Link-04	130.91	0.00	-5811.35	0.00	-5808.35	0.00	0.0000	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
10	Link-05	112.84	0.00	-5809.62	0.00	-5808.35	0.00	0.0000	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
11	Link-06	93.80	0.00	-5810.49	0.00	-5808.35	0.00	0.0000	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
12	Link-07	144.91	0.00	-5808.00	0.00	-5808.35	0.00	0.0000	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
13	Link-10	53.10	5804.00	0.00	5803.73	-3.81	0.27	0.5100	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1

Rolling Meadows Substation
5-Year Storm Event

Pipe Results

SN	Element ID	Peak Flow	Time of Peak Flow Occurrence	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Travel Time	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Froude Number	Reported Condition
		(cfs)	(days hh:mm)	(cfs)		(ft/sec)	(min)	(ft)		(min)		
1	01-12-NP	0.44	0 00:10	3.33	0.13	3.48	0.24	0.24	0.25	0.00		Calculated
2	02-12-P	1.02	0 00:10	2.55	0.40	4.90	0.61	0.44	0.44	0.00		Calculated
3	03-15-NP	1.44	0 00:10	4.81	0.30	3.44	0.39	0.47	0.38	0.00		Calculated
4	04-15-P	1.43	0 00:11	4.11	0.35	3.09	0.81	0.51	0.41	0.00		Calculated
5	05-15-NP	2.76	0 00:11	6.02	0.46	4.80	0.21	0.60	0.48	0.00		Calculated
6	06-12-P	1.73	0 00:10	3.07	0.56	5.86	0.43	0.54	0.54	0.00		Calculated
7	07-12-NP	1.72	0 00:10	5.13	0.34	5.89	0.18	0.40	0.40	0.00		Calculated
8	08-18-NP	0.05	0 00:24	6.45	0.01	1.10	0.69	0.10	0.06	0.00		Calculated
9	Link-04	0.36	0 00:10	0.00	0.01	0.00		0.10	0.06	0.00		Calculated
10	Link-05	1.72	0 00:10	0.00	0.01	0.00		0.10	0.06	0.00		Calculated
11	Link-06	2.76	0 00:11	0.00	0.01	0.00		0.10	0.06	0.00		Calculated
12	Link-07	0.48	0 00:10	0.00	0.01	0.00		0.10	0.06	0.00		Calculated
13	Link-10	0.05	0 00:24	0.00	0.01	0.00		0.10	0.06	0.00		Calculated

Storage Nodes

Storage Node : EDB

Input Data

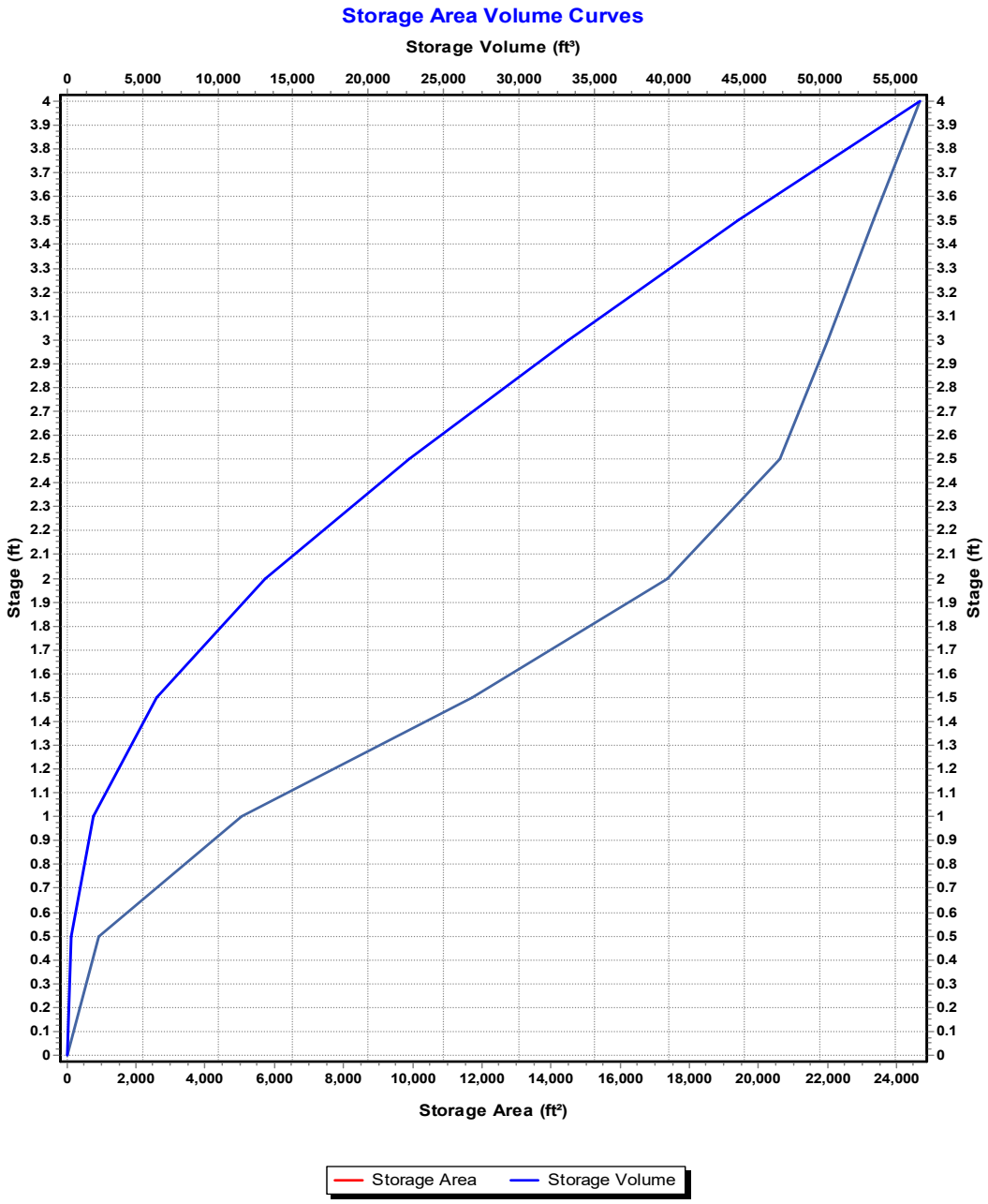
Invert Elevation (ft)	5808.35
Max (Rim) Elevation (ft)	5812.35
Max (Rim) Offset (ft)	4.00
Initial Water Elevation (ft)	0.00
Initial Water Depth (ft)	-5808.35
Ponded Area (ft^2)	0.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : Storage-01

Stage (ft)	Storage Area (ft^2)	Storage Volume (ft^3)
0	10	0
0.5	917	231.75
1	5052	1724
1.5	11717	5916.25
2	17359	13185.25
2.5	20610	22677.5
3	22010	33332.5
3.5	23327	44666.75
4	24671	56666.25

Rolling Meadows Substation
5-Year Storm Event



Storage Node : EDB (continued)

Outflow Weirs

SN	Element ID	Weir Type	Flap Gate	Crest Elevation (ft)	Crest Offset (ft)	Length (ft)	Weir Total Height (ft)	Discharge Coefficient
1	Spillway	Trapezoidal	No	5811.10	2.75	50.00	1.25	3.33
2	Weir-01	Rectangular	No	5810.35	2.00	4.00	0.75	3.33

Outflow Orifices

SN	Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (in)	Rectangular Orifice Height (in)	Rectangular Orifice Width (in)	Orifice Invert Elevation (ft)	Orifice Coefficient
1	Orifice-01	Side	CIRCULAR	No	0.63			5808.02	0.61
2	Orifice-02	Side	CIRCULAR	No	0.63			5808.77	0.61
3	Orifice-03	Side	CIRCULAR	No	1.00			5809.27	0.61
4	Orifice-04	Side	CIRCULAR	No	1.00			5809.52	0.61
5	Orifice-05	Side	CIRCULAR	No	1.00			5809.77	0.61

Output Summary Results

Peak Inflow (cfs)	7.92
Peak Lateral Inflow (cfs)	2.71
Peak Outflow (cfs)	0.05
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	5809.76
Max HGL Depth Attained (ft)	1.41
Average HGL Elevation Attained (ft)	5808.67
Average HGL Depth Attained (ft)	0.32
Time of Max HGL Occurrence (days hh:mm)	0 00:24
Total Exfiltration Volume (1000-ft³)	0
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

Project Description

File Name	24028-100Y.SPF

Project Options

Flow Units	CFS
Elevation Type	Elevation
Hydrology Method	Rational
Time of Concentration (TOC) Method	User-Defined
Link Routing Method	Kinematic Wave
Enable Overflow Ponding at Nodes	YES
Skip Steady State Analysis Time Periods	NO

Analysis Options

Start Analysis On	00:00:00	0:00:00
End Analysis On	00:00:00	0:00:00
Start Reporting On	00:00:00	0:00:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:05:00	days hh:mm:ss
Routing Time Step	30	seconds

Number of Elements

	Qty
Rain Gages	0
Subbasins	8
Nodes	16
Junctions	13
Outfalls	2
Flow Diversions	0
Inlets	0
Storage Nodes	1
Links	20
Channels	0
Pipes	13
Pumps	0
Orifices	5
Weirs	2
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

Return Period	100 year(s)

Rolling Meadows Substation
100-Year Storm Event

Subbasin Summary

SN	Subbasin ID	Area (ac)	Weighted Runoff Coefficient	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	Ex	4.76	0.4200	1.16	0.49	2.31	13.85	0 00:10:00
2	P1	0.63	0.1700	1.16	0.20	0.12	0.74	0 00:10:00
3	P2	0.97	0.0900	1.16	0.10	0.10	0.61	0 00:10:00
4	P3	0.72	0.1600	1.16	0.19	0.13	0.80	0 00:10:00
5	P4	0.73	0.9000	1.16	1.04	0.76	4.55	0 00:10:00
6	Y1	0.43	0.5900	1.16	0.68	0.29	1.76	0 00:10:00
7	Y2	0.61	0.5900	1.16	0.68	0.42	2.49	0 00:10:00
8	Y3	0.72	0.5900	1.16	0.68	0.49	2.94	0 00:10:00

Rolling Meadows Substation
100-Year Storm Event

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft^2)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	1-Jun	Junction	5812.59	5815.82	0.00	6.00	0.00	2.43	5813.22	0.00	2.60	0 00:00	0.00	0.00
2	2-Jun	Junction	5811.19	5814.56	0.00	6.00	0.00	4.65	5812.01	0.00	2.55	0 00:00	0.00	0.00
3	3-Jun	Junction	5810.49	5810.38	0.00	6.00	0.00	4.64	5811.31	0.00	0.43	0 00:00	0.00	0.00
4	5-Jun	Junction	5811.49	5814.60	5811.49	6.00	0.00	2.90	5812.26	0.00	2.34	0 00:00	0.00	0.00
5	6-Jun	Junction	5813.17	5813.95	0.00	6.00	0.00	0.74	5813.49	0.00	0.68	0 00:00	0.00	0.00
6	7-Jun	Junction	5811.35	5812.35	0.00	6.00	0.00	0.60	5811.35	0.00	1.00	0 00:00	0.00	0.00
7	8-Jun	Junction	5808.00	5809.00	0.00	6.00	0.00	0.80	5808.00	0.00	1.00	0 00:00	0.00	0.00
8	9-Jun	Junction	5804.42	5809.00	0.00	6.00	0.00	0.08	5807.89	0.00	1.38	0 00:00	0.00	0.00
9	10-Jun	Junction	5804.00	5806.00	0.00	6.00	0.00	0.08	5807.66	0.00	1.38	0 00:00	0.00	0.00
10	11-Jun	Junction	5812.00	5818.00	5812.00	0.00	0.00	2.42	5812.69	0.00	5.31	0 00:00	0.00	0.00
11	12-Jun	Junction	5812.97	5815.57	0.00	0.00	0.00	2.94	5813.76	0.00	1.81	0 00:00	0.00	0.00
12	13-Jun	Junction	5813.82	5815.99	5813.82	0.00	0.00	1.76	5814.43	0.00	1.56	0 00:00	0.00	0.00
13	SD-N-Out	Junction	5809.62	5809.62	0.00	6.00	0.00	2.89	5810.25	0.00	0.46	0 00:00	0.00	0.00
14	Out-01	Outfall	5807.54					0.08	5807.54					
15	Out-02	Outfall	0.00					13.85	0.00					
16	EDB	Storage Node	5808.35	5812.35	0.00		0.00	13.30	5810.03				0.00	0.00

Rolling Meadows Substation
100-Year Storm Event

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Reported Condition
					(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
1	01-12-NP	Pipe	6-Jun	1-Jun	50.00	5813.17	5812.59	1.1600	12.000	0.0150	0.74	3.33	0.22	3.93	0.32	0.32	0.00	Calculated
2	02-12-P	Pipe	13-Jun	1-Jun	180.00	5813.49	5812.59	0.5000	12.000	0.0150	1.71	2.55	0.67	5.46	0.60	0.60	0.00	Calculated
3	03-15-NP	Pipe	1-Jun	11-Jun	80.00	5812.34	5811.94	0.5000	15.000	0.0150	2.42	4.81	0.50	3.94	0.63	0.50	0.00	Calculated
4	04-15-P	Pipe	11-Jun	2-Jun	150.00	5811.94	5811.19	0.5000	15.000	0.0150	2.40	4.11	0.58	3.52	0.68	0.55	0.00	Calculated
5	05-15-NP	Pipe	2-Jun	3-Jun	60.61	5811.19	5810.38	1.3400	15.000	0.0150	4.64	6.02	0.77	5.42	0.82	0.66	0.00	Calculated
6	06-12-P	Pipe	12-Jun	5-Jun	150.00	5812.97	5811.49	0.9900	12.000	0.0150	2.90	3.07	0.94	6.46	0.77	0.77	0.00	Calculated
7	07-12-NP	Pipe	5-Jun	SD-N-Out	64.51	5811.49	5809.71	2.7600	12.000	0.0150	2.89	5.13	0.56	6.73	0.54	0.54	0.00	Calculated
8	08-18-NP	Pipe	9-Jun	10-Jun	45.77	5807.77	5807.54	0.5000	18.000	0.0150	0.08	6.45	0.01	1.25	0.12	0.08	0.00	Calculated
9	Link-04	Pipe	7-Jun	EDB	130.91	0.00	0.00	0.0000	0.000	0.0150	0.60	0.00	0.01	0.00	0.12	0.08	0.00	Calculated
10	Link-05	Pipe	SD-N-Out	EDB	112.84	0.00	0.00	0.0000	0.000	0.0150	2.89	0.00	0.01	0.00	0.12	0.08	0.00	Calculated
11	Link-06	Pipe	3-Jun	EDB	93.80	0.00	0.00	0.0000	0.000	0.0150	4.64	0.00	0.01	0.00	0.12	0.08	0.00	Calculated
12	Link-07	Pipe	8-Jun	EDB	144.91	0.00	0.00	0.0000	0.000	0.0150	0.80	0.00	0.01	0.00	0.12	0.08	0.00	Calculated
13	Link-10	Pipe	10-Jun	Out-01	53.10	5804.00	5803.73	0.5100	0.000	0.0150	0.08	0.00	0.01	0.00	0.12	0.08	0.00	Calculated
14	Orifice-01	Orifice	EDB	9-Jun		5808.35	5804.42		0.625		0.01							
15	Orifice-02	Orifice	EDB	9-Jun		5808.35	5804.42		0.625		0.01							
16	Orifice-03	Orifice	EDB	9-Jun		5808.35	5804.42		1.000		0.02							
17	Orifice-04	Orifice	EDB	9-Jun		5808.35	5804.42		1.000		0.02							
18	Orifice-05	Orifice	EDB	9-Jun		5808.35	5804.42		1.000		0.01							
19	Spillway	Weir	EDB	10-Jun		5808.35	5804.00				0.00							
20	Weir-01	Weir	EDB	9-Jun		5808.35	5804.42				0.00							

Subbasin Hydrology

Subbasin : Ex

Input Data

Area (ac)	4.76
Weighted Runoff Coefficient	0.42

Runoff Coefficient

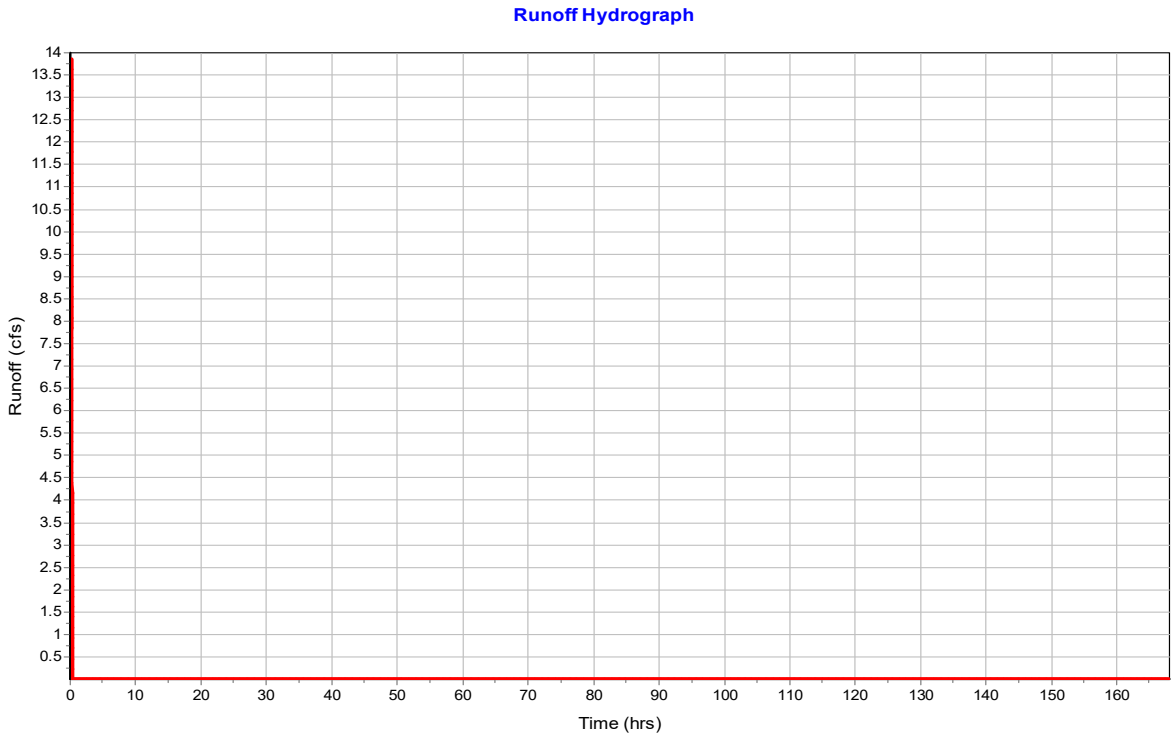
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	4.81	-	0.42
Composite Area & Weighted Runoff Coeff.	4.81		0.42

Subbasin Runoff Results

Total Rainfall (in)	1.16
Total Runoff (in)	0.49
Peak Runoff (cfs)	13.85
Rainfall Intensity	6.93
Weighted Runoff Coefficient	0.42
Time of Concentration (days hh:mm:ss)	0 00:10:00

Rolling Meadows Substation
100-Year Storm Event

Subbasin : Ex



Rolling Meadows Substation
100-Year Storm Event

Subbasin : P1

Input Data

Area (ac)	0.63
Weighted Runoff Coefficient	0.17

Runoff Coefficient

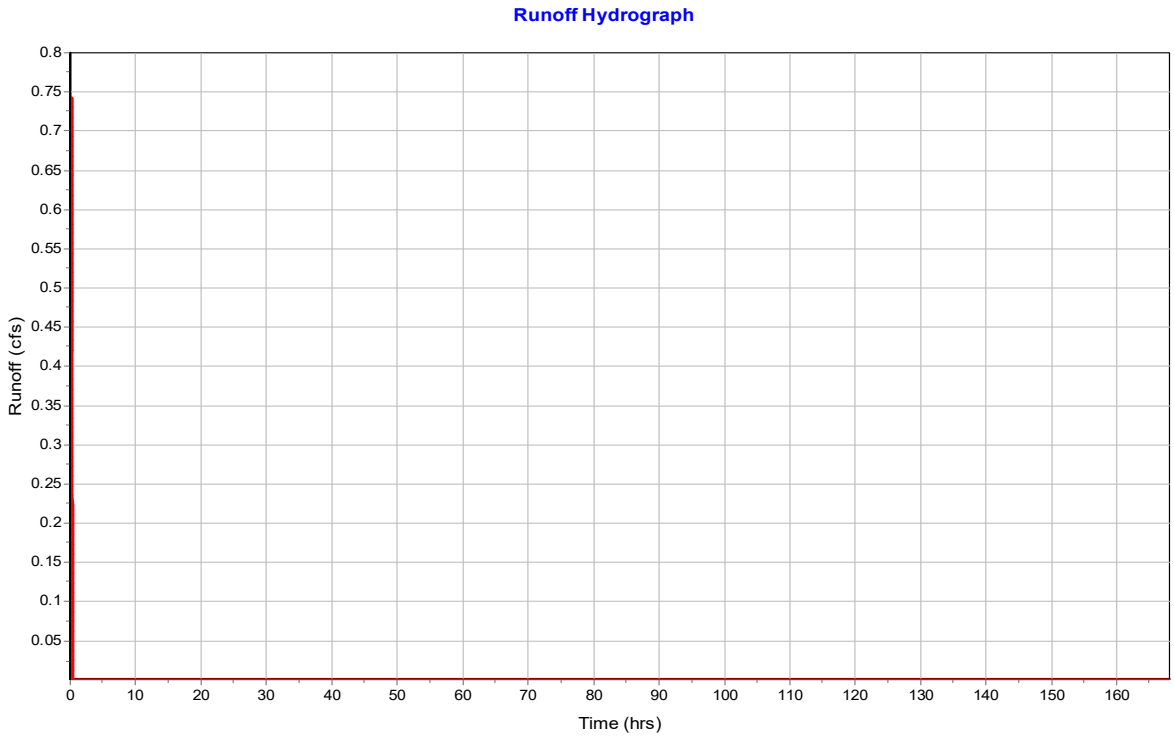
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.63	-	0.17
Composite Area & Weighted Runoff Coeff.	0.63		0.17

Subbasin Runoff Results

Total Rainfall (in)	1.16
Total Runoff (in)	0.2
Peak Runoff (cfs)	0.74
Rainfall Intensity	6.93
Weighted Runoff Coefficient	0.17
Time of Concentration (days hh:mm:ss)	0 00:10:00

Rolling Meadows Substation
100-Year Storm Event

Subbasin : P1



Subbasin : P2

Input Data

Area (ac) 0.97
Weighted Runoff Coefficient 0.09

Runoff Coefficient

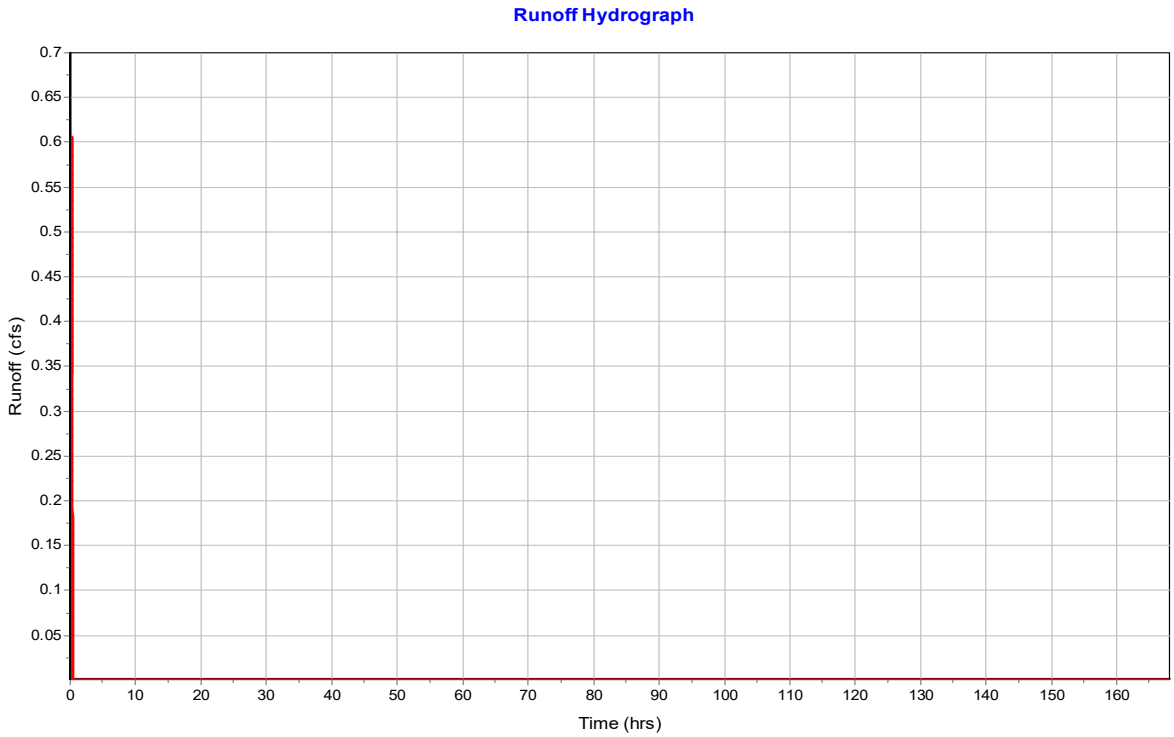
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.97	-	0.09
Composite Area & Weighted Runoff Coeff.	0.97		0.09

Subbasin Runoff Results

Total Rainfall (in) 1.16
Total Runoff (in) 0.1
Peak Runoff (cfs) 0.61
Rainfall Intensity 6.93
Weighted Runoff Coefficient 0.09
Time of Concentration (days hh:mm:ss) 0 00:10:00

Rolling Meadows Substation
100-Year Storm Event

Subbasin : P2



Subbasin : P3

Input Data

Area (ac) 0.72
Weighted Runoff Coefficient 0.16

Runoff Coefficient

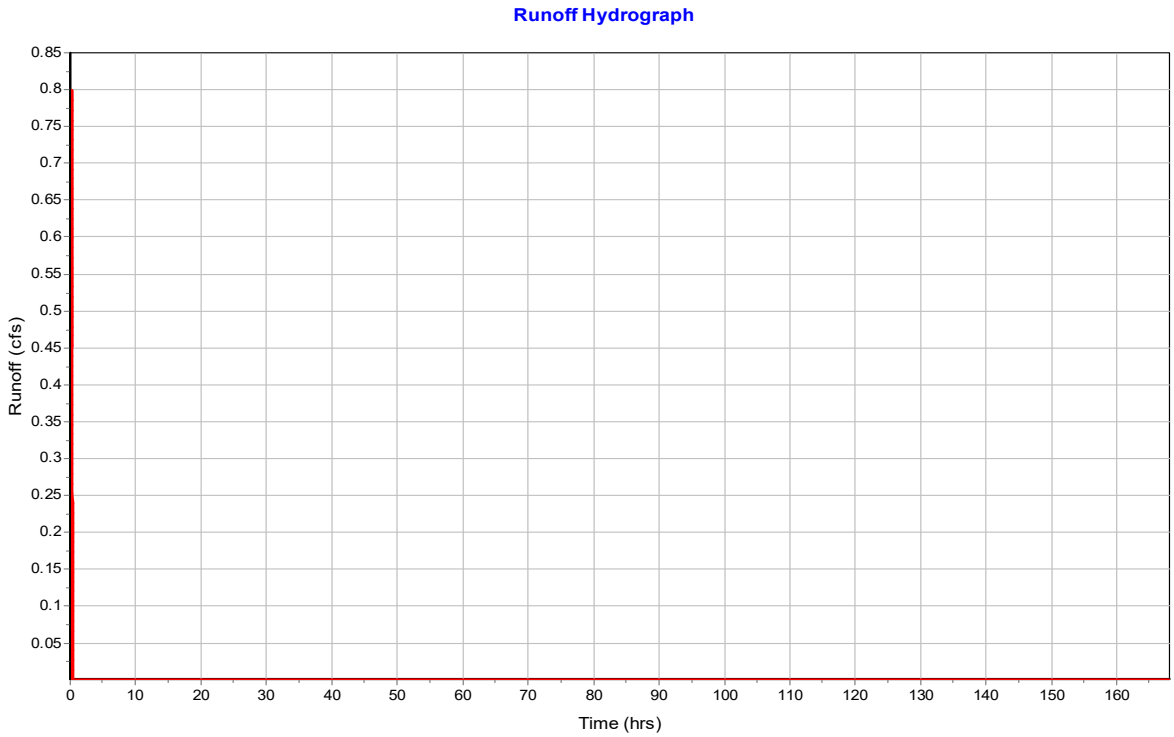
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.72	-	0.16
Composite Area & Weighted Runoff Coeff.	0.72		0.16

Subbasin Runoff Results

Total Rainfall (in) 1.16
Total Runoff (in) 0.19
Peak Runoff (cfs) 0.8
Rainfall Intensity 6.93
Weighted Runoff Coefficient 0.16
Time of Concentration (days hh:mm:ss) 0 00:10:00

Rolling Meadows Substation
100-Year Storm Event

Subbasin : P3



Subbasin : P4

Input Data

Area (ac) 0.73
Weighted Runoff Coefficient 0.9

Runoff Coefficient

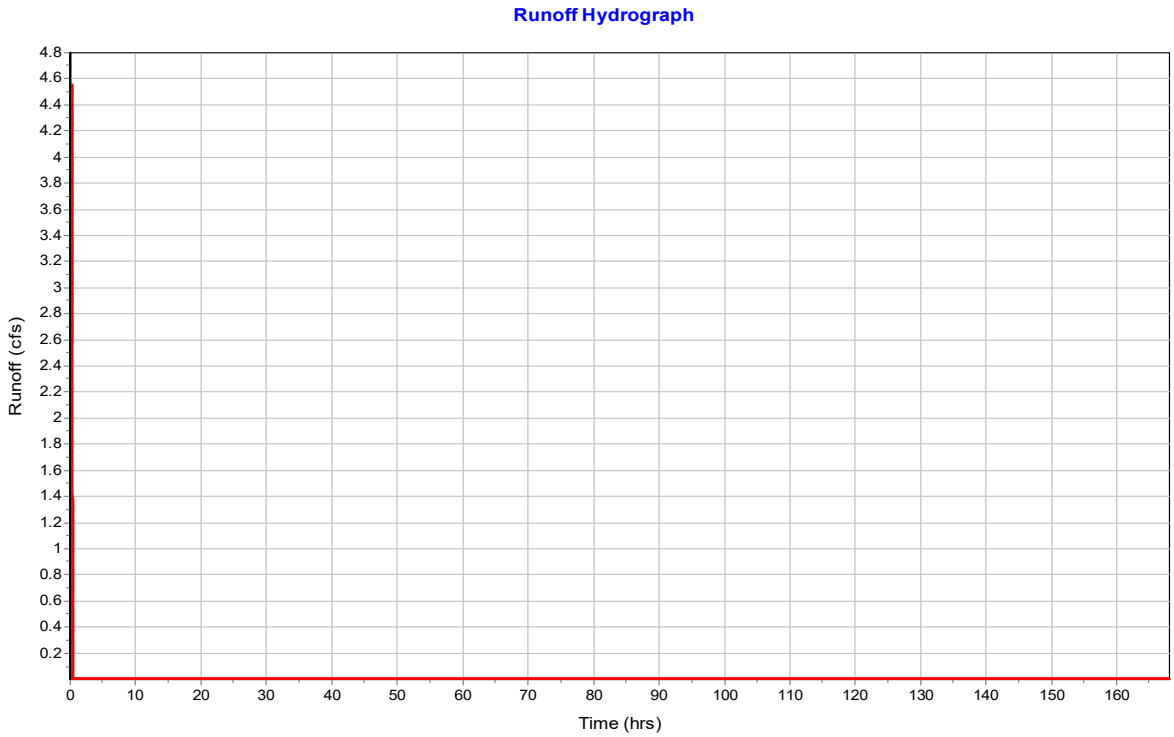
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.73	-	0.9
Composite Area & Weighted Runoff Coeff.	0.73		0.9

Subbasin Runoff Results

Total Rainfall (in) 1.16
Total Runoff (in) 1.04
Peak Runoff (cfs) 4.55
Rainfall Intensity 6.93
Weighted Runoff Coefficient 0.9
Time of Concentration (days hh:mm:ss) 0 00:10:00

Rolling Meadows Substation
100-Year Storm Event

Subbasin : P4



Subbasin : Y1

Input Data

Area (ac)	0.43
Weighted Runoff Coefficient	0.59

Runoff Coefficient

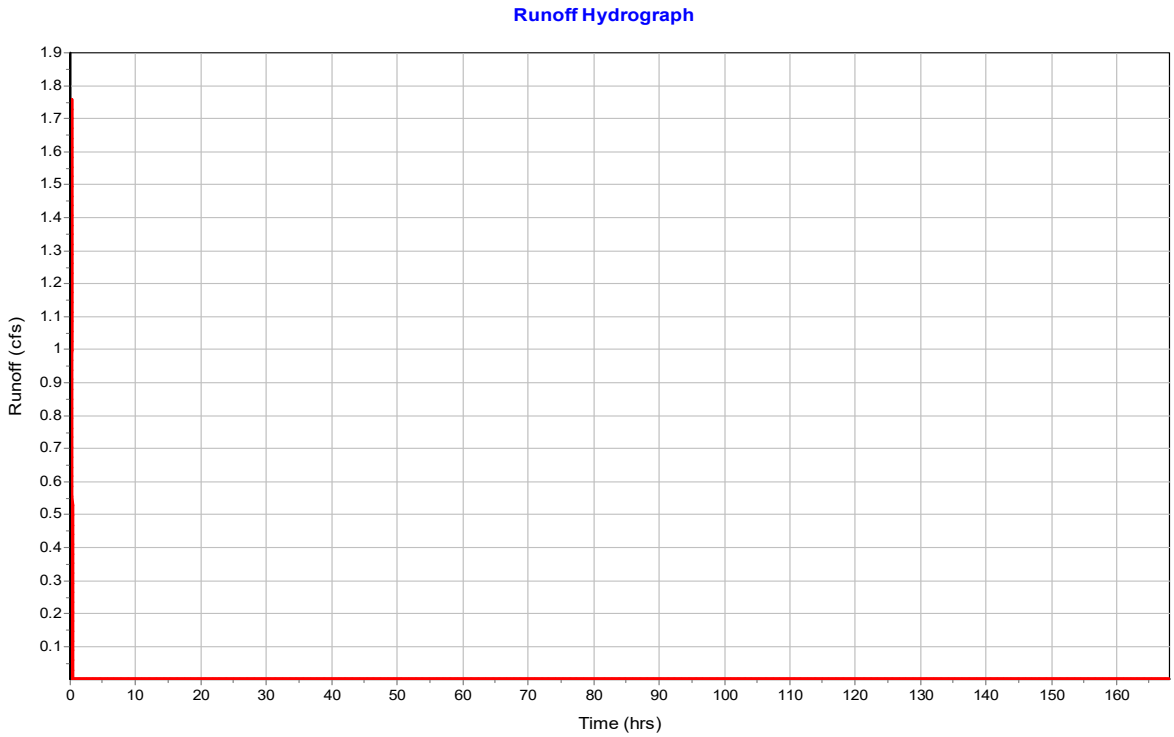
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.43	-	0.59
Composite Area & Weighted Runoff Coeff.	0.43		0.59

Subbasin Runoff Results

Total Rainfall (in)	1.16
Total Runoff (in)	0.68
Peak Runoff (cfs)	1.76
Rainfall Intensity	6.93
Weighted Runoff Coefficient	0.59
Time of Concentration (days hh:mm:ss)	0 00:10:00

Rolling Meadows Substation
100-Year Storm Event

Subbasin : Y1



Subbasin : Y2

Input Data

Area (ac)	0.61
Weighted Runoff Coefficient	0.59

Runoff Coefficient

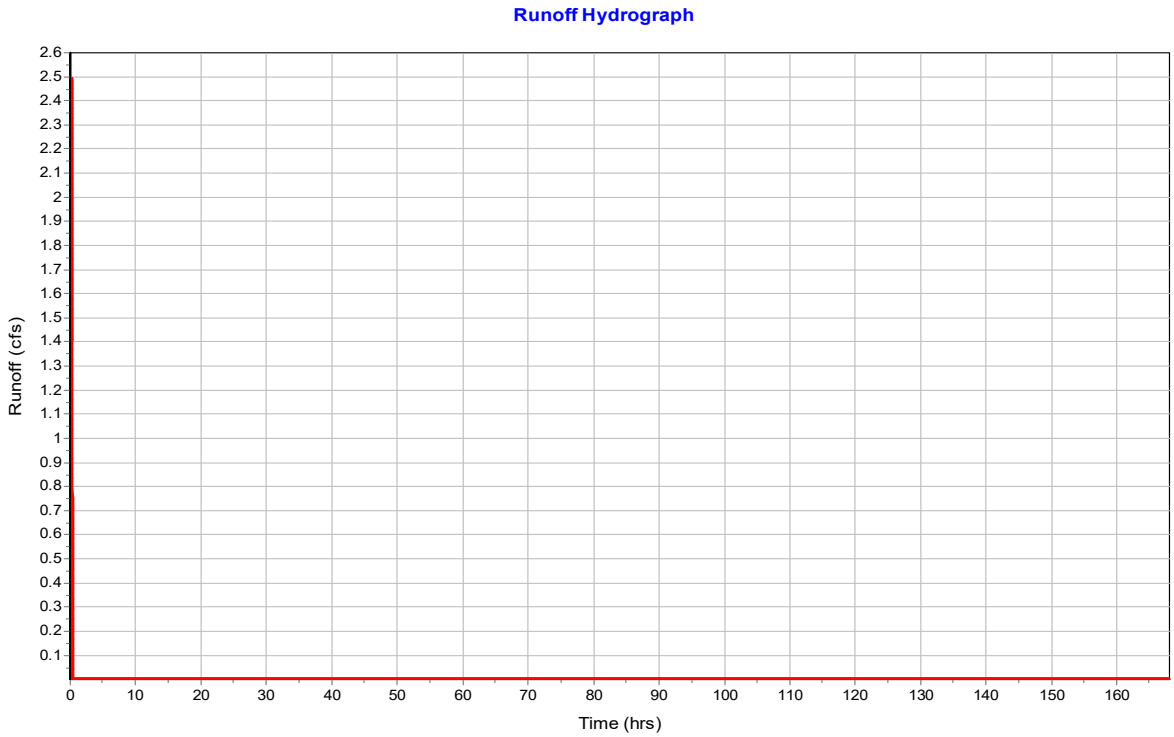
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.61	-	0.59
Composite Area & Weighted Runoff Coeff.	0.61		0.59

Subbasin Runoff Results

Total Rainfall (in)	1.16
Total Runoff (in)	0.68
Peak Runoff (cfs)	2.49
Rainfall Intensity	6.93
Weighted Runoff Coefficient	0.59
Time of Concentration (days hh:mm:ss)	0 00:10:00

Rolling Meadows Substation
100-Year Storm Event

Subbasin : Y2



Subbasin : Y3

Input Data

Area (ac)	0.72
Weighted Runoff Coefficient	0.59

Runoff Coefficient

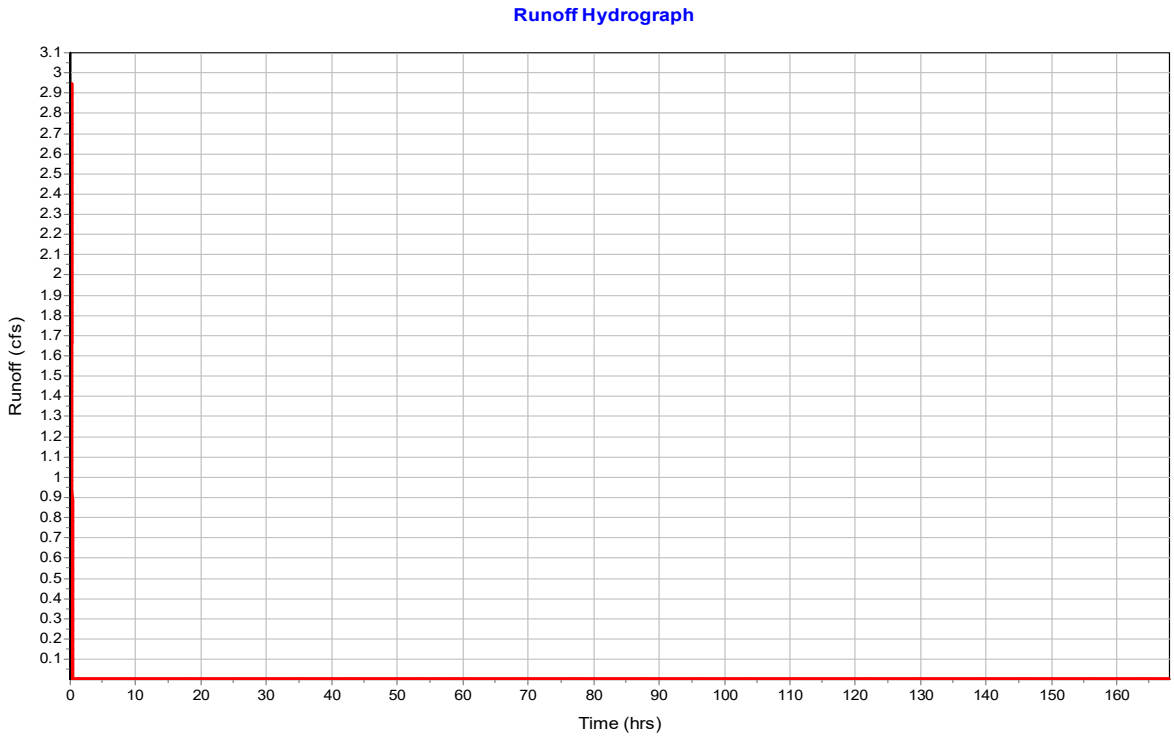
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	5	-	0.59
Composite Area & Weighted Runoff Coeff.	5		0.59

Subbasin Runoff Results

Total Rainfall (in)	1.16
Total Runoff (in)	0.68
Peak Runoff (cfs)	2.94
Rainfall Intensity	6.93
Weighted Runoff Coefficient	0.59
Time of Concentration (days hh:mm:ss)	0 00:10:00

Rolling Meadows Substation
100-Year Storm Event

Subbasin : Y3



Rolling Meadows Substation
100-Year Storm Event

Junction Input

SN	Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft^2)	Minimum Pipe Cover (in)
1	1-Jun	5812.59	5815.82	3.23	0.00	-5812.59	6.00	-5809.82	0.00	0.00
2	2-Jun	5811.19	5814.56	3.37	0.00	-5811.19	6.00	-5808.56	0.00	0.00
3	3-Jun	5810.49	5810.38	-0.11	0.00	-5810.49	6.00	-5804.38	0.00	0.00
4	5-Jun	5811.49	5814.60	3.11	5811.49	0.00	6.00	-5808.60	0.00	0.00
5	6-Jun	5813.17	5813.95	0.78	0.00	-5813.17	6.00	-5807.95	0.00	0.00
6	7-Jun	5811.35	5812.35	1.00	0.00	-5811.35	6.00	-5806.35	0.00	0.00
7	8-Jun	5808.00	5809.00	1.00	0.00	-5808.00	6.00	-5803.00	0.00	0.00
8	9-Jun	5804.42	5809.00	4.58	0.00	-5804.42	6.00	-5803.00	0.00	0.00
9	10-Jun	5804.00	5806.00	2.00	0.00	-5804.00	6.00	-5800.00	0.00	0.00
10	11-Jun	5812.00	5818.00	6.00	5812.00	0.00	0.00	-5818.00	0.00	0.00
11	12-Jun	5812.97	5815.57	2.60	0.00	-5812.97	0.00	-5815.57	0.00	0.00
12	13-Jun	5813.82	5815.99	2.17	5813.82	0.00	0.00	-5815.99	0.00	0.00
13	SD-N-Out	5809.62	5809.62	0.00	0.00	-5809.62	6.00	-5803.62	0.00	0.00

Rolling Meadows Substation
100-Year Storm Event

Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	1-Jun	2.43	0.00	5813.22	0.63	0.00	2.60	5812.59	0.00	0 00:10	0 00:00	0.00	0.00
2	2-Jun	4.65	2.49	5812.01	0.82	0.00	2.55	5811.19	0.00	0 00:10	0 00:00	0.00	0.00
3	3-Jun	4.64	0.00	5811.31	0.82	0.00	0.43	5810.49	0.00	0 00:11	0 00:00	0.00	0.00
4	5-Jun	2.90	0.00	5812.26	0.77	0.00	2.34	5811.49	0.00	0 00:10	0 00:00	0.00	0.00
5	6-Jun	0.74	0.74	5813.49	0.32	0.00	0.68	5813.17	0.00	0 00:10	0 00:00	0.00	0.00
6	7-Jun	0.60	0.60	5811.35	0.00	0.00	1.00	5811.35	0.00	0 00:00	0 00:00	0.00	0.00
7	8-Jun	0.80	0.80	5808.00	0.00	0.00	1.00	5808.00	0.00	0 00:00	0 00:00	0.00	0.00
8	9-Jun	0.08	0.00	5807.89	3.47	0.00	1.38	5807.80	3.38	0 00:23	0 00:00	0.00	0.00
9	10-Jun	0.08	0.00	5807.66	3.66	0.00	1.38	5807.57	3.57	0 00:24	0 00:00	0.00	0.00
10	11-Jun	2.42	0.00	5812.69	0.69	0.00	5.31	5812.00	0.00	0 00:10	0 00:00	0.00	0.00
11	12-Jun	2.94	2.94	5813.76	0.79	0.00	1.81	5812.97	0.00	0 00:10	0 00:00	0.00	0.00
12	13-Jun	1.76	1.76	5814.43	0.61	0.00	1.56	5813.82	0.00	0 00:10	0 00:00	0.00	0.00
13	SD-N-Out	2.89	0.00	5810.25	0.63	0.00	0.46	5809.71	0.09	0 00:10	0 00:00	0.00	0.00

Rolling Meadows Substation
100-Year Storm Event

Pipe Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate	No. of Barrels
1	01-12-NP	50.00	5813.17	0.00	5812.59	0.00	0.58	1.1600	CIRCULAR	12.000	12.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
2	02-12-P	180.00	5813.49	-0.33	5812.59	0.00	0.90	0.5000	CIRCULAR	12.000	12.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
3	03-15-NP	80.00	5812.34	-0.25	5811.94	-0.06	0.40	0.5000	CIRCULAR	15.000	15.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
4	04-15-P	150.00	5811.94	-0.06	5811.19	0.00	0.75	0.5000	CIRCULAR	15.000	15.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
5	05-15-NP	60.61	5811.19	0.00	5810.38	-0.11	0.81	1.3400	CIRCULAR	15.000	15.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
6	06-12-P	150.00	5812.97	0.00	5811.49	0.00	1.48	0.9900	CIRCULAR	12.000	12.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
7	07-12-NP	64.51	5811.49	0.00	5809.71	0.09	1.78	2.7600	CIRCULAR	12.000	12.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
8	08-18-NP	45.77	5807.77	3.35	5807.54	3.54	0.23	0.5000	CIRCULAR	18.000	18.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
9	Link-04	130.91	0.00	-5811.35	0.00	-5808.35	0.00	0.0000	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
10	Link-05	112.84	0.00	-5809.62	0.00	-5808.35	0.00	0.0000	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
11	Link-06	93.80	0.00	-5810.49	0.00	-5808.35	0.00	0.0000	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
12	Link-07	144.91	0.00	-5808.00	0.00	-5808.35	0.00	0.0000	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
13	Link-10	53.10	5804.00	0.00	5803.73	-3.81	0.27	0.5100	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1

Rolling Meadows Substation
100-Year Storm Event

Pipe Results

SN	Element ID	Peak Flow	Time of Peak Flow Occurrence	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Travel Time	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Froude Number	Reported Condition
		(cfs)	(days hh:mm)	(cfs)		(ft/sec)	(min)	(ft)		(min)		
1	01-12-NP	0.74	0 00:10	3.33	0.22	3.93	0.21	0.32	0.32	0.00		Calculated
2	02-12-P	1.71	0 00:10	2.55	0.67	5.46	0.55	0.60	0.60	0.00		Calculated
3	03-15-NP	2.42	0 00:10	4.81	0.50	3.94	0.34	0.63	0.50	0.00		Calculated
4	04-15-P	2.40	0 00:11	4.11	0.58	3.52	0.71	0.68	0.55	0.00		Calculated
5	05-15-NP	4.64	0 00:11	6.02	0.77	5.42	0.19	0.82	0.66	0.00		Calculated
6	06-12-P	2.90	0 00:10	3.07	0.94	6.46	0.39	0.77	0.77	0.00		Calculated
7	07-12-NP	2.89	0 00:10	5.13	0.56	6.73	0.16	0.54	0.54	0.00		Calculated
8	08-18-NP	0.08	0 00:24	6.45	0.01	1.25	0.61	0.12	0.08	0.00		Calculated
9	Link-04	0.60	0 00:10	0.00	0.01	0.00		0.12	0.08	0.00		Calculated
10	Link-05	2.89	0 00:10	0.00	0.01	0.00		0.12	0.08	0.00		Calculated
11	Link-06	4.64	0 00:11	0.00	0.01	0.00		0.12	0.08	0.00		Calculated
12	Link-07	0.80	0 00:10	0.00	0.01	0.00		0.12	0.08	0.00		Calculated
13	Link-10	0.08	0 00:24	0.00	0.01	0.00		0.12	0.08	0.00		Calculated

Storage Nodes

Storage Node : EDB

Input Data

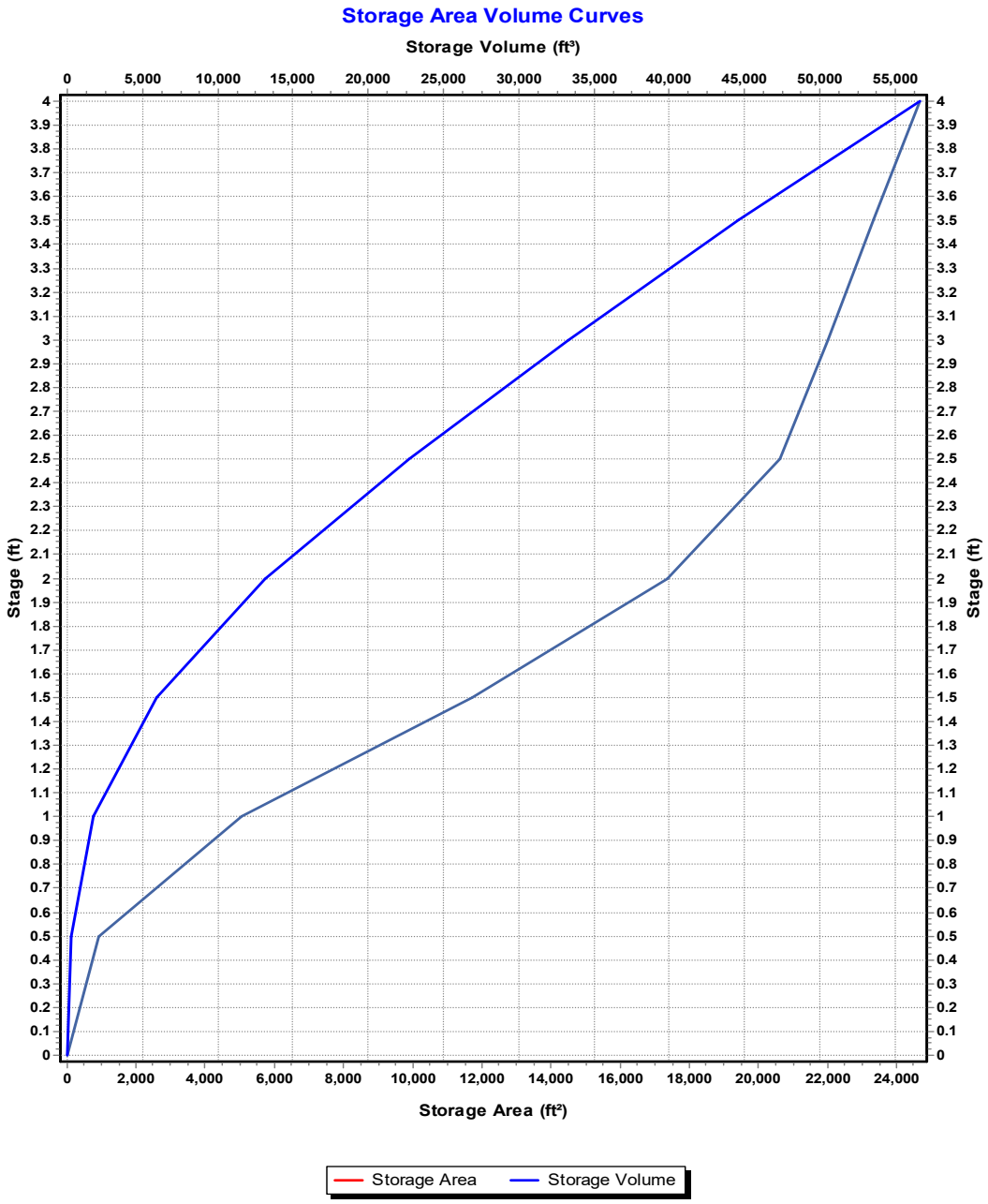
Invert Elevation (ft)	5808.35
Max (Rim) Elevation (ft)	5812.35
Max (Rim) Offset (ft)	4.00
Initial Water Elevation (ft)	0.00
Initial Water Depth (ft)	-5808.35
Ponded Area (ft^2)	0.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : Storage-01

Stage (ft)	Storage Area (ft^2)	Storage Volume (ft^3)
0	10	0
0.5	917	231.75
1	5052	1724
1.5	11717	5916.25
2	17359	13185.25
2.5	20610	22677.5
3	22010	33332.5
3.5	23327	44666.75
4	24671	56666.25

Rolling Meadows Substation
100-Year Storm Event



Storage Node : EDB (continued)

Outflow Weirs

SN	Element ID	Weir Type	Flap Gate	Crest Elevation (ft)	Crest Offset (ft)	Length (ft)	Weir Total Height (ft)	Discharge Coefficient
1	Spillway	Trapezoidal	No	5811.10	2.75	50.00	1.25	3.33
2	Weir-01	Rectangular	No	5810.35	2.00	4.00	0.75	3.33

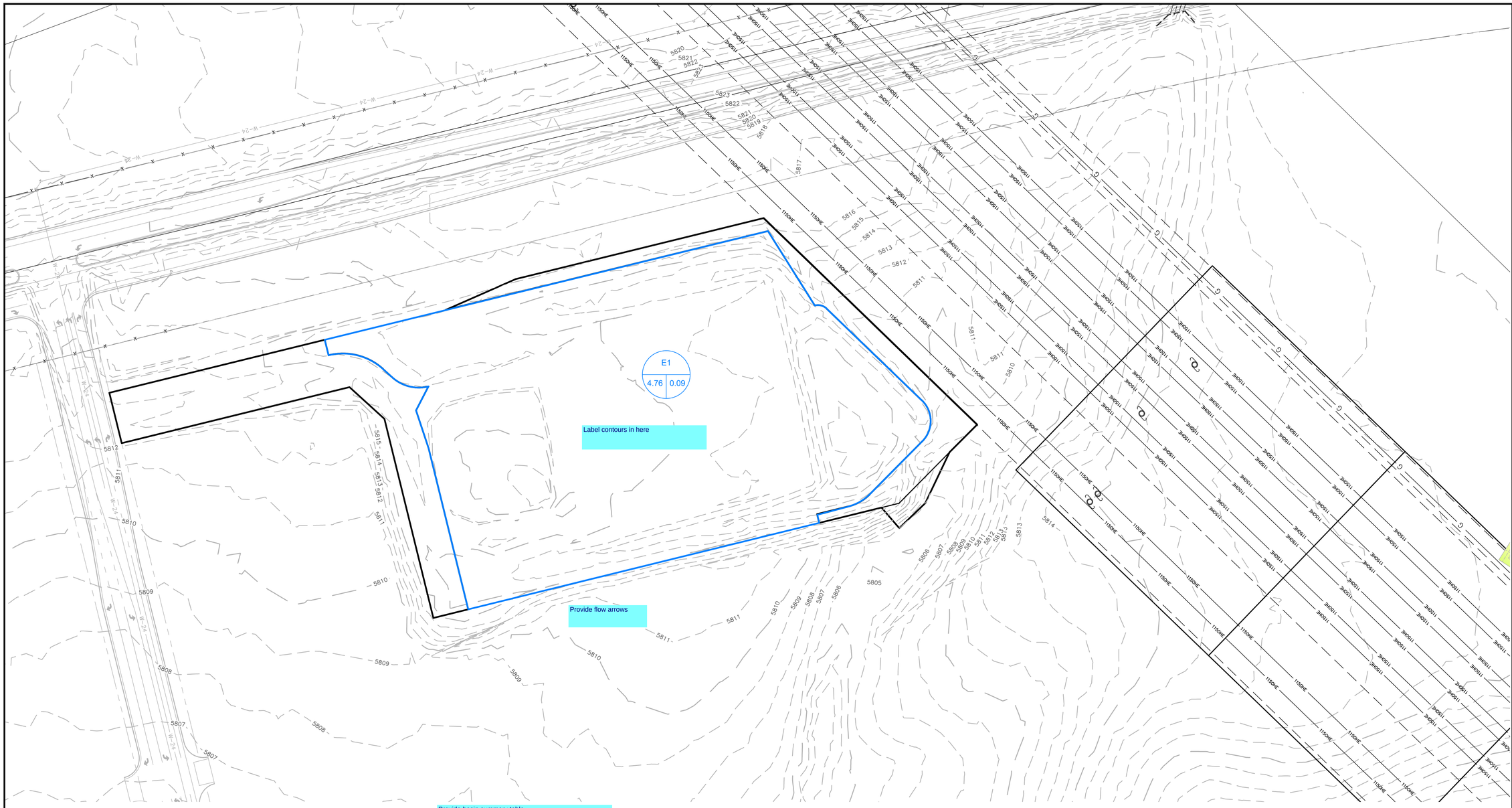
Outflow Orifices

SN	Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (in)	Rectangular Orifice Height (in)	Rectangular Orifice Width (in)	Orifice Invert Elevation (ft)	Orifice Coefficient
1	Orifice-01	Side	CIRCULAR	No	0.63			5808.02	0.61
2	Orifice-02	Side	CIRCULAR	No	0.63			5808.77	0.61
3	Orifice-03	Side	CIRCULAR	No	1.00			5809.27	0.61
4	Orifice-04	Side	CIRCULAR	No	1.00			5809.52	0.61
5	Orifice-05	Side	CIRCULAR	No	1.00			5809.77	0.61

Output Summary Results

Peak Inflow (cfs)	13.3
Peak Lateral Inflow (cfs)	4.55
Peak Outflow (cfs)	0.08
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	5810.03
Max HGL Depth Attained (ft)	1.68
Average HGL Elevation Attained (ft)	5808.8
Average HGL Depth Attained (ft)	0.45
Time of Max HGL Occurrence (days hh:mm)	0 00:23
Total Exfiltration Volume (1000-ft³)	0
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

Appendix C
Site Maps & Design Drawings



Provide basin summary table

Sumarry Runoff Tables			
Existing			
Design Point	Contributing Area	Runoff Peak 5-year Event	Runoff Peak 100-year Event
	(acres)	(cfs)	(cfs)
1	4.76	2.63	10.25

Flows do not match with SWMM model

LEGEND

EXISTING INDEX CONTOUR
EXISTING INTERMEDIATE CONTOUR
EXISTING DRAINAGE FLOWLINE
FLOW ARROW
DRAINAGE BASIN
UNANALYZED DRAINAGE AREA = 1.32 ACRES

A = BASIN
B = AREA IN ACRES
C = WEIGHTED RUNOFF COEFFICIENT

Why? Entire project site should be analyzed , even if it's not treated. Please provide additional basins for these areas and determine existing flows.

1" = 60'

Scale in feet
60' 0 60' 120'

No.	Date	Dwn.	Appd.	Revision	M.F.
7					
6					
5					
4					
3					
2					
1					

Dwg. No. | Mfgr. | Drawing Title
Reference Drawings

ROLLING MEADOWS SUBSTATION
115/12.47kV
EXISTING BASINS

TRI-STATE GENERATION & TRANSMISSION ASSOCIATION, INCORPORATED

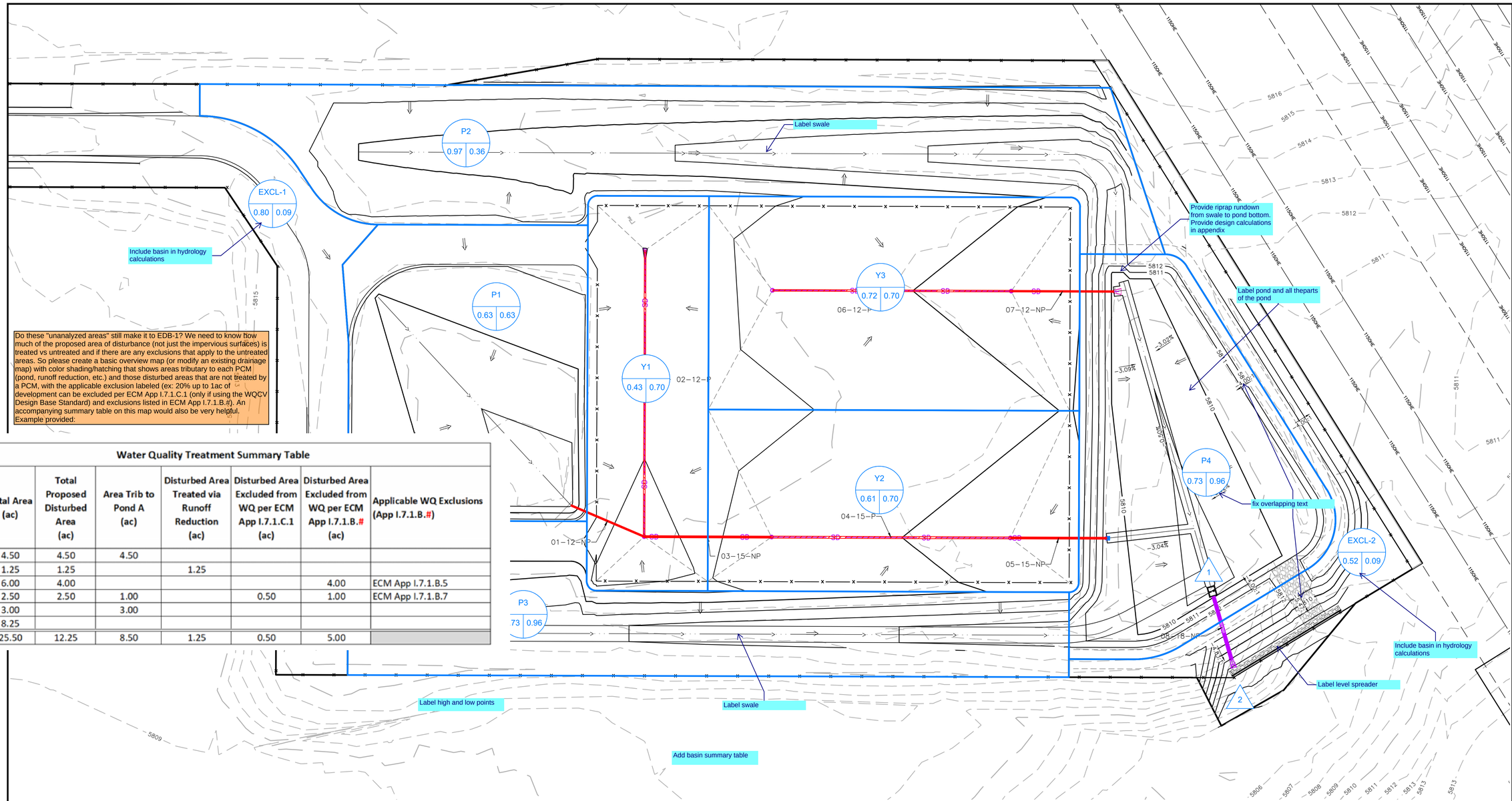
UPDATED BY: WLUDGATE 6/18/2026 3:54 PM | Contract: 4713

PATH: \\DMS1A\Projects\Active Projects\2024\24028-TSGT Rolling Meadows Substation\Facility\Civil\Sheets\S1183-A-01-SHEETS.dwg

TRI-STATE
Generation and Transmission Association, Inc.
A Touchstone Energy® Cooperative
1100 W. 116th Ave.
P.O. Box 33695
Denver, Colorado 80233
303-452-6111

Dwn:	Date:
TMC	02/18/26
Appd:	Date:
.	.

EXISTING BASINS



Water Quality Treatment Summary Table

Basin ID	Total Area (ac)	Total Proposed Disturbed Area (ac)	Area Trib to Pond A (ac)	Disturbed Area Treated via Runoff Reduction (ac)	Disturbed Area Excluded from WQ per ECM App I.7.1.C.1 (ac)	Disturbed Area Excluded from WQ per ECM App I.7.1.B.# (ac)	Applicable WQ Exclusions (App I.7.1.B.#)
A	4.50	4.50	4.50				
B	1.25	1.25		1.25			
C	6.00	4.00				4.00	ECM App I.7.1.B.5
D	2.50	2.50	1.00		0.50	1.00	ECM App I.7.1.B.7
E	3.00		3.00				
F	8.25						
Total	25.50	12.25	8.50	1.25	0.50	5.00	

Why? Entire project site should be analyzed , even if it's not treated. Please provide additional basins for these areas and determine existing flows.

LEGEND

5800 / 5796 — EXISTING INDEX CONTOUR; EXISTING INTERMEDIATE CONTOUR

EXISTING DRAINAGE FLOWLINE

FLOW ARROW

DRAINAGE BASIN

UNANALYZED DRAINAGE AREA = 1.32 ACRES

A / B / C — A = BASIN; B = AREA IN ACRES; C = WEIGHTED RUNOFF COEFFICIENT

D — D = DESIGN POINT DESIGNATION

Delete table from this sheet

Sumarry Runoff Tables			
Existing			
Design Point	Contributing Area (acres)	Runoff Peak 5-year Event (cfs)	Runoff Peak 100-year Event (cfs)
1	4.82	2.63	10.25

Summary Runoff Tables			
Proposed			
Design Point	Contributing Area (acres)	Runoff Peak 5-year Event (cfs)	Runoff Peak 100-year Event (cfs)
1	4.82	0.09	3.48
2	4.82	0.05	0.08

Water Quality Treatment Summary Table		
Basin ID(s)	PCM Tributary Area	PCM ID
Y1-Y3	1.76	EDB-1
P1-P4	3.00	Runoff Reduction
EXCL-1	0.80	EXCLUDED
EXCL-2	0.52	EXCLUDED

1" = 60'

Scale in feet: 60' 0 60' 120'

Drawing Title | Mfgr. | Reference Drawings | Dwg. No. | Revision | Date | Dwn. | Appd. | M.F.

ROLLING MEADOWS SUBSTATION
115/12.47kV
PROPOSED BASINS

TRI-STATE GENERATION & TRANSMISSION ASSOCIATION, INCORPORATED

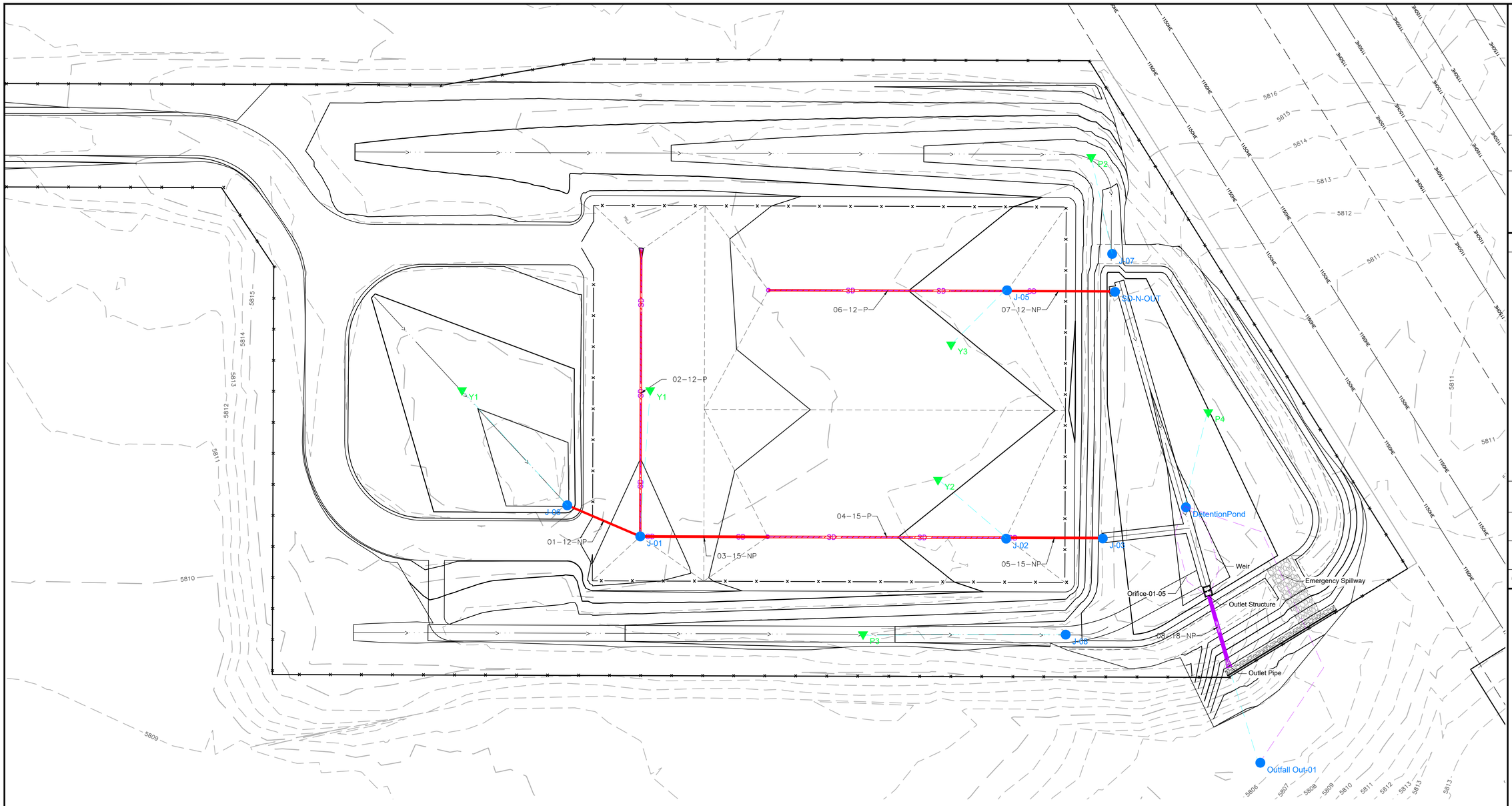
UPDATED BY: WLIDGATE 6/18/2026 3:54 PM | Contract: 47113

PATH: \\DNS1\Projects\Active Projects\2024\24028-TSGT Rolling Meadows Substation\Facility\Civil\Sheets\ST183-A-01-SHEETS.dwg

TRI-STATE
Generation and Transmission Association, Inc.
A Touchstone Energy Cooperative
1100 W. 116th Ave.
P.O. Box 33695
Denver, Colorado 80233
303-452-6111

Dwn: TMC | Date: 02/18/26
Appd: . | Date: .

PROPOSED BASINS



LEGEND

5800	PROPOSED INDEX CONTOUR
5796	PROPOSED INTERMEDIATE CONTOUR
→	PROPOSED DRAINAGE FLOWLINE
	DRAINAGE LINK
	DIRECT LINK
	DRAINAGE BASIN
Pond	DRAINAGE NODE
Yard	SUB-BASIN

NOTE: THIS DRAWING IS A SCHEMATIC REPRESENTATION OF THE AUTODESK STORM AND SANITARY ANALYSIS MODEL. FOR ALL DESIGN SPECIFIC INFORMATION SEE CIVIL PLANS.

1" = 60'

Scale in feet

60' 0 60' 120'

Drawing Title	M.F.
Mfgr.	Revision
Reference Drawings	Appd.
Dwg. No.	Dwn.
	Date
	No.

ROLLING MEADOWS SUBSTATION
115/12.47kV
BASIN SCHEMATIC

TRI-STATE GENERATION & TRANSMISSION ASSOCIATION, INCORPORATED

UPDATED BY: WLUDGATE 6/18/2026 3:54 PM | Contract: 47113

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TRI-STATE
Generation and Transmission Association, Inc.
A Touchstone Energy Cooperative
1100 W. 116th Ave.
P.O. Box 33695
Denver, Colorado 80233
303-452-6111

Dwn:	Date:
TMC	02/18/26
Appd:	Date:
.	.

BASIN SCHEMATIC

Appendix D
Forebay Analysis

Please put these calcs with the other pond calcs

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Designer: Thayne Clement
Company: Del-Mont Consultants
Date: February 16, 2026
Project: Crosspoint Substation - Forebay 1
Location: El Paso County, CO

1. Basin Storage Volume

A) Effective Imperviousness of Tributary Area, I_a — I_a = 35.0 %

B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$) — i = 0.350

C) Contributing Watershed Area — Area = 1.690 ac

D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm — d_6 = 1.19 in

E) Design Concept (Select EURV when also designing for flood control)

Choose One
- (●) Water Quality Capture Volume (WQCV)
- ( ) Excess Urban Runoff Volume (EURV)

F) Design Volume (WQCV) Based on 40-hour Drain Time
($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area$) — V_{DESIGN} = ac-ft

G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume
($V_{WQCV\ OTHER} = (d_6 * (V_{DESIGN}/0.43))$) — $V_{DESIGN\ OTHER}$ = ac-ft

H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired) — $V_{DESIGN\ USER}$ = 0.082 ac-ft

I) NRCS Hydrologic Soil Groups of Tributary Watershed
- i) Percentage of Watershed consisting of Type A Soils — HSG_A = %
- ii) Percentage of Watershed consisting of Type B Soils — HSG_B = %
- iii) Percentage of Watershed consisting of Type C/D Soils — $HSG_{C/D}$ = %

J) Excess Urban Runoff Volume (EURV) Design Volume
For HSG A: $EURV_A = 1.68 * i^{1.28}$
For HSG B: $EURV_B = 1.36 * i^{1.08}$
For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$
— $EURV_{DESIGN}$ = ac-f t

K) User Input of Excess Urban Runoff Volume (EURV) Design Volume (Only if a different EURV Design Volume is desired) — $EURV_{DESIGN\ USER}$ = ac-f t

2. Basin Shape: Length to Width Ratio (A basin length to width ratio of at least 2:1 will improve TSS reduction.) — L : W = 2.0 : 1

3. Basin Side Slopes

A) Basin Maximum Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred) — Z = 4.00 ft / ft

4. Inlet

A) Describe means of providing energy dissipation at concentrated inflow locations:

5. Forebay

A) Minimum Forebay Volume (V_{FMIN} = 0% of the WQCV) — V_{FMIN} = 0.000 ac-ft — A FOREBAY MAY NOT BE NECESSARY FOR THIS SIZE SITE

B) Actual Forebay Volume — V_F = 0.002 ac-ft

C) Forebay Depth (D_F = 12 inch maximum) — D_F = 12.0 in

D) Forebay Discharge

i) Undetained 100-year Peak Discharge — Q_{100} = 2.15 cfs

ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$) — Q_F = 0.04 cfs

E) Forebay Discharge Design

Choose One
- ( ) Berm With Pipe
- (●) Wall with Rect. Notch
- ( ) Wall with V-Notch Weir

Flow too small for berm w/ pipe

F) Discharge Pipe Size (minimum 8-inches) — Calculated D_P = in

G) Rectangular Notch Width — Calculated W_N = 2.6 in

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Designer: Thayne Clement
Company: Del-Mont Consultants
Date: February 16, 2026
Project: Crosspoint Substation - Forebay 2
Location: Yoder, CO

1. Basin Storage Volume

A) Effective Imperviousness of Tributary Area, I_a — I_a = 55.0 %

B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$) — i = 0.550

C) Contributing Watershed Area — Area = 1.670 ac

D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm — d_6 = 1.19 in

E) Design Concept (Select EURV when also designing for flood control)

Choose One
- (●) Water Quality Capture Volume (WQCV)
- ( ) Excess Urban Runoff Volume (EURV)

F) Design Volume (WQCV) Based on 40-hour Drain Time
($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area$)
V_{DESIGN} = ac-ft

G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume
($V_{WQCV\ OTHER} = (d_6 * (V_{DESIGN}/0.43))$)
$V_{DESIGN\ OTHER}$ = ac-ft

H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)
$V_{DESIGN\ USER}$ = 0.082 ac-ft

I) NRCS Hydrologic Soil Groups of Tributary Watershed
i) Percentage of Watershed consisting of Type A Soils — HSG_A = %
ii) Percentage of Watershed consisting of Type B Soils — HSG_B = %
iii) Percentage of Watershed consisting of Type C/D Soils — $HSG_{C/D}$ = %

J) Excess Urban Runoff Volume (EURV) Design Volume
For HSG A: $EURV_A = 1.68 * i^{1.28}$
For HSG B: $EURV_B = 1.36 * i^{1.08}$
For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$
$EURV_{DESIGN}$ = ac-f t

K) User Input of Excess Urban Runoff Volume (EURV) Design Volume (Only if a different EURV Design Volume is desired)
$EURV_{DESIGN\ USER}$ = ac-f t

2. Basin Shape: Length to Width Ratio (A basin length to width ratio of at least 2:1 will improve TSS reduction.)
L : W = 2.0 : 1

3. Basin Side Slopes

A) Basin Maximum Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred)
Z = 4.00 ft / ft

4. Inlet

A) Describe means of providing energy dissipation at concentrated inflow locations:

5. Forebay

A) Minimum Forebay Volume
(V_{FMIN} = 0% of the WQCV)
V_{FMIN} = 0.000000000000 ac-ft — A FOREBAY MAY NOT BE NECESSARY FOR THIS SIZE SITE

B) Actual Forebay Volume
V_F = 0.000 ac-ft

C) Forebay Depth
(D_F = 12 inch maximum)
D_F = 12.0 in

D) Forebay Discharge

i) Undetained 100-year Peak Discharge
Q_{100} = 2.50 cfs

ii) Forebay Discharge Design Flow
($Q_F = 0.02 * Q_{100}$)
Q_F = 0.05 cfs

E) Forebay Discharge Design

Choose One
- ( ) Berm With Pipe
- (●) Wall with Rect. Notch
- ( ) Wall with V-Notch Weir

Flow too small for berm w/ pipe

F) Discharge Pipe Size (minimum 8-inches)
Calculated D_P = in

G) Rectangular Notch Width
Calculated W_N = 2.6 in

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Designer: Thayne Clement
Company: Del-Mont Consultants
Date: February 16, 2026
Project: Crosspoint Substation - Forebay 3
Location: Yoder, CO

1. Basin Storage Volume

A) Effective Imperviousness of Tributary Area, I_a — I_a = 13.0 %

B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$) — i = 0.130

C) Contributing Watershed Area — Area = 0.720 ac

D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm — d_6 = 1.19 in

E) Design Concept (Select EURV when also designing for flood control)

Choose One
- (●) Water Quality Capture Volume (WQCV)
- ( ) Excess Urban Runoff Volume (EURV)

F) Design Volume (WQCV) Based on 40-hour Drain Time
($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area$) — V_{DESIGN} = ac-ft

G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume
($V_{WQCV\ OTHER} = (d_6 * (V_{DESIGN}/0.43))$) — $V_{DESIGN\ OTHER}$ = ac-ft

H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired) — $V_{DESIGN\ USER}$ = 0.005 ac-ft

I) NRCS Hydrologic Soil Groups of Tributary Watershed
- i) Percentage of Watershed consisting of Type A Soils — HSG_A = %
- ii) Percentage of Watershed consisting of Type B Soils — HSG_B = %
- iii) Percentage of Watershed consisting of Type C/D Soils — $HSG_{C/D}$ = %

J) Excess Urban Runoff Volume (EURV) Design Volume
For HSG A: $EURV_A = 1.68 * i^{1.28}$
For HSG B: $EURV_B = 1.36 * i^{1.08}$
For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$
— $EURV_{DESIGN}$ = ac-f t

K) User Input of Excess Urban Runoff Volume (EURV) Design Volume (Only if a different EURV Design Volume is desired) — $EURV_{DESIGN\ USER}$ = ac-f t

2. Basin Shape: Length to Width Ratio
(A basin length to width ratio of at least 2:1 will improve TSS reduction.) — L : W = 2.0 : 1

3. Basin Side Slopes

A) Basin Maximum Side Slopes
(Horizontal distance per unit vertical, 4:1 or flatter preferred) — Z = 4.00 ft / ft

4. Inlet

A) Describe means of providing energy dissipation at concentrated inflow locations:

5. Forebay

A) Minimum Forebay Volume
(V_{FMIN} = 0% of the WQCV) — V_{FMIN} = 0.000 ac-ft — A FOREBAY MAY NOT BE NECESSARY FOR THIS SIZE SITE

B) Actual Forebay Volume — V_F = 0.001 ac-ft

C) Forebay Depth
(D_F = 12 inch maximum) — D_F = 12.0 in

D) Forebay Discharge

i) Undetained 100-year Peak Discharge — Q_{100} = 0.74 cfs

ii) Forebay Discharge Design Flow
($Q_F = 0.02 * Q_{100}$) — Q_F = 0.01 cfs

E) Forebay Discharge Design

Choose One
- ( ) Berm With Pipe
- (●) Wall with Rect. Notch
- ( ) Wall with V-Notch Weir

Flow too small for berm w/ pipe

F) Discharge Pipe Size (minimum 8-inches) — Calculated D_P = in

G) Rectangular Notch Width — Calculated W_N = 2.5 in

FINAL Drainage Report.pdf Markup Summary

CDurham (51)

PCD FILE #

PPR2619

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County

Author: CDurham
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County

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are present on the site
FIRM Map Number 08

Include a copy of the floodplain map in the appendix.

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Include a copy of the floodplain map in the appendix.

The entire basin (5.95 acres) needs to be analyzed. If the remaining acre goes a different way, it needs to be it's own basin.

verland flow with no drainage
oced preliminary rough grading

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The entire basin (5.95 acres) needs to be analyzed. If the remaining acre goes a different way, it needs to be it's own basin.

These basins still need to be included in the hydrology calculations and discussed.

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These basins still need to be included in the hydrology calculations and discussed.

P1	0.63
P2	0.97
P3	0.72
P4	0.68

Basins EXCL-1 & 2 need to be included

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Basins EXCL-1 & 2 need to be included

Include a copy of this information in the appendix

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Include a copy of this information in the appendix

Flows do not match with information in SWMM model. Please revise

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Flows do not match with information in SWMM model. Please revise

---

Provide a calculation showing what max capacity of the swale is.

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Provide a calculation showing what max capacity of the swale is.

---

ic discharge rate presented in **Table 4** time per State Requirements. The found in **Appendix A.** The design of

What is the bottom width?

sin P1 and P2 were not analyzed as ales are designed as a flat-bottom t, and a flow line slope of 0.5%. The y convey the negligible run-on flows.

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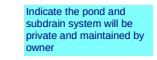
What is the bottom width?



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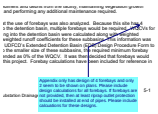
Indicate the pond and subdrain system will be private and maintained by owner

---



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Subject: Callout
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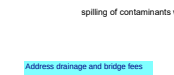
Appendix only has design of 4 forebays and only 2 seem to be shown on plans. Please include design calculations for all forebays. If forebays are not provided, then at least riprap outlet protection should be installed at end of pipes. Please include calcuations for these designs.



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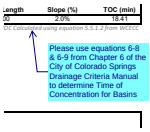
Address drainage and bridge fees



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Subject: Callout
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Please use equations 6-8 & 6-9 from Chapter 6 of the City of Colorado Springs Drainage Criteria Manual to determine Time of Concentration for Basins

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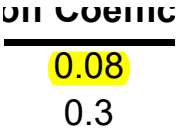

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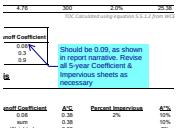

Author: CDurham
Subject: Callout
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Date: 7/24/2026 11:32:32 AM
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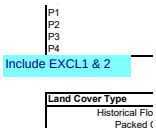
Should be 0.09, as shown in report narrative. Revise all 5-year Coefficient & Impervious sheets as necessary



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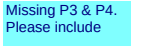
Include EXCL1 & 2



Author: CDurham
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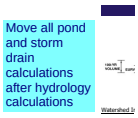
Missing P3 & P4. Please include



Author: CDurham
Subject: Text Box
Page Label: 23
Date: 7/24/2026 11:20:22 AM
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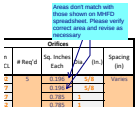
Move all pond and storm drain calculations after hydrology calculations

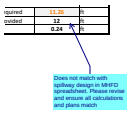
---



Author: CDurham
Subject: Callout
Page Label: 29
Date: 7/24/2026 1:01:11 PM
Status:
Color:
Layer:
Space:

Areas don't match with those shown on MHFD spreadsheet. Please verify correct area and revise as necessary

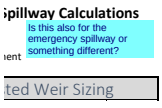
---



Author: CDurham
Subject: Callout
Page Label: 31
Date: 7/24/2026 12:01:48 PM
Status:
Color:
Layer:
Space:

Does not match with spillway design in MHFD spreadsheet. Please revise and ensure all calculations and plans match

---



Author: CDurham
Subject: Text Box
Page Label: 31
Date: 7/24/2026 12:14:25 PM
Status:
Color:
Layer:
Space:

Is this also for the emergency spillway or something different?

Input

3.66

2.6

Author: CDurham
Subject: Highlight
Page Label: 31
Date: 7/24/2026 12:14:36 PM
Status:
Color:
Layer:
Space:

3.66

Indicate which swale this is for

Required D50 @

Author: CDurham
Subject: Text Box
Page Label: 32
Date: 7/24/2026 11:54:35 AM
Status:
Color:
Layer:
Space:

Indicate which swale this is for

Provide design calculations for both swales discharging into pond

Author: CDurham
Subject: Text Box
Page Label: 32
Date: 7/24/2026 12:13:17 PM
Status:
Color:
Layer:
Space:

Provide design calculations for both swales discharging into pond

---

Provide riprap sizing for level spreader

Author: CDurham
Subject: Text Box
Page Label: 33
Date: 7/24/2026 11:56:09 AM
Status:
Color:
Layer:
Space:

Provide riprap sizing for level spreader

Provide calculations for determining length and width for protection.

Author: CDurham
Subject: Text Box
Page Label: 33
Date: 7/24/2026 11:58:43 AM
Status:
Color:
Layer:
Space:

Provide calculations for determining length and width for protection.

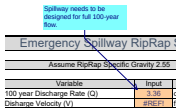
Per GEC plan details, there are several locations with outlet protection. Please ensure all pipes with outlet protection have design calculations provided.

Author: CDurham
Subject: Text Box
Page Label: 33
Date: 7/24/2026 11:59:27 AM
Status:
Color:
Layer:
Space:

Per GEC plan details, there are several locations with outlet protection. Please ensure all pipes with outlet protection have design calculations provided.

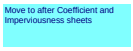
Author: CDurham
Subject: Callout
Page Label: 33
Date: 7/24/2026 12:00:07 PM
Status:
Color:
Layer:
Space:

Fix information in table



Author: CDurham
Subject: Callout
Page Label: 33
Date: 7/24/2026 12:12:23 PM
Status:
Color:
Layer:
Space:

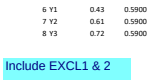
Spillway needs to be designed for full 100-year flow.



Appendix B

Author: CDurham
Subject: Text Box
Page Label: 34
Date: 7/24/2026 11:21:16 AM
Status:
Color:
Layer:
Space:

Move to after Coefficient and Imperviousness sheets

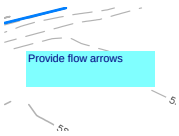


Author: CDurham
Subject: Text Box
Page Label: 36
Date: 7/24/2026 12:58:09 PM
Status:
Color:
Layer:
Space:

Include EXCL1 & 2

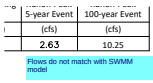
Author: CDurham
Subject: Text Box
Page Label: [1] EXISTING BASINS
Date: 7/24/2026 12:50:15 PM
Status:
Color:
Layer:
Space:

Label contours in here



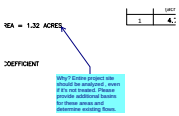
Author: CDurham
Subject: Text Box
Page Label: [1] EXISTING BASINS
Date: 7/24/2026 12:50:24 PM
Status:
Color:
Layer:
Space:

Provide flow arrows



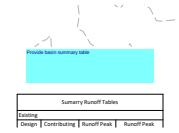
Author: CDurham
Subject: Text Box
Page Label: [1] EXISTING BASINS
Date: 7/24/2026 12:50:47 PM
Status:
Color:
Layer:
Space:

Flows do not match with SWMM model



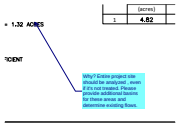
Author: CDurham
Subject: Callout
Page Label: [1] EXISTING BASINS
Date: 7/24/2026 12:51:37 PM
Status:
Color:
Layer:
Space:

Why? Entire project site should be analyzed , even if it's not treated. Please provide additional basins for these areas and determine existing flows.



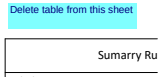
Author: CDurham
Subject: Text Box
Page Label: [1] EXISTING BASINS
Date: 7/24/2026 12:51:52 PM
Status:
Color:
Layer:
Space:

Provide basin summary table



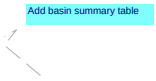
Author: CDurham
Subject: Callout
Page Label: [2] PROPOSED BASINS
Date: 7/24/2026 12:52:15 PM
Status:
Color:
Layer:
Space:

Why? Entire project site should be analyzed , even if it's not treated. Please provide additional basins for these areas and determine existing flows.



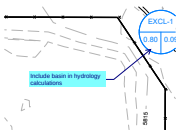
Author: CDurham
Subject: Text Box
Page Label: [2] PROPOSED BASINS
Date: 7/24/2026 12:52:27 PM
Status:
Color:
Layer:
Space:

Delete table from this sheet



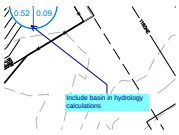
Author: CDurham
Subject: Text Box
Page Label: [2] PROPOSED BASINS
Date: 7/24/2026 12:52:42 PM
Status:
Color:
Layer:
Space:

Add basin summary table



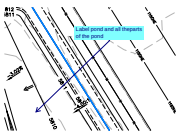
Author: CDurham
Subject: Callout
Page Label: [2] PROPOSED BASINS
Date: 7/24/2026 12:53:17 PM
Status:
Color:
Layer:
Space:

Include basin in hydrology calculations



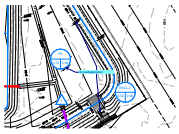
Author: CDurham
Subject: Callout
Page Label: [2] PROPOSED BASINS
Date: 7/24/2026 12:53:30 PM
Status:
Color:
Layer:
Space:

Include basin in hydrology calculations



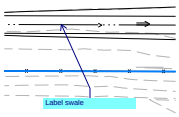
Author: CDurham
Subject: Callout
Page Label: [2] PROPOSED BASINS
Date: 7/24/2026 12:53:56 PM
Status:
Color:
Layer:
Space:

Label pond and all theparts of the pond



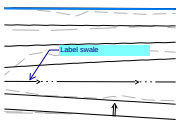
Author: CDurham
Subject: Callout
Page Label: [2] PROPOSED BASINS
Date: 7/24/2026 12:56:27 PM
Status:
Color:
Layer:
Space:

fix overlapping text



Author: CDurham
Subject: Callout
Page Label: [2] PROPOSED BASINS
Date: 7/24/2026 12:54:55 PM
Status:
Color:
Layer:
Space:

Label swale



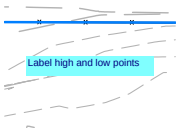
Author: CDurham
Subject: Callout
Page Label: [2] PROPOSED BASINS
Date: 7/24/2026 12:55:10 PM
Status:
Color:
Layer:
Space:

Label swale

Author: CDurham
Subject: Callout
Page Label: [2] PROPOSED BASINS
Date: 7/24/2026 12:55:36 PM
Status:
Color:
Layer:
Space:

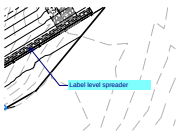
Provide riprap rundown from swale to pond bottom. Provide design calculations in appendix

---



Author: CDurham
Subject: Text Box
Page Label: [2] PROPOSED BASINS
Date: 7/24/2026 12:56:05 PM
Status:
Color:
Layer:
Space:

Label high and low points

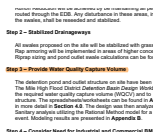


Author: CDurham
Subject: Callout
Page Label: [2] PROPOSED BASINS
Date: 7/24/2026 12:56:18 PM
Status:
Color:
Layer:
Space:

Label level spreader

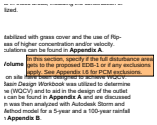
Mikayla Hartford (35)

Author: Mikayla Hartford
Subject: Stamp - Stormwater Comment Legend
Page Label: 1
Date: 7/30/2026 11:13:21 AM
Status:
Color:
Layer:
Space:



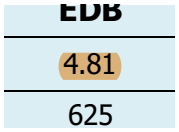
Author: Mikayla Hartford
Subject: SW - Highlight
Page Label: 13
Date: 7/30/2026 11:31:10 AM
Status:
Color:
Layer:
Space:

Step 3 – Provide Water Quality Capture Volume



Author: Mikayla Hartford
Subject: SW - Textbox
Page Label: 13
Date: 7/30/2026 11:31:49 AM
Status:
Color:
Layer:
Space:

In this section, specify if the full disturbance area gets to the proposed EDB-1 or if any exclusions apply. See Appendix I.6 for PCM exclusions.

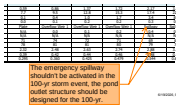


Author: Mikayla Hartford
Subject: SW - Highlight
Page Label: 23
Date: 7/30/2026 11:32:05 AM
Status:
Color:
Layer:
Space:

4.81

Author: Mikayla Hartford
Subject: SW - Textbox with Arrow
Page Label: 23
Date: 7/30/2026 11:32:35 AM
Status:
Color:
Layer:
Space:

This is not the full disturbance area. The pond should treat the entire disturbed area or exclusions should be identified that apply to the untreated areas.

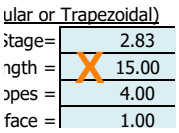


Author: Mikayla Hartford
Subject: SW - Textbox with Arrow
Page Label: 25
Date: 7/30/2026 11:22:49 AM
Status:
Color:
Layer:
Space:

The emergency spillway shouldn't be activated in the 100-yr storm event, the pond outlet structure should be designed for the 100-yr.

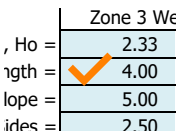
Author: Mikayla Hartford
Subject: Group
Page Label: 25
Date: 7/30/2026 11:36:55 AM
Status:
Color:
Layer:
Space:

X

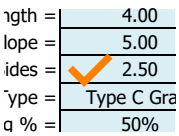


Author: Mikayla Hartford
Subject: Text Box
Page Label: 25
Date: 7/30/2026 11:37:49 AM
Status:
Color:
Layer:
Space:

X



Author: Mikayla Hartford
Subject: Checkmark
Page Label: 25
Date: 7/30/2026 11:40:11 AM
Status:
Color:
Layer:
Space:



Author: Mikayla Hartford
Subject: Checkmark
Page Label: 25
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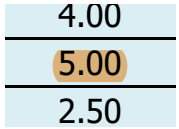
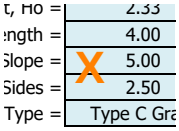


Author: Mikayla Hartford
Subject: SW - Highlight
Page Label: 25
Date: 7/30/2026 11:41:22 AM
Status:
Color:
Layer:
Space:

5.00



Author: Mikayla Hartford
Subject: Text Box
Page Label: 25
Date: 7/30/2026 11:41:25 AM
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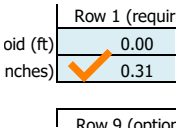
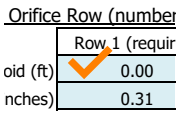
Color:
Layer:
Space:

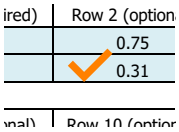
X



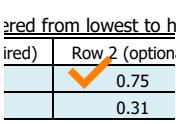
Author: Mikayla Hartford
Subject: Checkmark
Page Label: 25
Date: 7/30/2026 11:43:04 AM
Status:
Color:
Layer:
Space:



Author: Mikayla Hartford
Subject: Checkmark
Page Label: 25
Date: 7/30/2026 11:43:06 AM
Status:
Color:
Layer:
Space:



Author: Mikayla Hartford
Subject: Checkmark
Page Label: 25
Date: 7/30/2026 11:43:13 AM
Status:
Color:
Layer:
Space:


ered from lowest to h

ired)	Row 2 (option
	0.75
	0.31

Author: Mikayla Hartford
Subject: Checkmark
Page Label: 25
Date: 7/30/2026 11:43:13 AM
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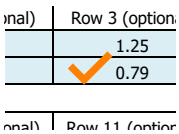
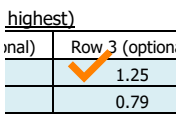
Layer:
Space:



onal)	Row 3 (option
	1.25
	0.79

Author: Mikayla Hartford
Subject: Checkmark
Page Label: 25
Date: 7/30/2026 11:43:31 AM
Status:
Color:
Layer:
Space:


highest)

onal)	Row 3 (option
	1.25
	0.79

Author: Mikayla Hartford
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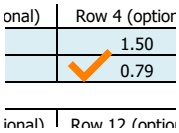

onal)	Row 4 (optior
	1.50
	0.79

Author: Mikayla Hartford
Subject: Checkmark
Page Label: 25
Date: 7/30/2026 11:43:34 AM
Status:
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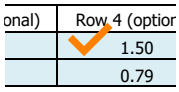

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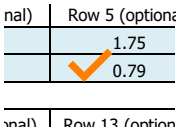

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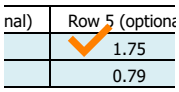

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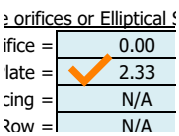

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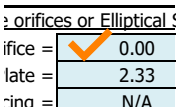

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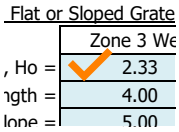

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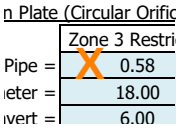

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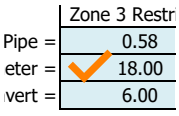

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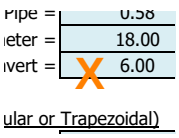

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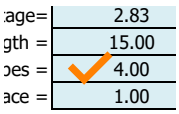

Author: Mikayla Hartford
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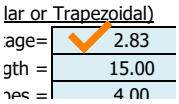

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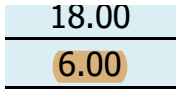

Author: Mikayla Hartford
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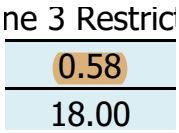

Author: Mikayla Hartford
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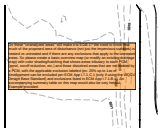

Author: Mikayla Hartford
Subject: SW - Textbox
Page Label: [2] PROPOSED BASINS
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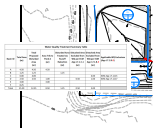
Do these "unanalyzed areas" still make it to EDB-1? We need to know how much of the proposed area of disturbance (not just the impervious surfaces) is treated vs untreated and if there are any exclusions that apply to the untreated areas. So please create a basic overview map (or modify an existing drainage map) with color shading/hatching that shows areas tributary to each PCM (pond, runoff reduction, etc.) and those disturbed areas that are not treated by a PCM, with the applicable exclusion labeled (ex: 20% up to 1ac of development can be excluded per ECM App I.7.1.C.1 (only if using the WQCV Design Base Standard) and exclusions listed in ECM App I.7.1.B.#). An accompanying summary table on this map would also be very helpful. Example provided:



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Subject: Image
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Appendix D
Forebay Analysis

Please put these calcs with the other pond calcs

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Please put these calcs with the other pond calcs