TRI-STATE GENERATION & TRANSMISSION, INC.

ROLLING MEADOWS SUBSTATION
FINAL DRAINAGE REPORT

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Prepared by:

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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 — 09/01/2026

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 — 8/31/2026

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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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.

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)
EX-1	4.76
EX-2	0.96
EX-3	0.46

Currently, the existing subbasins experience 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).

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	0.75
EXCL-1	0.95
EXCL-2	0.46

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**.

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
EX-1	4.76	2%	0.09	0.36
EX-2	0.96	2%	0.09	0.36
EX-3	0.46	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	0.75	100%	0.90	0.96
EXCL-1	0.96	40%	0.33	0.52
EXCL-2	0.46	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-1	1.77	11.88
Existing-2	0.36	2.40
Existing-3	0.17	1.15
TOTAL	**2.30**	**15.43**

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.

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, a bottom width of 10 feet, 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
5808.6	158
5808.85	916
5809.1	2,546
5809.35	5,046
5809.6	8,287
5809.85	11,734
5810.1	14,771
5810.35	17,395
5810.6	19,333
5810.85	20,660
5811.1 (Emergency Spillway)	21,453
5812.35 (Top of Bank)	28,470

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 C.**

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 (08-18-NP)	18	6.45	1.28	5.17

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	2.09
Y2	1.49	2.96
Y3	1.75	3.49
P1	0.44	1.79
P2	0.36	2.42
P3	0.48	2.05
P4	2.79	4.99
EXCL-1	0.29	3.46
EXCL-2	0.15	1.56

*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. Upon analysis, two pipes were identified to be surcharged for 2 minutes each, resulting in a flooded volume of 0.01 acre-inches (36.3 cu.ft.). It was determined that this was not a concern due to the short duration, and because the backup would be confined to substation without issue. A model schematic identifying each pipe can be found in **Appendix D**.

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	3.86	1.78	2.08
02-12-P	12	2.75	2.04	0.71
03-15-NP	15	4.38	3.77	0.61
04-15-P	15	4.36	3.74	0.62
05-18-NP	15	8.27	6.43	1.84
06-15-P	12	5.56	3.44	2.12
07-15-NP	12	9.30	3.44	5.86

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. The 'Proposed' discharge is the sum of the outlet pipe flow and the excluded subbasin flows.

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

Basin	5-Year Discharge (CFS)		100-Year Discharge (CFS)	
	Existing	Proposed	Existing	Proposed
Total	2.30	0.49	15.43	6.30

*Proposed Discharge Values = EXCL1 + EXCL2 + Pond Outlet discharge rates

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 investigated. Because this site has 4 locations of inflow into the detention basin, separating sediment prior to reaching the detention pond outlet structure was analyzed. Per the MHFD's *Stormwater Control Measure (SCM) Design Workbook*, once an Extended Detention Basin (EDB) worksheet is generated, it states that a Concrete Sediment Pad is sufficient for impervious areas less 2 acres. All 4 subbasins are less than 2 acres, with outlets running into the detention basin which will flow onto riprap rundowns and then onto a 6' wide concrete trickle channel, which will act as a sediment pad and provide sufficient sediment separation.

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 can be found in **Appendix C** and swale capacity calculations can be found in the SWMM model in **Appendix B**.

Step 3 – Provide Water Quality Capture Volume

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**.

The majority of the disturbed area will drain to the EDB-1, and exclusions have been applied to the areas no draining to EDB-1. 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. Reference the 'PROPOSED BASINS' drawing in Appendix E for

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.

NOTE: This proposed system will be private and maintained by TSGT.

NOTE: Drainage and Bridge Fees for this project shall be paid by the developer during the Final Plat approval process.

5.4 Cost Estimate

Line Item Description	Quantity	U.O.M.	Labor	CFM	Labor & Materials
D50=6" Rip Rap	159	SY	$ 61.56	$ 40.29	$ 16,194.15
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:	**$ 51,024.22**

Appendix A

Site Specific Physical Design Properties

Rolling Meadows Substation Drainage Design

Existing Conditions-100 Year

Area Name	Total Area (sf)	Total Area (acres)	Flow Length	Slope (%)	TOC (min)
EX-1	207320	4.76	300	2.0%	18.41
EX-2	41887	0.96	50	2.0%	10.97
EX-3	20229	0.46	50	2.0%	11.17

TOC Calculated using equation 6-8 & 6-9 from Chapter 6 of the Colordo Springs DCM

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

Runoff Coefficient and Imperviousness Analysis

EX-1

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%**				

EX-2

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
Native	0.96	0.36	0.35	2%	2%
		sum	0.35		2%
Total Area (ac)	**0.962**	Weighted	0.36		2%
Weighted Runoff Coefficient	**0.36**				
Weighted Percent Impervious	**2%**				

EX-2

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
Native	0.46	0.36	0.17	2%	1%
		sum	0.17		1%
Total Area (ac)	**0.464**	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-1	207320.088	4.76	300	2.0%	25.13
EX-2	41887	0.96	50	2.0%	10.97
EX-3	20229	0.46	50	2.0%	11.17

TOC Calculated using equation 6-8 & 6-9 from Chapter 6 of the Colordo Springs DCM

Land Cover Type	Percent Impervious	Runoff Coefficient
Historical Flow Analysis	2%	0.09
Gravel	40%	0.3
Pond	100%	0.9

Runoff Coefficient and Imperviousness Analysis

EX-1

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
Existing Site	4.76	0.09	0.43	2%	10%
		sum	0.43		10%
Total Area (ac)	**4.76**	Weighted	0.09		2%
Weighted Runoff Coefficient	**0.09**				
Weighted Percent Impervious	**2%**				

EX-2

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
Native	0.96	0.09	0.09	2%	2%
		sum	0.09		2%
Total Area (ac)	**0.962**	Weighted	0.09		2%
Weighted Runoff Coefficient	**0.09**				
Weighted Percent Impervious	**2%**				

EX-3

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
Native	0.46	0.09	0.04	2%	1%
		sum	0.04		1%
Total Area (ac)	**0.464**	Weighted	0.09		2%
Weighted Runoff Coefficient	**0.09**				
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	18833	0.43	50	1.00%	5.11
Y2	26554	0.61	50	1.00%	5.11
Y3	31214	0.72	50	1.00%	5.11
P1	27283	0.63	50	1.00%	8.76
P2	42126	0.97	50	3.00%	8.53
P3	31278	0.72	50	3.00%	9.77
P4	32493	0.75	50	3.00%	6.57
EXCL-1	41887	0.96	50	3.00%	9.60
EXCL-2	20229	0.46	50	3.00%	9.77

TOC Calculated using equation 6-8 & 6-9 from Chapter 6 of the Colordo Springs DCM

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	0.75	0.96	0.72	100%	74.6%
		sum	0.72		74.6%
Total Area (ac)	**0.75**	Weighted	0.96		100%
Weighted Runoff Coefficient	**0.96**				
Weighted Percent Impervious	**100%**				

EXCL-1

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
Driving Surface (Gravel)	0.46	0.7	0.32	80%	36.8%
Native	0.50	0.36	0.18	2%	1.0%
		sum	0.50		37.8%
Total Area (ac)	**0.96**	Weighted	0.52		39%
Weighted Runoff Coefficient	**0.52**				
Weighted Percent Impervious	**39%**				

EXCL-2

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
Native	0.52	0.36	0.19	2%	1.0%
		sum	0.19		1.0%
Total Area (ac)	**0.52**	Weighted	0.36		2%
Weighted Runoff Coefficient	**0.36**				
Weighted Percent Impervious	**2%**				

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	2.11	0.36	0.76	2%	4.2%
Pond	0.75	0.96	0.72	100%	74.6%
		sum	2.85		235.5%
Total Area (ac)	**4.82**	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	18833	0.43	50	1.0%	6.51
Y2	26554	0.61	50	1.0%	6.51
Y3	31214	0.72	50	1.0%	6.51
P1	27283	0.63	50	1.0%	11.87
P2	42126	0.97	50	3.0%	9.77
P3	31278	0.72	50	3.0%	9.77
P4	32493	0.75	50	3.0%	8.97
EXCL-1	41887	0.96	50	3.0%	9.60
EXCL-2	20229	0.46	50	3.0%	9.77

TOC Calculated using equation 6-8 & 6-9 from Chapter 6 of the Colordo Springs DCM

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%**				

P3

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
Driving Surface (Gravel)	0.10	0.59	0.06	80%	8.0%
Native	0.62	0.09	0.06	2%	1.2%
Pond	0.00	0.9	0.00	100%	0.0%
		sum	0.11		9.2%
Total Area (ac)	**0.72**	Weighted	0.16		13%
Weighted Runoff Coefficient	**0.16**				
Weighted Percent Impervious	**13%**				

P4

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
Driving Surface (Gravel)	0.00	0.59	0.00	80%	0.0%
Native	0.00	0.09	0.00	2%	0.0%
Pond	0.75	0.9	0.67	100%	74.6%
		sum	0.67		74.6%
Total Area (ac)	**0.75**	Weighted	0.90		100%
Weighted Runoff Coefficient	**0.90**				
Weighted Percent Impervious	**100%**				

EXCL-1

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
Driving Surface (Gravel)	0.46	0.59	0.27	80%	36.8%
Native	0.50	0.09	0.05	2%	1.0%
		sum	0.32		37.8%
Total Area (ac)	**0.96**	Weighted	0.33		39%
Weighted Runoff Coefficient	**0.33**				
Weighted Percent Impervious	**39%**				

EXCL-2

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
Native	0.52	0.09	0.05	2%	1.0%
		sum	0.05		1.0%
Total Area (ac)	**0.52**	Weighted	0.09		2%
Weighted Runoff Coefficient	**0.09**				
Weighted Percent Impervious	**2%**				

Composite

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
Driving Surface (Gravel)	1.96	0.59	1.16	80%	156.7%
Native	2.11	0.09	0.19	2%	4.2%
Pond	0.75	0.9	0.67	100%	74.6%
		sum	2.02		235.5%
Total Area (ac)	**4.82**	Weighted	0.42		49%
Weighted Runoff Coefficient	**0.42**				
Weighted Percent Impervious	**49%**				

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	0.31	5/8	Varies
5808.853	0.83	910	382		5808.77		0.31	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

Rolling Meadows Spillway Calculations

08/26/26

Calculated by: Thayne Clement

Emergency Spillway 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)	4.5	cfs
Disharge Coefficient (C)	2.6	
Weir Height (H)	1.25	ft
Required Freeboard	1	ft
Width of Weir (L) - Required	**13.85**	ft
Width of Weir (L) - Provided	**15**	ft
100 Year Flow Depth	**0.24**	ft

Emergency Spillway RipRap Sizing		
Izbash Formula: D50 = (V^2)/(2*32.2*(0.86^2)*(2.55-1))*12		
Assume RipRap Specific Gravity 2.55		
Assume non-eroding veolicty = 5 ft/s		
L_p = (1/(2tanX))(A_t/Y_t-W)		
Width of Protection, T = 2(L_p*tanX)+W		
Variable	Input	Units
Spillway Bottom Width	15	ft
Spillway Side Slope (X:1)	4	ft
100yr Flow Depth	0.25	ft
Spillway XS Area	**4.00**	sqft
Froude Parameter	**0.14**	ft/s / ft^2.5
Expansion Factor	0.5	
Expansion Angle	0.79	
100 year Discharge Rate (Q)	16.35	cfs
Disharge Velocity (V)	4.0875	ft/s
Area of Allowable Velovcity	**3.27**	sq. ft.
Required D50 Value	**2.72**	in
Provided D50 Value	**6.00**	in
Calc. Length of Protection, L	**-0.96**	ft
Min. Length of Protection, 3H	**0.75**	
Provided Length of Protection	**18.60**	
Width of Protection, T	**16.50**	ft
Provided Width of Protection	**17.00**	ft

Level Spreader RipRap Sizing		
Izbash Formula: D50 = (V^2)/(2*32.2*(0.86^2)*(2.55-1))*12		
Assume RipRap Specific Gravity 2.55		
Assume non-eroding veolicty = 5 ft/s		
Length of Protection: L_p = (1/(2tanX))(A_t/Y_t-W)		
Width of Protection, T = 2(L_p*tanX)+W		
Variable	Input	Units
Spillway Bottom Width	1.0	ft
Spillway Side Slope (X:1)	1.0	ft/ft
100yr Flow Depth	1.0	ft
Spillway XS Area	2.0	sqft
Froude Parameter	1.3	ft/s / ft^2.5
Expansion Factor	0.3	
Expansion Angle	1.0	
100 year Discharge Rate (Q)	1.3	cfs
Disharge Velocity (V)	0.6	ft/s
Area of Allowable Velovcity	0.3	sq. ft.
Required D50 Value	0.1	in
Provided D50 Value	6.0	in
Calc. Length of Protection, L	0.3	ft
Min. Length of Protection, 3H	3.0	ft
Provided Length of Protection	3.0	ft
Width of Protection, T	10.1	ft
Provided Width of Protection	80.0	ft

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		
Assume non-eroding veolicty = 5 ft/s		
Length of Protection: L_p = (1/(2tanX))(A_t/Y_t-W)		
Width of Protection, T = 2(L_p*tanX)+W		
Variable	Input	Units
Pipe Diameter	1.5	ft
Pipe XS Area	1.7671459	sqft
100yr Flow Depth	0.435	ft
Froude Parameter	**0.42**	ft/s / ft^2.5
Expansion Factor	**6.50**	
Expansion Angle	0.0767719	
100 year Discharge Rate (Q)	1.15	cfs
Disharge Velocity (V)	0.65	ft/s
Area of Allowable Velovcity	**0.23**	sq. ft.
Required D50 Value	**0.07**	in
Provided D50 Value	**6.00**	in
Calc. Length of Protection, L	**-6.31**	ft
Min. Length of Protection, 3H	**4.50**	ft
Provided Length of Protection	**4.50**	ft
Width of Protection, T	**2.19**	ft
Provided Width of Protection	**3.00**	ft

Northern Swale RipRap Sizing		
Izbash Formula: D50 = (V^2)/(2*32.2*(0.86^2)*(2.55-1))*12		
Assume RipRap Specific Gravity 2.55		
Assume non-eroding veolicty = 5 ft/s		
Length of Protection: L_p = (1/(2tanX))(A_t/Y_t-W)		
Width of Protection, T = 2(L_p*tanX)+W		
Variable	Input	Units
Spillway Bottom Width	10	ft
Spillway Side Slope (X:1)	4	ft
Max Depth	1	
100yr Flow Depth	**0.16**	ft
Spillway XS Area	**1.70**	sqft
Froude Parameter	0.01	ft/s / ft^2.5
Y_t/H	0.16	ft/ft
Expansion Factor	6.60	
Expansion Angle	**0.08**	
100 year Discharge Rate (Q)	**1.90**	cfs
Disharge Velocity (V)	**1.12**	ft/s
Area of Allowable Velocity	**0.38**	sq. ft.
Required D50 Value	**0.20**	in
Provided D50 Value	**6.00**	in
Calc. Length of Protection, L	**-50.33**	ft
Min. Length of Protection, 3H	**3.00**	ft
Provided Length of Protection	**3.00**	ft
Width of Protection, T	**10.45**	ft
Provided Width of Protection	**11.00**	ft

If the northern swale is meant to be grass lined, just provide a design calculation and show it meets the depth, freeboard and velocity requirements. If it needs to be lined, then show it hatched on drainage map and GEC plans.

Southern Swale RipRap Sizing		
Izbash Formula: D50 = (V^2)/(2*32.2*(0.86^2)*(2.55-1))*12		
Assume RipRap Specific Gravity 2.55		
Assume non-eroding veolicty = 5 ft/s		
Length of Protection: L_p = (1/(2tanX))(A_t/Y_t-W)		
Width of Protection, T = 2(L_p*tanX)+W		
Variable	Input	Units
Spillway Bottom Width	10	ft
Spillway Side Slope (X:1)	4	ft
Max Depth	1	
100yr Flow Depth	0.15	ft
Spillway XS Area	1.59	sqft
Froude Parameter	0.01	ft/s / ft^2.5
Y_t/H	0.15	ft/ft
Expansion Factor	6.6	
Expansion Angle	0.08	
100 year Discharge Rate (Q)	1.64	cfs
Disharge Velocity (V)	1.03	ft/s
Area of Allowable Velocity	0.33	sq. ft.
Required D50 Value	0.17	in
Provided D50 Value	N/A	in
Calc. Length of Protection, L	-51.57	ft
Min. Length of Protection, 3H	3.00	ft
Provided Length of Protection	3.00	ft
Width of Protection, T	10.45	ft
Provided Width of Protection	N/A	ft

*Class 5 gravel road provides sufficent energy

*Class 5 gravel road provides sufficent energy

North Subdrain Outlet RipRap		
Izbash Formula: D50 = (V^2)/(2*32.2*(0.86^2)*(2.55-1))*12		
Assume RipRap Specific Gravity 2.55		
Assume non-eroding veolicty = 5 ft/s		
Length of Protection: L_p = (1/(2tanX))(A_t/Y_t-W)		
Width of Protection, T = 2(L_p*tanX)+W		
Variable	Input	Units
Pipe Diameter	1	ft
Pipe XS Area	0.79	sqft
100yr Flow Depth	0.58	ft
Froude Parameter	3.29	ft/s / ft^2.5
Y_t/H	0.58	ft/ft
Expansion Factor	6.25	
Expansion Angle	0.08	
100 year Discharge Rate (Q)	3.29	cfs
Disharge Velocity (V)	4.19	ft/s
Area of Allowable Velocity	0.66	sq. ft.
Required D50 Value	2.85	in
Provided D50 Value	6.00	in
Calc. Length of Protection, L	0.84	ft
Min. Length of Protection, 3H	3.00	ft
Provided Length of Protection	3.00	ft
Width of Protection, T	1.48	ft
Provided Width of Protection	3.00	ft

South Subdrain Outlet RipRap		
Izbash Formula: D50 = (V^2)/(2*32.2*(0.86^2)*(2.55-1))*12		
Assume RipRap Specific Gravity 2.55		
Assume non-eroding veolicty = 5 ft/s		
Length of Protection: L_p = (1/(2tanX))(A_t/Y_t-W)		
Width of Protection, T = 2(L_p*tanX)+W		
Variable	Input	Units
Pipe Diameter	1.25	ft
Pipe XS Area	**1.23**	sqft
100yr Flow Depth	1.16	ft
Froude Parameter	**3.72**	ft/s / ft^2.5
Y_t/H	**0.93**	ft/ft
Expansion Factor	6.6	
Expansion Angle	**0.08**	
100 year Discharge Rate (Q)	6.5	cfs
Disharge Velocity (V)	5.30	ft/s
Area of Allowable Velocity	1.30	sq. ft.
Required D50 Value	**4.56**	in
Provided D50 Value	**6.00**	in
Calc. Length of Protection, L	**-0.87**	ft
Min. Length of Protection, 3H	**3.75**	ft
Provided Length of Protection	**4.00**	ft
Width of Protection, T	**1.82**	ft
Provided Width of Protection	**2.00**	ft

Appendix B
SWMM Modeling Results

Project Description

File Name	24028-5Y_new.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	12
Nodes	22
Junctions	15
Outfalls	6
Flow Diversions	0
Inlets	0
Storage Nodes	1
Links	22
Channels	2
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

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-1	4.76	0.0900	0.69	0.06	0.30	1.77	0 00:10:00
2	EX-2	0.96	0.0900	0.69	0.06	0.06	0.36	0 00:10:00
3	EX-3	0.46	0.0900	0.69	0.06	0.03	0.17	0 00:10:00
4	EXCL-1	0.96	0.3300	0.69	0.23	0.22	1.31	0 00:10:00
5	EXCL-2	0.46	0.0900	0.69	0.06	0.03	0.17	0 00:10:00
6	P1	0.63	0.1700	0.69	0.12	0.07	0.44	0 00:10:00
7	P2	0.97	0.0900	0.69	0.06	0.06	0.36	0 00:10:00
8	P3	0.72	0.1600	0.69	0.11	0.08	0.48	0 00:10:00
9	P4	0.75	0.9000	0.69	0.62	0.46	2.79	0 00:10:00
10	Y1	0.43	0.5900	0.69	0.41	0.17	1.05	0 00:10:00
11	Y2	0.61	0.5900	0.69	0.41	0.25	1.49	0 00:10:00
12	Y3	0.72	0.5900	0.69	0.41	0.29	1.75	0 00:10:00

Rolling Meadows Substation
5-Year Storm

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	5812.39	5815.82	0.00	6.00	0.00	1.45	5812.89	0.00	2.93	0 00:00	0.00	0.00
2	2-Jun	Junction	5810.99	5814.56	0.00	6.00	0.00	2.77	5811.59	0.00	2.97	0 00:00	0.00	0.00
3	3-Jun	Junction	5810.49	5810.38	0.00	6.00	0.00	2.77	5811.09	0.00	0.90	0 00:00	0.00	0.00
4	5-Jun	Junction	5811.49	5814.60	5811.49	6.00	0.00	1.73	5811.97	0.00	2.63	0 00:00	0.00	0.00
5	6-Jun	Junction	5813.17	5813.95	0.00	6.00	0.00	0.44	5813.40	0.00	0.77	0 00:00	0.00	0.00
6	7-Jun	Junction	5811.35	5812.35	0.00	6.00	0.00	0.30	5811.41	0.00	0.95	0 00:00	0.00	0.00
7	8-Jun	Junction	5808.00	5809.00	0.00	6.00	0.00	0.38	5811.53	0.00	0.94	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	5811.90	5818.00	5812.00	0.00	0.00	1.45	5812.40	0.00	5.60	0 00:00	0.00	0.00
11	12-Jun	Junction	5812.97	5815.57	0.00	0.00	0.00	1.75	5813.45	0.00	2.12	0 00:00	0.00	0.00
12	13-Jun	Junction	5813.82	5815.99	5813.82	0.00	0.00	1.05	5814.25	0.00	1.74	0 00:00	0.00	0.00
13	14-Jun	Junction	0.00	6.00	0.00	6.00	0.00	0.36	5815.05	0.00	0.94	0 00:00	0.00	0.00
14	15-Jun	Junction	0.00	6.00	0.00	6.00	0.00	0.48	5814.45	0.00	0.93	0 00:00	0.00	0.00
15	SD-N-Out	Junction	5809.62	5809.62	0.00	6.00	0.00	1.73	5810.07	0.00	0.89	0 00:00	0.00	0.00
16	Out-01	Outfall	5807.54					0.05	5807.54					
17	Out-02	Outfall	0.00					1.77	0.00					
18	Out-05	Outfall	0.00					0.36	0.00					
19	Out-06	Outfall	0.00					0.17	0.00					
20	Out-EXCL1	Outfall	0.00					1.31	0.00					
21	Out-EXCL2	Outfall	0.00					0.17	0.00					
22	EDB	Storage Node	5808.35	5812.35	0.00		0.00	7.28	5809.77				0.00	0.00

Rolling Meadows Substation
5-Year Storm

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	5812.39	1.5600	12.000	0.0150	0.44	3.86	0.11	3.77	0.23	0.23	0.00	Calculated
2	02-12-P	Pipe	13-Jun	1-Jun	180.00	5813.49	5812.39	0.6100	12.000	0.0150	1.02	2.75	0.37	5.11	0.42	0.42	0.00	Calculated
3	03-15-NP	Pipe	1-Jun	11-Jun	80.00	5812.39	5811.90	0.6100	15.000	0.0150	1.45	4.38	0.33	3.22	0.49	0.40	0.00	Calculated
4	04-15-P	Pipe	11-Jun	2-Jun	150.00	5811.90	5810.99	0.6100	15.000	0.0150	1.44	4.36	0.33	3.22	0.49	0.39	0.00	Calculated
5	05-18-NP	Pipe	2-Jun	3-Jun	60.61	5810.99	5810.38	1.0100	18.000	0.0150	2.77	8.27	0.34	4.22	0.60	0.40	0.00	Calculated
6	06-15-P	Pipe	12-Jun	5-Jun	150.00	5812.57	5810.77	1.2000	15.000	0.0150	1.73	5.56	0.31	5.79	0.48	0.38	0.00	Calculated
7	07-15-NP	Pipe	5-Jun	SD-N-Out	64.51	5810.77	5809.71	1.6400	15.000	0.0150	1.73	9.30	0.19	5.80	0.36	0.29	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	0.30	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	1.73	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	2.77	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	0.38	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	Swale-N	Channel	14-Jun	7-Jun	525.18	5814.99	5811.36	0.6900	12.000	0.0320	0.30	45.30	0.01	1.09	0.04	0.04	0.00	
15	Swale-S	Channel	15-Jun	8-Jun	446.88	5814.38	5811.47	0.6500	12.000	0.0320	0.38	43.97	0.01	1.19	0.05	0.05	0.00	
16	Orifice-01	Orifice	EDB	9-Jun		5808.35	5804.42		0.625		0.01							
17	Orifice-02	Orifice	EDB	9-Jun		5808.35	5804.42		0.625		0.01							
18	Orifice-03	Orifice	EDB	9-Jun		5808.35	5804.42		1.000		0.02							
19	Orifice-04	Orifice	EDB	9-Jun		5808.35	5804.42		1.000		0.01							
20	Orifice-05	Orifice	EDB	9-Jun		5808.35	5804.42		1.000		0.00							
21	Spillway	Weir	EDB	10-Jun		5808.35	5804.00				0.00							
22	Weir-01	Weir	EDB	9-Jun		5808.35	5804.42				0.00							

Subbasin Hydrology

Subbasin : EX-1

Input Data

Area (ac)	4.76
Weighted Runoff Coefficient	0.09

Runoff Coefficient

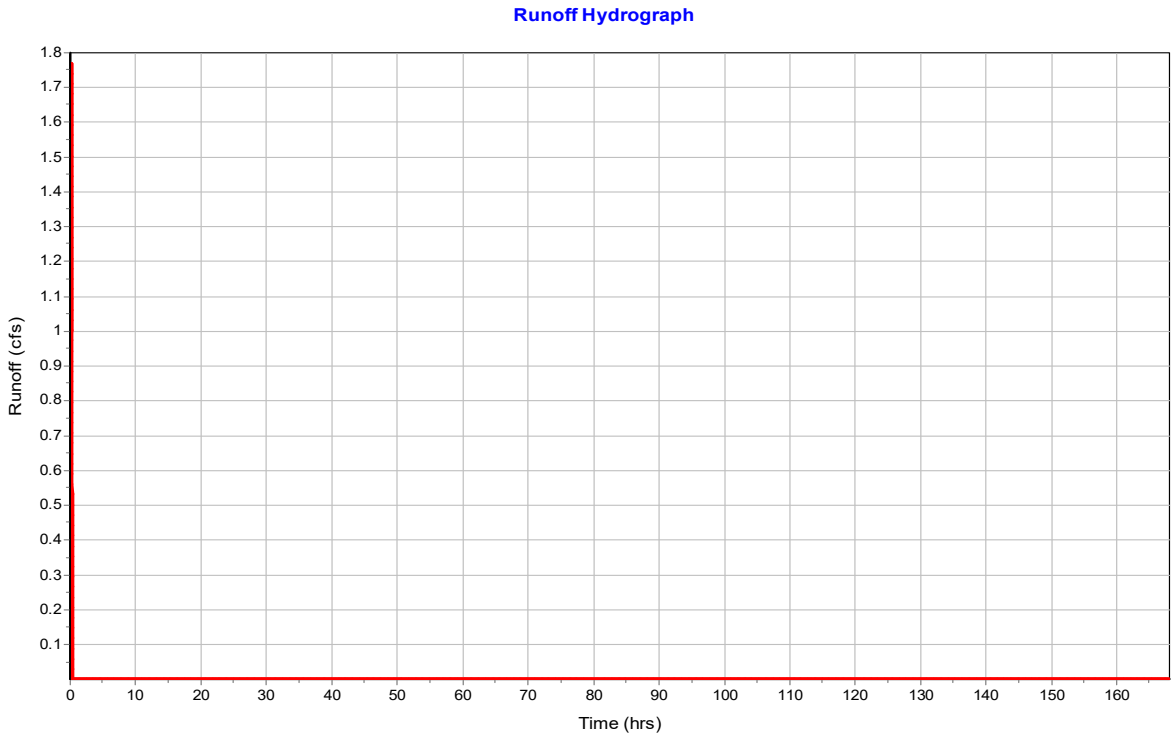
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	5.95	-	0.09
Composite Area & Weighted Runoff Coeff.	5.95		0.09

Subbasin Runoff Results

Total Rainfall (in)	0.69
Total Runoff (in)	0.06
Peak Runoff (cfs)	1.77
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

Subbasin : EX-1



Subbasin : EX-2

Input Data

Area (ac)	0.96
Weighted Runoff Coefficient	0.09

Runoff Coefficient

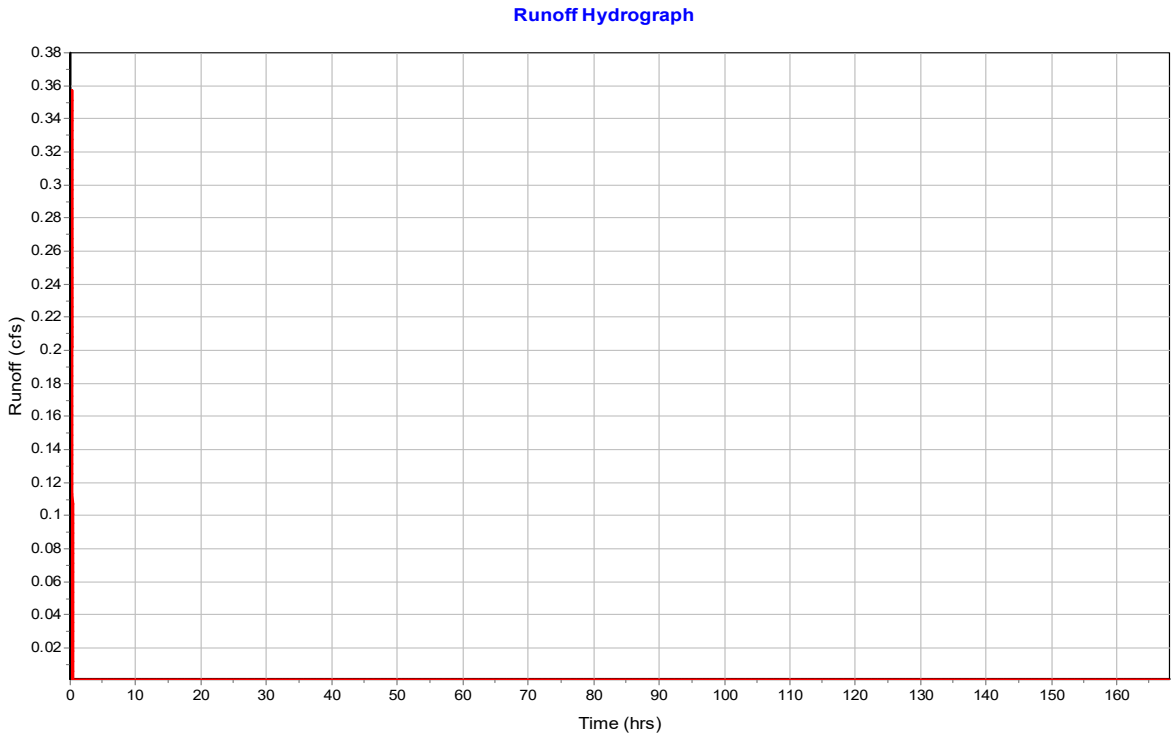
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.8	-	0.09
Composite Area & Weighted Runoff Coeff.	0.8		0.09

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

Subbasin : EX-2



Subbasin : EX-3

Input Data

Area (ac)	0.46
Weighted Runoff Coefficient	0.09

Runoff Coefficient

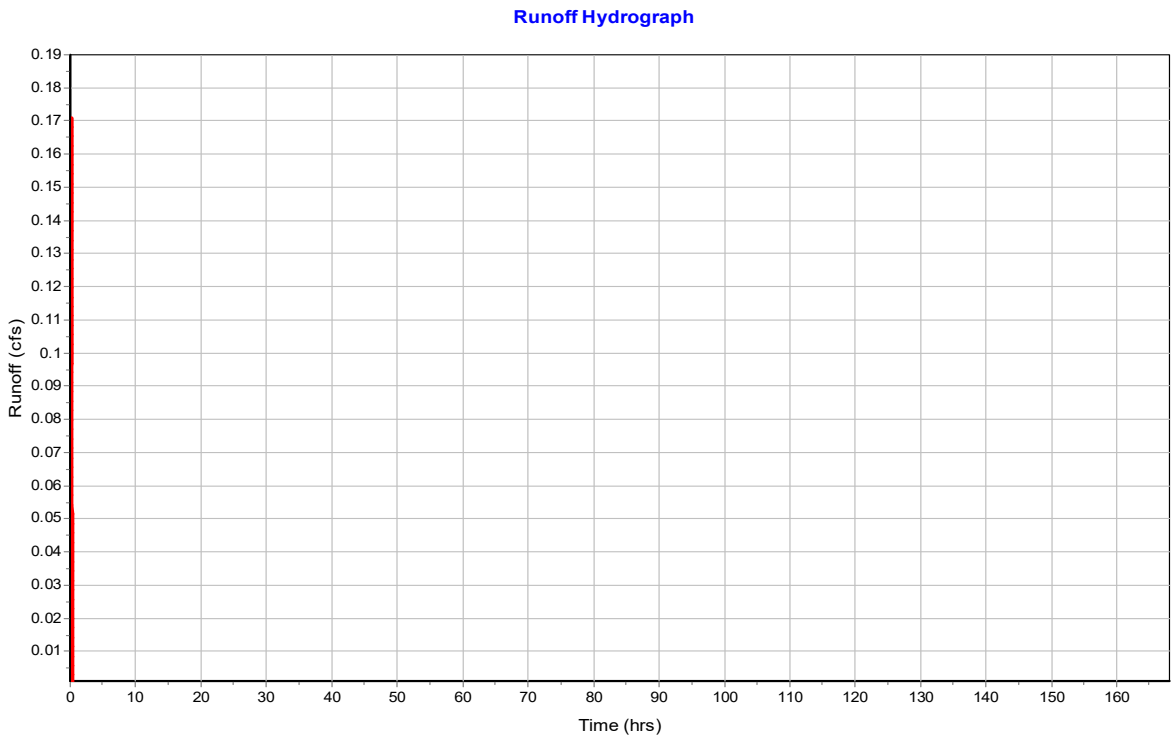
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.52	-	0.09
Composite Area & Weighted Runoff Coeff.	0.52		0.09

Subbasin Runoff Results

Total Rainfall (in)	0.69
Total Runoff (in)	0.06
Peak Runoff (cfs)	0.17
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

Subbasin : EX-3



Subbasin : EXCL-1

Input Data

Area (ac)	0.96
Weighted Runoff Coefficient	0.33

Runoff Coefficient

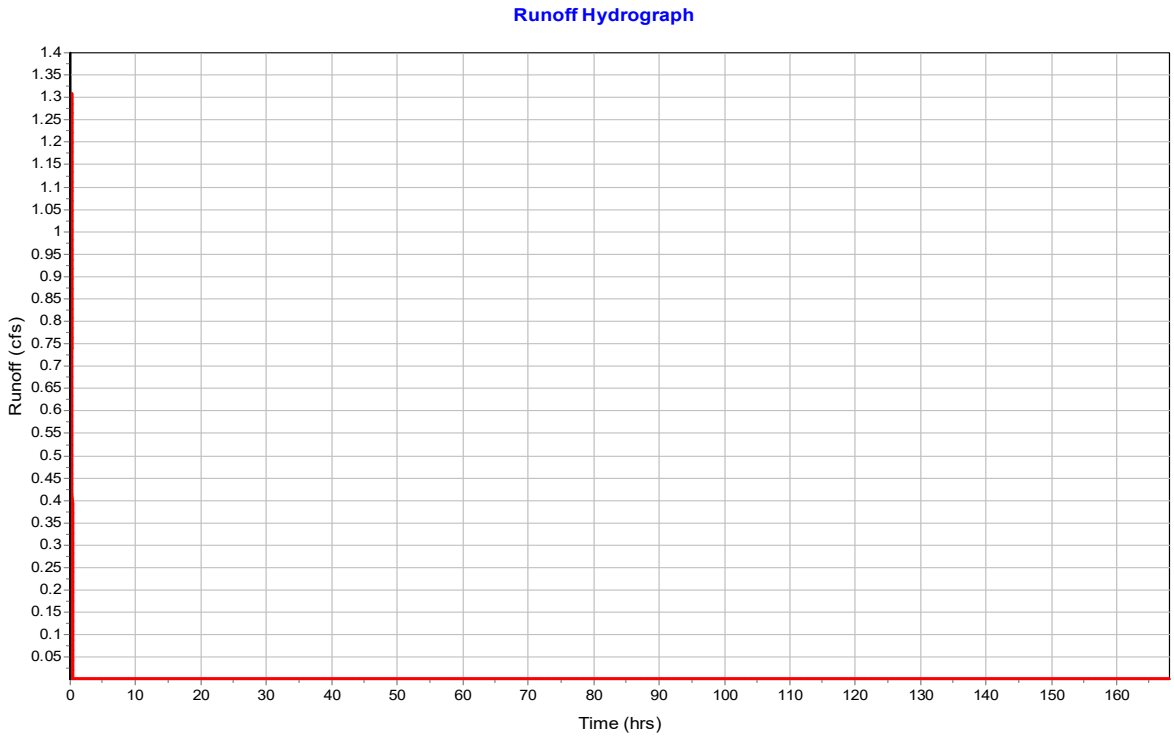
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.78	-	0.33
Composite Area & Weighted Runoff Coeff.	0.78		0.33

Subbasin Runoff Results

Total Rainfall (in)	0.69
Total Runoff (in)	0.23
Peak Runoff (cfs)	1.31
Rainfall Intensity	4.13
Weighted Runoff Coefficient	0.33
Time of Concentration (days hh:mm:ss)	0 00:10:00

Rolling Meadows Substation
5-Year Storm

Subbasin : EXCL-1



Subbasin : EXCL-2

Input Data

Area (ac)	0.46
Weighted Runoff Coefficient	0.09

Runoff Coefficient

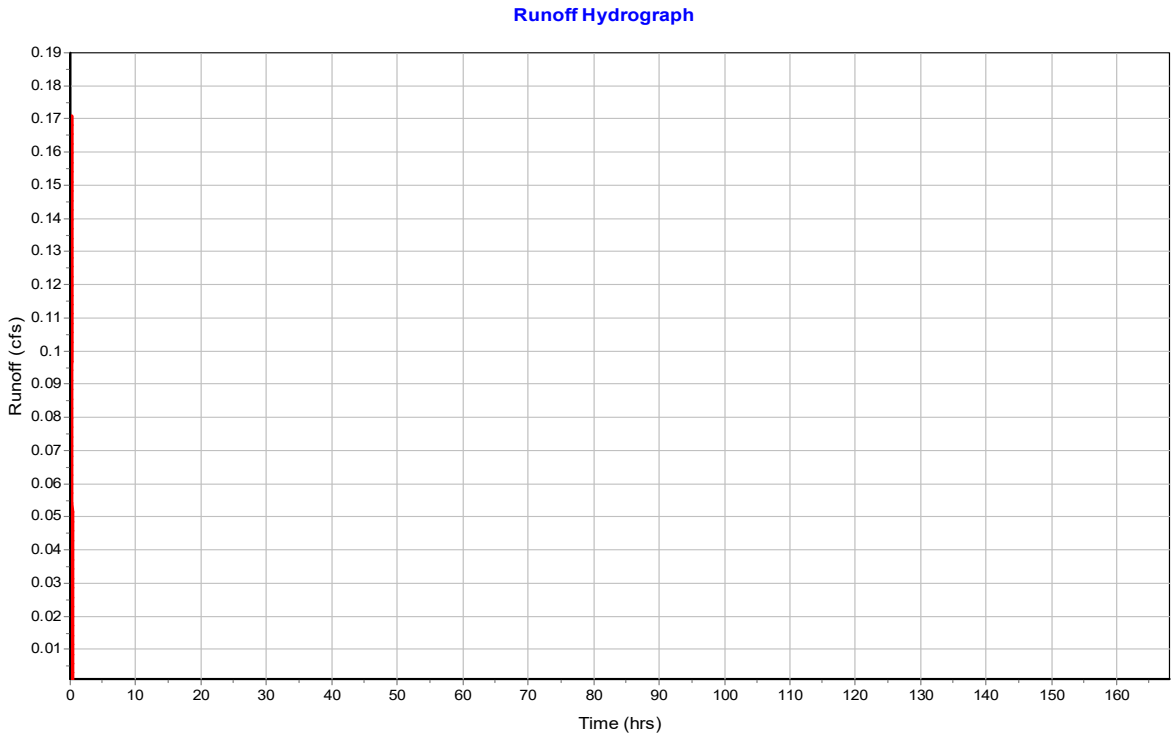
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	5	-	0.09
Composite Area & Weighted Runoff Coeff.	5		0.09

Subbasin Runoff Results

Total Rainfall (in)	0.69
Total Runoff (in)	0.06
Peak Runoff (cfs)	0.17
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

Subbasin : EXCL-2



Rolling Meadows Substation
5-Year Storm

Subbasin : P1

Input Data

Area (ac) 0.63
Weighted Runoff Coefficient 0.17

Runoff Coefficient

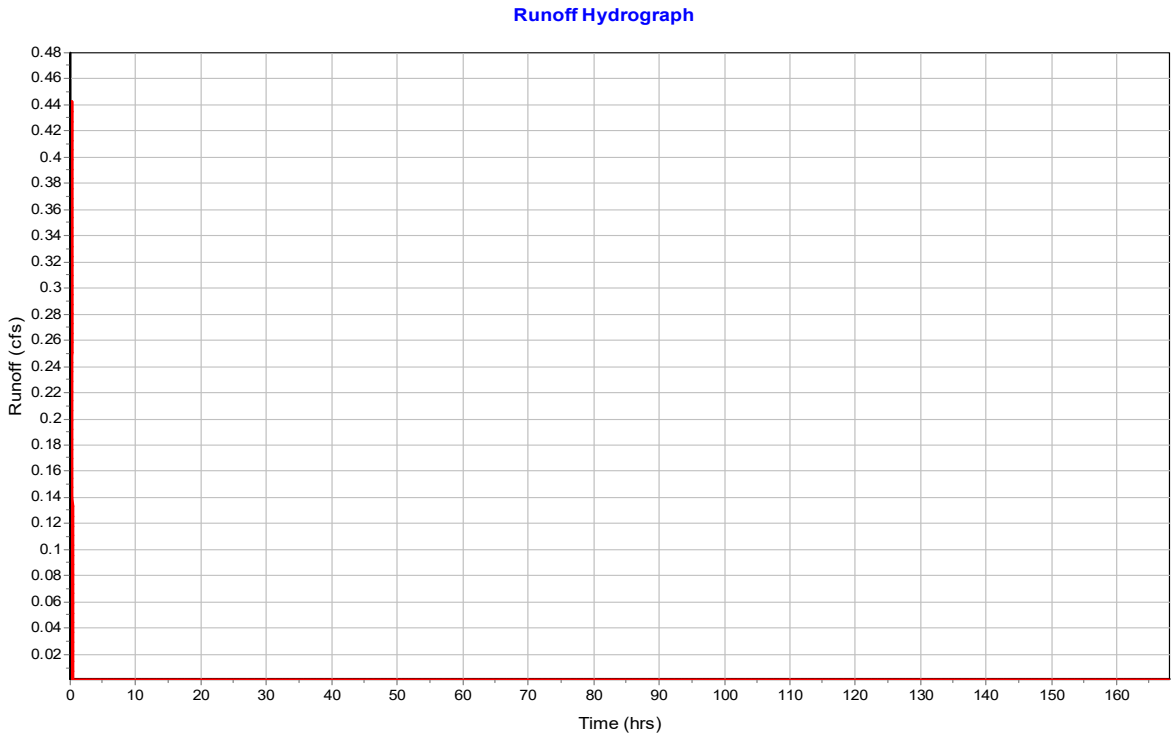
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.63	-	0.17
Composite Area & Weighted Runoff Coeff.	0.63		0.17

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

Subbasin : P1



Subbasin : P2

Input Data

Area (ac)	0.97
Weighted Runoff Coefficient	0.09

Runoff Coefficient

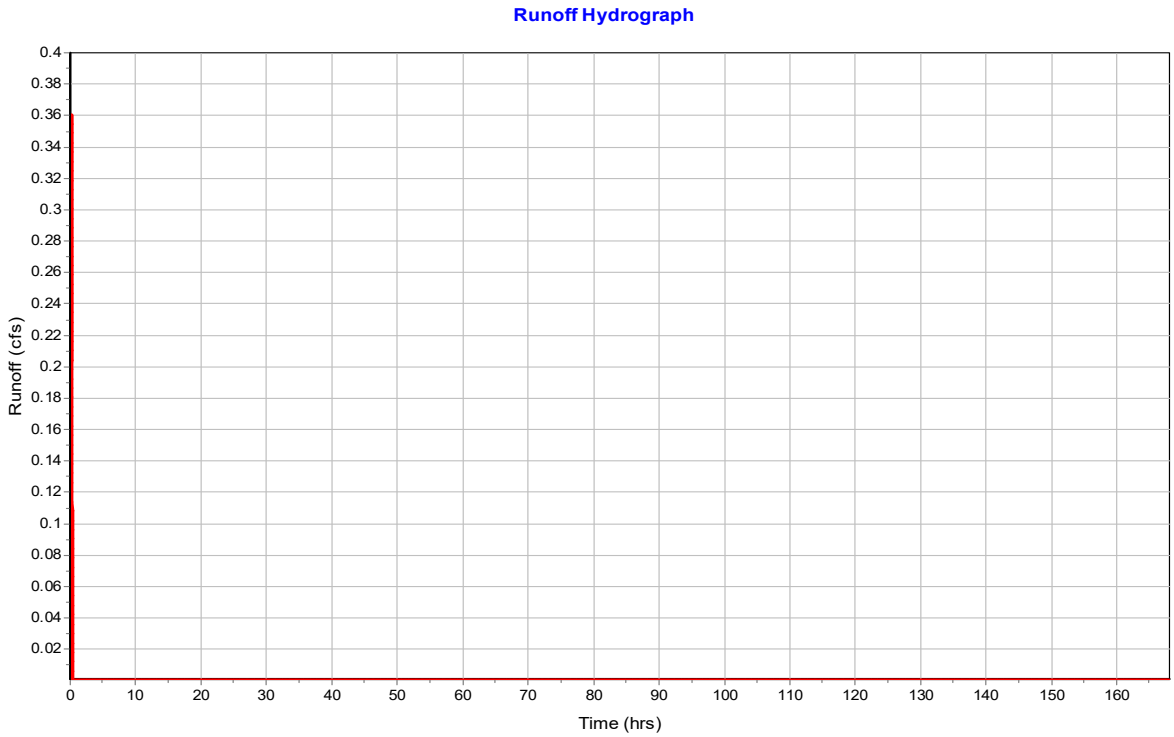
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.97	-	0.09
Composite Area & Weighted Runoff Coeff.	0.97		0.09

Subbasin Runoff Results

Total Rainfall (in)	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

Subbasin : P2



Subbasin : P3

Input Data

Area (ac)	0.72
Weighted Runoff Coefficient	0.16

Runoff Coefficient

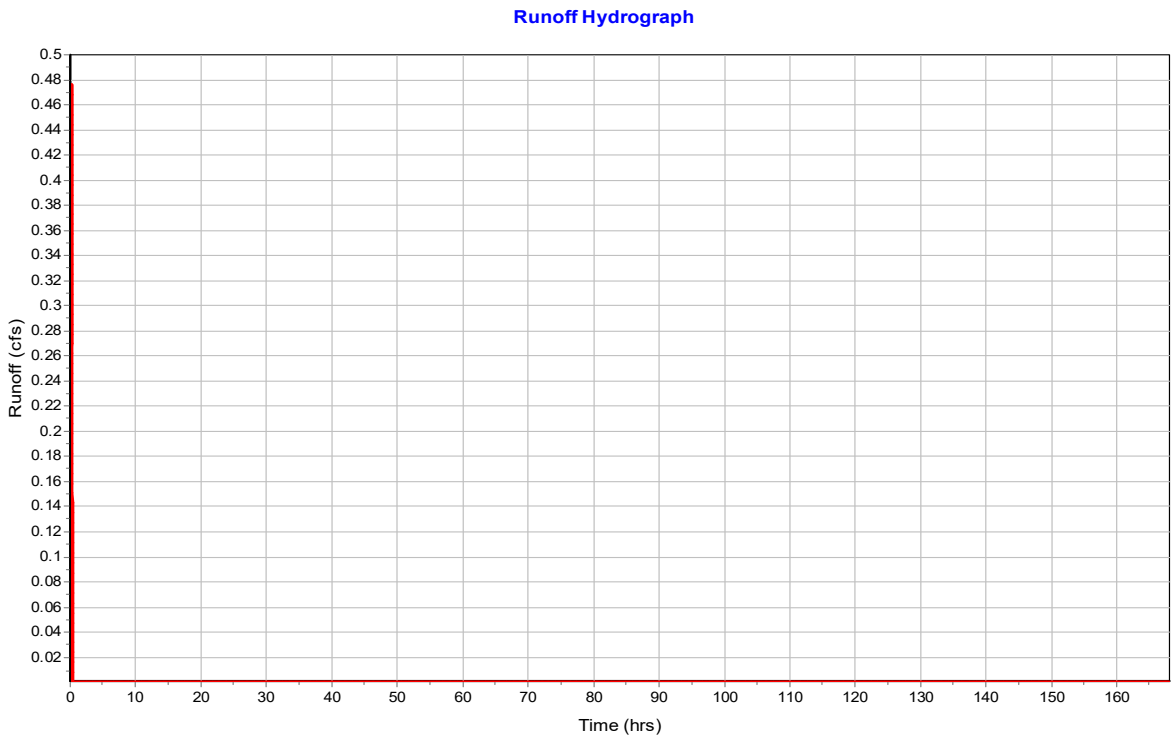
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.72	-	0.16
Composite Area & Weighted Runoff Coeff.	0.72		0.16

Subbasin Runoff Results

Total Rainfall (in)	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

Subbasin : P3



Subbasin : P4

Input Data

Area (ac)	0.75
Weighted Runoff Coefficient	0.9

Runoff Coefficient

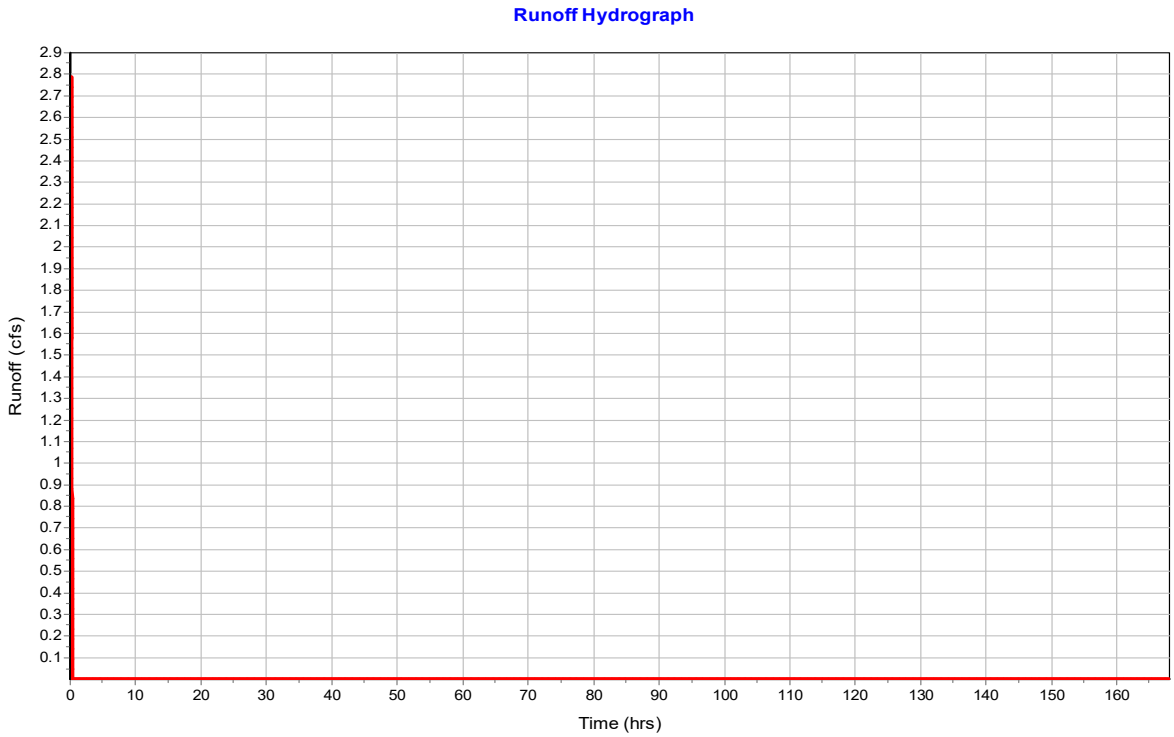
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.68	-	0.9
Composite Area & Weighted Runoff Coeff.	0.68		0.9

Subbasin Runoff Results

Total Rainfall (in)	0.69
Total Runoff (in)	0.62
Peak Runoff (cfs)	2.79
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

Subbasin : P4



Rolling Meadows Substation
5-Year Storm

Subbasin : Y1

Input Data

Area (ac) 0.43
Weighted Runoff Coefficient 0.59

Runoff Coefficient

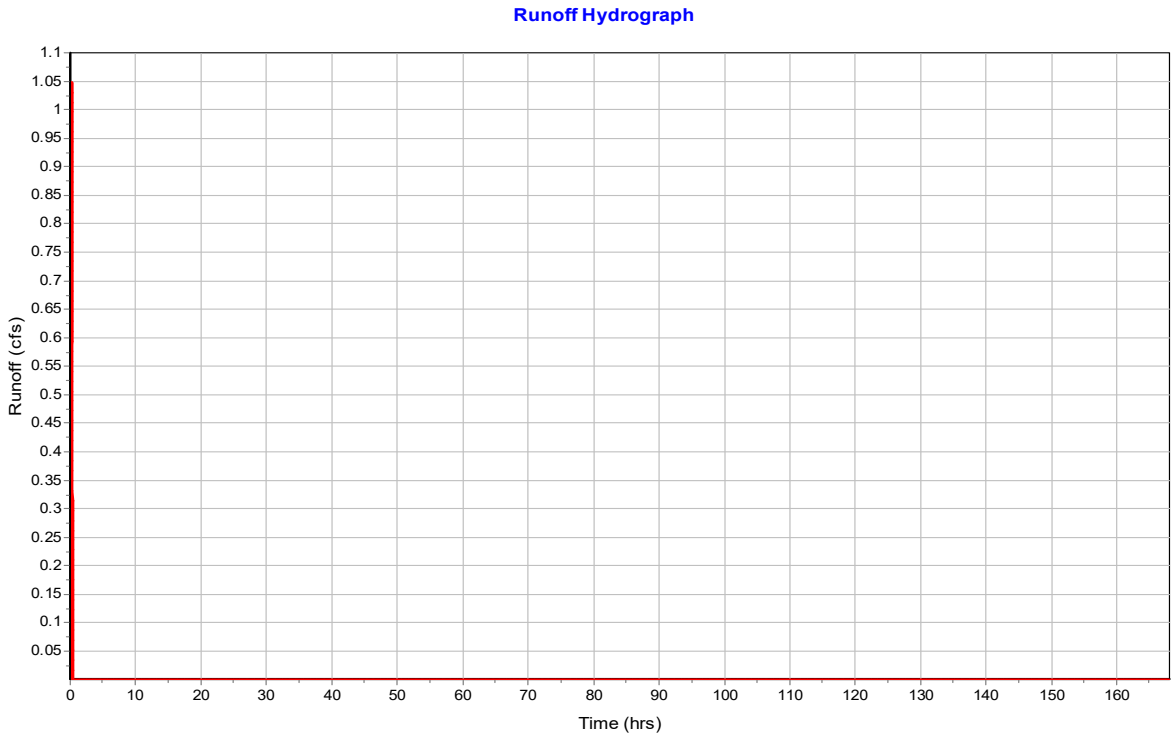
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.43	-	0.59
Composite Area & Weighted Runoff Coeff.	0.43		0.59

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

Subbasin : Y1



Subbasin : Y2

Input Data

Area (ac)	0.61
Weighted Runoff Coefficient	0.59

Runoff Coefficient

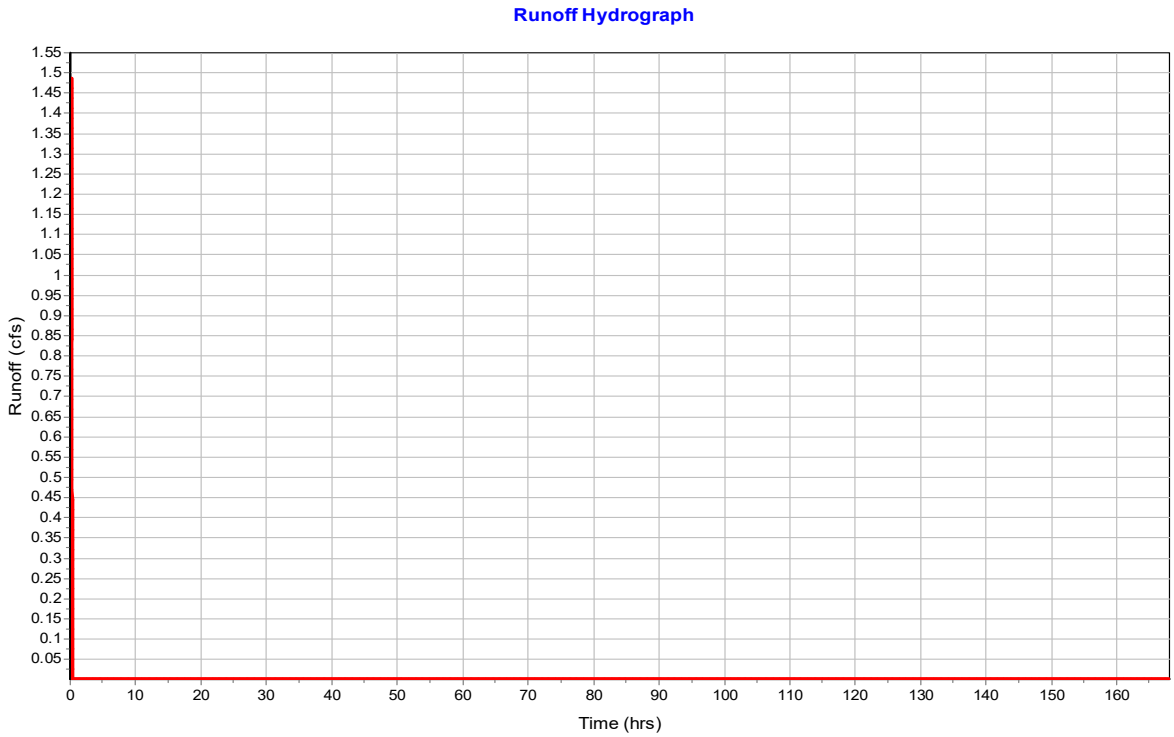
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.61	-	0.59
Composite Area & Weighted Runoff Coeff.	0.61		0.59

Subbasin Runoff Results

Total Rainfall (in)	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

Subbasin : Y2



Subbasin : Y3

Input Data

Area (ac)	0.72
Weighted Runoff Coefficient	0.59

Runoff Coefficient

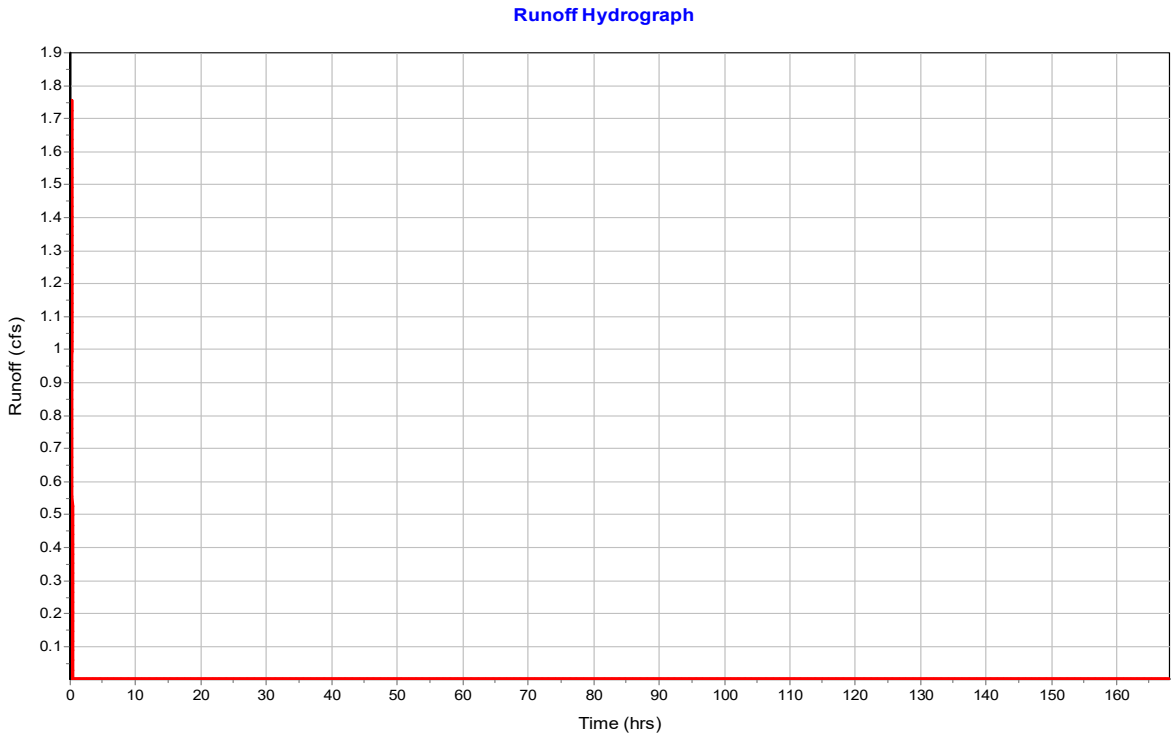
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	5	-	0.59
Composite Area & Weighted Runoff Coeff.	5		0.59

Subbasin Runoff Results

Total Rainfall (in)	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

Subbasin : Y3



Rolling Meadows Substation
5-Year Storm

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	5812.39	5815.82	3.43	0.00	-5812.39	6.00	-5809.82	0.00	0.00
2	2-Jun	5810.99	5814.56	3.57	0.00	-5810.99	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	5811.90	5818.00	6.10	5812.00	0.10	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	14-Jun	0.00	6.00	6.00	0.00	0.00	6.00	0.00	0.00	0.00
14	15-Jun	0.00	6.00	6.00	0.00	0.00	6.00	0.00	0.00	0.00
15	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

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	5812.89	0.50	0.00	2.93	5812.39	0.00	0 00:10	0 00:00	0.00	0.00
2	2-Jun	2.77	1.49	5811.59	0.60	0.00	2.97	5810.99	0.00	0 00:10	0 00:00	0.00	0.00
3	3-Jun	2.77	0.00	5811.09	0.60	0.00	0.90	5810.49	0.00	0 00:11	0 00:00	0.00	0.00
4	5-Jun	1.73	0.00	5811.97	0.48	0.00	2.63	5811.49	0.00	0 00:10	0 00:00	0.00	0.00
5	6-Jun	0.44	0.44	5813.40	0.23	0.00	0.77	5813.17	0.00	0 00:10	0 00:00	0.00	0.00
6	7-Jun	0.30	0.00	5811.41	0.06	0.00	0.95	5811.36	0.01	0 00:20	0 00:00	0.00	0.00
7	8-Jun	0.38	0.00	5811.53	3.53	0.00	0.94	5811.47	3.47	0 00:20	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 00:43	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 00:43	0 00:00	0.00	0.00
10	11-Jun	1.45	0.00	5812.40	0.50	0.00	5.60	5811.90	0.00	0 00:10	0 00:00	0.00	0.00
11	12-Jun	1.75	1.75	5813.45	0.48	0.00	2.12	5812.97	0.00	0 00:10	0 00:00	0.00	0.00
12	13-Jun	1.05	1.05	5814.25	0.43	0.00	1.74	5813.82	0.00	0 00:10	0 00:00	0.00	0.00
13	14-Jun	0.36	0.36	5815.05	5815.05	0.00	0.94	5814.99	5814.99	0 00:10	0 00:00	0.00	0.00
14	15-Jun	0.48	0.48	5814.45	5814.45	0.00	0.93	5814.38	5814.38	0 00:10	0 00:00	0.00	0.00
15	SD-N-Out	1.73	0.00	5810.07	0.45	0.00	0.89	5809.71	0.09	0 00:10	0 00:00	0.00	0.00

Channel 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 (%)	Shape	Height (ft)	Width (ft)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate
1	Swale-N	525.18	5814.99	5814.99	5811.36	0.01	3.63	0.6900	Trapezoidal	1.000	18.000	0.0320	0.5000	0.5000	0.0000	0.00	No
2	Swale-S	446.88	5814.38	5814.38	5811.47	3.47	2.91	0.6500	Trapezoidal	1.000	18.000	0.0320	0.5000	0.5000	0.0000	0.00	No

Rolling Meadows Substation
5-Year Storm

Channel Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	Swale-N	0.30	0 00:20	45.30	0.01	1.09	8.03	0.04	0.04	0.00		
2	Swale-S	0.38	0 00:20	43.97	0.01	1.19	6.26	0.05	0.05	0.00		

Rolling Meadows Substation
5-Year Storm

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	5812.39	0.00	0.78	1.5600	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	5812.39	0.00	1.10	0.6100	CIRCULAR	12.000	12.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
3	03-15-NP	80.00	5812.39	0.00	5811.90	0.00	0.49	0.6100	CIRCULAR	15.000	15.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
4	04-15-P	150.00	5811.90	0.00	5810.99	0.00	0.91	0.6100	CIRCULAR	15.000	15.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
5	05-18-NP	60.61	5810.99	0.00	5810.38	-0.11	0.61	1.0100	CIRCULAR	18.000	18.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
6	06-15-P	150.00	5812.57	-0.40	5810.77	-0.72	1.80	1.2000	CIRCULAR	15.000	15.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
7	07-15-NP	64.51	5810.77	-0.72	5809.71	0.09	1.06	1.6400	CIRCULAR	15.000	15.000	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

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	3.86	0.11	3.77	0.22	0.23	0.23	0.00		Calculated
2	02-12-P	1.02	0 00:10	2.75	0.37	5.11	0.59	0.42	0.42	0.00		Calculated
3	03-15-NP	1.45	0 00:10	4.38	0.33	3.22	0.41	0.49	0.40	0.00		Calculated
4	04-15-P	1.44	0 00:11	4.36	0.33	3.22	0.78	0.49	0.39	0.00		Calculated
5	05-18-NP	2.77	0 00:11	8.27	0.34	4.22	0.24	0.60	0.40	0.00		Calculated
6	06-15-P	1.73	0 00:10	5.56	0.31	5.79	0.43	0.48	0.38	0.00		Calculated
7	07-15-NP	1.73	0 00:10	9.30	0.19	5.80	0.19	0.36	0.29	0.00		Calculated
8	08-18-NP	0.05	0 00:43	6.45	0.01	1.10	0.69	0.10	0.06	0.00		Calculated
9	Link-04	0.30	0 00:20	0.00	0.01	0.00		0.10	0.06	0.00		Calculated
10	Link-05	1.73	0 00:10	0.00	0.01	0.00		0.10	0.06	0.00		Calculated
11	Link-06	2.77	0 00:11	0.00	0.01	0.00		0.10	0.06	0.00		Calculated
12	Link-07	0.38	0 00:20	0.00	0.01	0.00		0.10	0.06	0.00		Calculated
13	Link-10	0.05	0 00:43	0.00	0.01	0.00		0.10	0.06	0.00		Calculated

Storage Nodes

Storage Node : EDB

Input Data

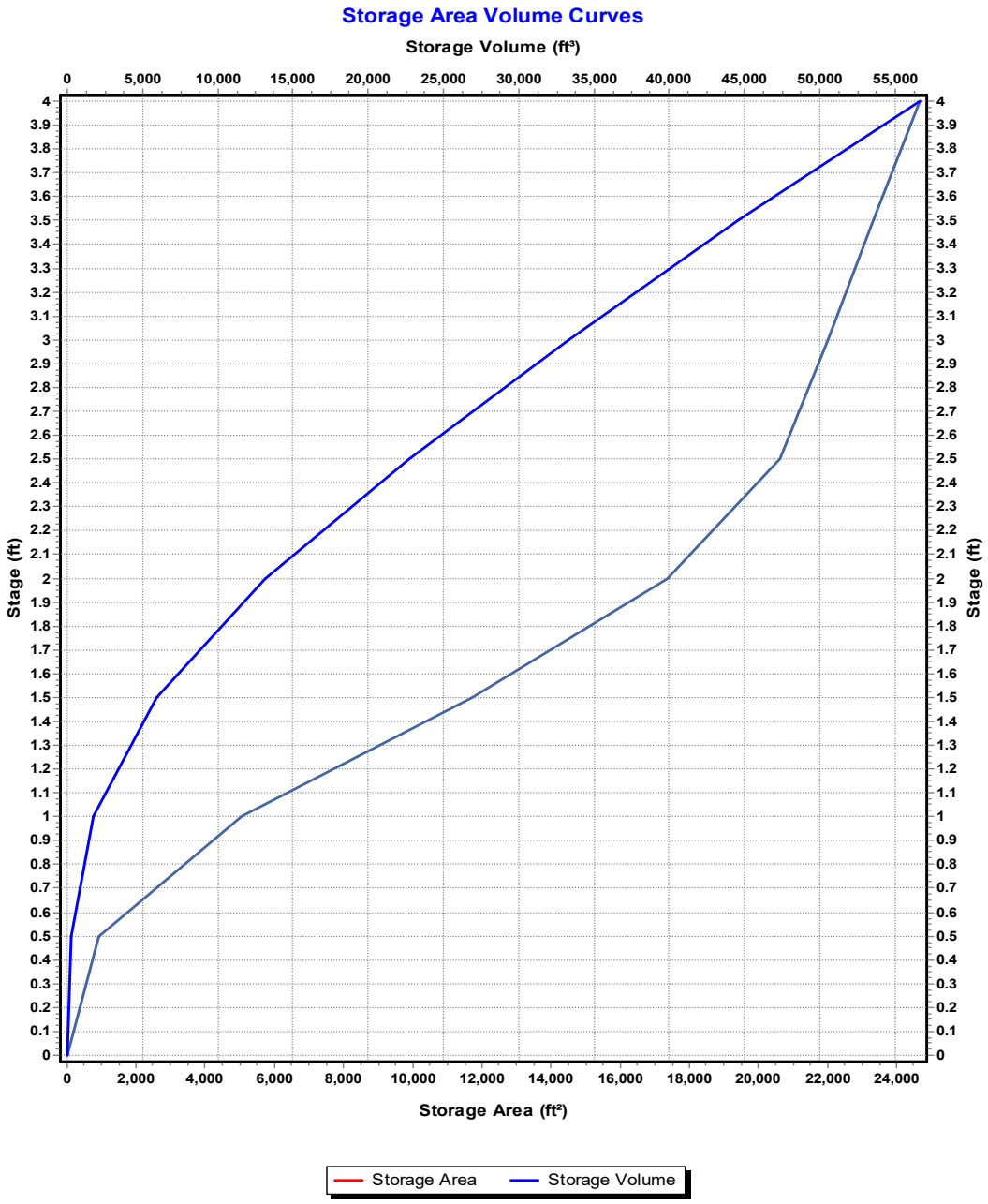
Invert Elevation (ft)	5808.35
Max (Rim) Elevation (ft)	5812.35
Max (Rim) Offset (ft)	4.00
Initial Water Elevation (ft)	0.00
Initial Water Depth (ft)	-5808.35
Ponded Area (ft^2)	0.00
Evaporation Loss	0.00

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



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	5810.02	1.67	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)	7.28
Peak Lateral Inflow (cfs)	2.79
Peak Outflow (cfs)	0.05
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	5809.77
Max HGL Depth Attained (ft)	1.42
Average HGL Elevation Attained (ft)	5808.68
Average HGL Depth Attained (ft)	0.33
Time of Max HGL Occurrence (days hh:mm)	0 00:43
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_new.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	12
Nodes	22
Junctions	15
Outfalls	6
Flow Diversions	0
Inlets	0
Storage Nodes	1
Links	22
Channels	2
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

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-1	4.76	0.3600	1.16	0.42	1.98	11.88	0 00:10:00
2	EX-2	0.96	0.3600	1.16	0.42	0.40	2.40	0 00:10:00
3	EX-3	0.46	0.3600	1.16	0.42	0.19	1.15	0 00:10:00
4	EXCL-1	0.96	0.5200	1.16	0.60	0.58	3.46	0 00:10:00
5	EXCL-2	0.46	0.4900	1.16	0.57	0.26	1.56	0 00:10:00
6	P1	0.63	0.4100	1.16	0.47	0.30	1.79	0 00:10:00
7	P2	0.97	0.3600	1.16	0.42	0.40	2.42	0 00:10:00
8	P3	0.72	0.4100	1.16	0.47	0.34	2.05	0 00:10:00
9	P4	0.75	0.9600	1.16	1.11	0.83	4.99	0 00:10:00
10	Y1	0.43	0.7000	1.16	0.81	0.35	2.09	0 00:10:00
11	Y2	0.61	0.7000	1.16	0.81	0.49	2.96	0 00:10:00
12	Y3	0.72	0.7000	1.16	0.81	0.58	3.49	0 00:10:00

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	5812.39	5815.82	0.00	6.00	0.00	3.78	5813.29	0.00	2.53	0 00:00	0.00	0.00
2	2-Jun	Junction	5810.99	5814.56	0.00	6.00	0.00	6.43	5811.98	0.00	2.58	0 00:00	0.00	0.00
3	3-Jun	Junction	5810.49	5810.38	0.00	6.00	0.00	6.43	5811.48	0.00	0.51	0 00:00	0.00	0.00
4	5-Jun	Junction	5811.49	5814.60	5811.49	6.00	0.00	3.44	5812.20	0.00	2.40	0 00:00	0.00	0.00
5	6-Jun	Junction	5813.17	5813.95	0.00	6.00	0.00	1.79	5813.65	0.00	0.52	0 00:00	0.00	0.00
6	7-Jun	Junction	5811.35	5812.35	0.00	6.00	0.00	1.90	5811.52	0.00	0.84	0 00:00	0.00	0.00
7	8-Jun	Junction	5808.00	5809.00	0.00	6.00	0.00	1.64	5811.62	0.00	0.85	0 00:00	0.00	0.00
8	9-Jun	Junction	5804.42	5809.00	0.00	6.00	0.00	1.28	5808.22	0.00	1.05	0 00:00	0.00	0.00
9	10-Jun	Junction	5804.00	5806.00	0.00	6.00	0.00	1.28	5807.99	0.00	1.05	0 00:00	0.00	0.00
10	11-Jun	Junction	5811.90	5818.00	5812.00	0.00	0.00	3.77	5812.80	0.00	5.20	0 00:00	0.00	0.00
11	12-Jun	Junction	5812.97	5815.57	0.00	0.00	0.00	3.49	5813.69	0.00	1.88	0 00:00	0.00	0.00
12	13-Jun	Junction	5813.82	5815.99	5813.82	0.00	0.00	2.09	5814.47	0.00	1.52	0 00:00	0.00	0.00
13	14-Jun	Junction	0.00	6.00	0.00	6.00	0.00	2.42	5815.18	0.00	0.81	0 00:00	0.00	0.00
14	15-Jun	Junction	0.00	6.00	0.00	6.00	0.00	2.05	5814.55	0.00	0.83	0 00:00	0.00	0.00
15	SD-N-Out	Junction	5809.62	5809.62	0.00	6.00	0.00	3.44	5810.24	0.00	0.72	0 00:00	0.00	0.00
16	Out-01	Outfall	5807.54					1.28	5807.54					
17	Out-EX-1	Outfall	0.00					11.88	0.00					
18	Out-EX-2	Outfall	0.00					2.40	0.00					
19	Out-EX-3	Outfall	0.00					1.15	0.00					
20	Out-EXCL1	Outfall	0.00					3.46	0.00					
21	Out-EXCL2	Outfall	0.00					1.56	0.00					
22	EDB	Storage Node	5808.35	5812.35	0.00		0.00	16.79	5810.22				0.00	0.00

Rolling Meadows Substation
100-Year Storm

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	5812.39	1.5600	12.000	0.0150	1.78	3.86	0.46	5.19	0.48	0.48	0.00	Calculated
2	02-12-P	Pipe	13-Jun	1-Jun	180.00	5813.49	5812.39	0.6100	12.000	0.0150	2.04	2.75	0.74	5.89	0.64	0.64	0.00	Calculated
3	03-15-NP	Pipe	1-Jun	11-Jun	80.00	5812.39	5811.90	0.6100	15.000	0.0150	3.77	4.38	0.86	4.04	0.89	0.71	0.00	Calculated
4	04-15-P	Pipe	11-Jun	2-Jun	150.00	5811.90	5810.99	0.6100	15.000	0.0150	3.74	4.36	0.86	4.05	0.89	0.71	0.00	Calculated
5	05-18-NP	Pipe	2-Jun	3-Jun	60.61	5810.99	5810.38	1.0100	18.000	0.0150	6.43	8.27	0.78	5.18	0.99	0.66	0.00	Calculated
6	06-15-P	Pipe	12-Jun	5-Jun	150.00	5812.57	5810.77	1.2000	15.000	0.0150	3.44	5.56	0.62	6.66	0.71	0.57	0.00	Calculated
7	07-15-NP	Pipe	5-Jun	SD-N-Out	64.51	5810.77	5809.71	1.6400	15.000	0.0150	3.44	9.30	0.37	7.01	0.53	0.42	0.00	Calculated
8	08-18-NP	Pipe	9-Jun	10-Jun	45.77	5807.77	5807.54	0.5000	18.000	0.0150	1.28	6.45	0.20	2.84	0.45	0.30	0.00	Calculated
9	Link-04	Pipe	7-Jun	EDB	130.91	0.00	0.00	0.0000	0.000	0.0150	1.90	0.00	0.20	0.00	0.45	0.30	0.00	Calculated
10	Link-05	Pipe	SD-N-Out	EDB	112.84	0.00	0.00	0.0000	0.000	0.0150	3.44	0.00	0.20	0.00	0.45	0.30	0.00	Calculated
11	Link-06	Pipe	3-Jun	EDB	93.80	0.00	0.00	0.0000	0.000	0.0150	6.43	0.00	0.20	0.00	0.45	0.30	0.00	Calculated
12	Link-07	Pipe	8-Jun	EDB	144.91	0.00	0.00	0.0000	0.000	0.0150	1.64	0.00	0.20	0.00	0.45	0.30	0.00	Calculated
13	Link-10	Pipe	10-Jun	Out-01	53.10	5804.00	5803.73	0.5100	0.000	0.0150	1.28	0.00	0.20	0.00	0.45	0.30	0.00	Calculated
14	Swale-N	Channel	14-Jun	7-Jun	525.18	5814.99	5811.36	0.6900	12.000	0.0320	1.90	45.30	0.04	2.13	0.16	0.16	0.00	
15	Swale-S	Channel	15-Jun	8-Jun	446.88	5814.38	5811.47	0.6500	12.000	0.0320	1.64	43.97	0.04	1.93	0.15	0.15	0.00	
16	Orifice-01	Orifice	EDB	9-Jun		5808.35	5804.42		0.625		0.01							
17	Orifice-02	Orifice	EDB	9-Jun		5808.35	5804.42		0.625		0.01							
18	Orifice-03	Orifice	EDB	9-Jun		5808.35	5804.42		1.000		0.03							
19	Orifice-04	Orifice	EDB	9-Jun		5808.35	5804.42		1.000		0.02							
20	Orifice-05	Orifice	EDB	9-Jun		5808.35	5804.42		1.000		0.02							
21	Spillway	Weir	EDB	10-Jun		5808.35	5804.00				0.00							
22	Weir-01	Weir	EDB	9-Jun		5808.35	5804.42				1.19							

Subbasin Hydrology

Subbasin : EX-1

Input Data

Area (ac)	4.76
Weighted Runoff Coefficient	0.36

Runoff Coefficient

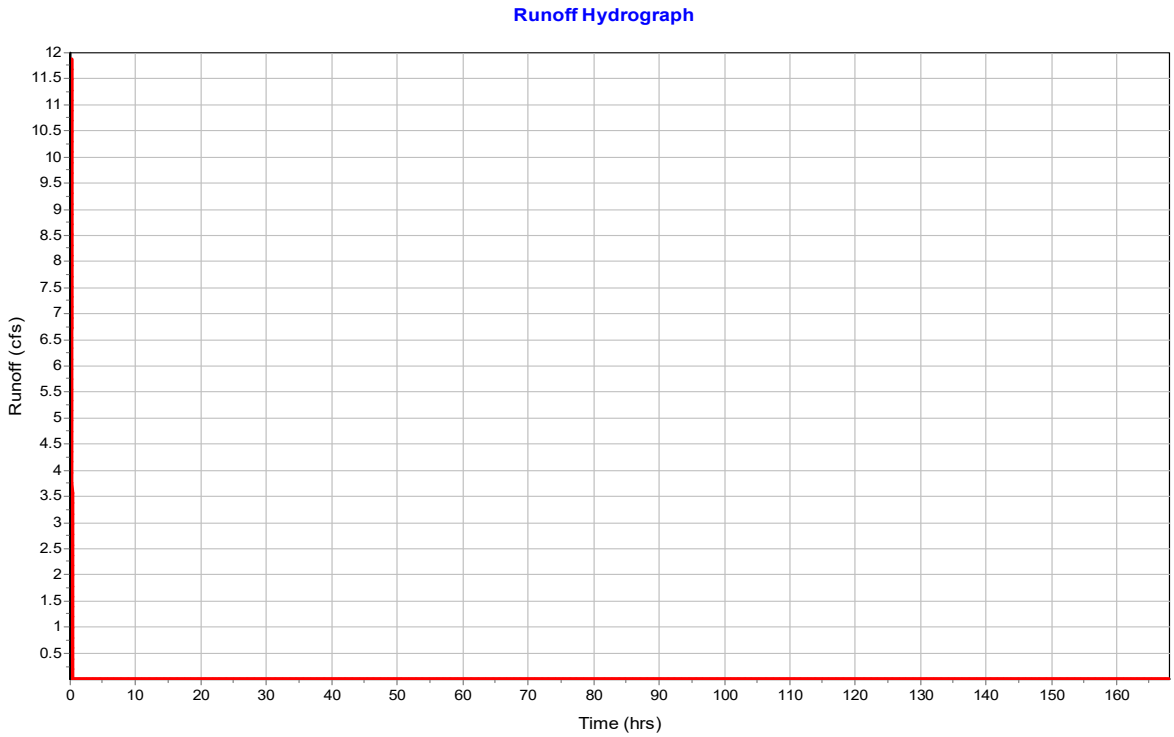
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	5.95	-	0.36
Composite Area & Weighted Runoff Coeff.	5.95		0.36

Subbasin Runoff Results

Total Rainfall (in)	1.16
Total Runoff (in)	0.42
Peak Runoff (cfs)	11.88
Rainfall Intensity	6.93
Weighted Runoff Coefficient	0.36
Time of Concentration (days hh:mm:ss)	0 00:10:00

Rolling Meadows Substation
100-Year Storm

Subbasin : EX-1



Subbasin : EX-2

Input Data

Area (ac)	0.96
Weighted Runoff Coefficient	0.36

Runoff Coefficient

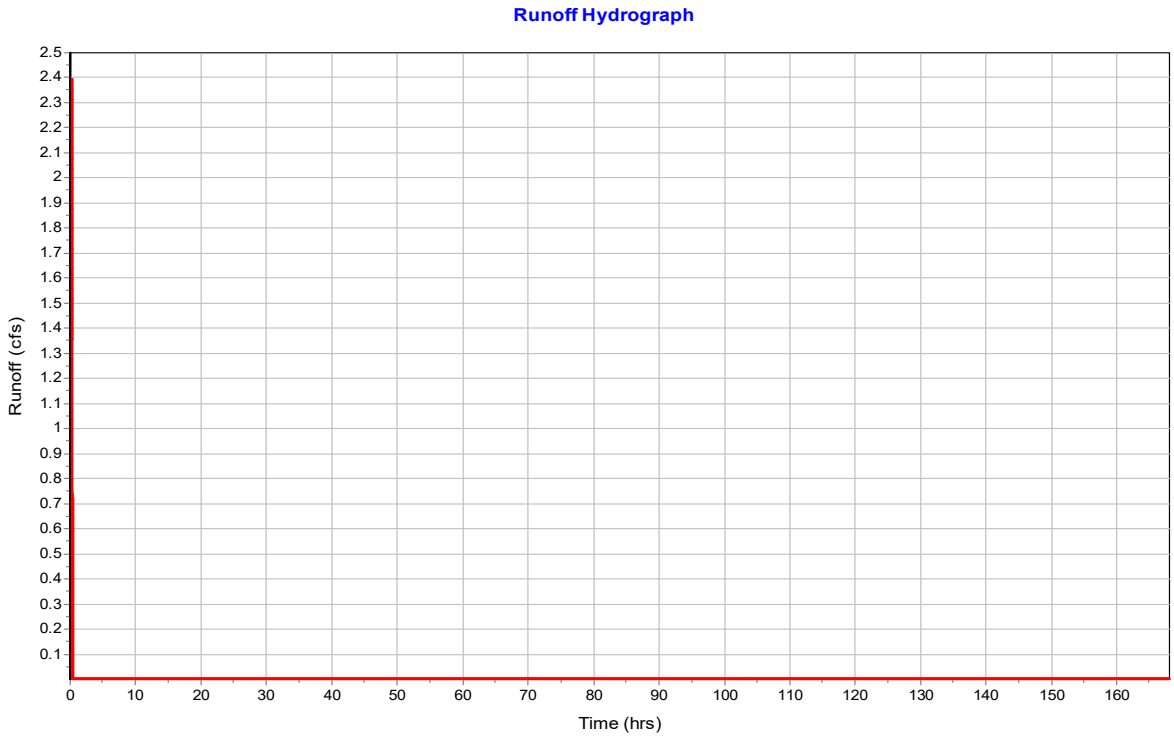
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.8	-	0.36
Composite Area & Weighted Runoff Coeff.	0.8		0.36

Subbasin Runoff Results

Total Rainfall (in)	1.16
Total Runoff (in)	0.42
Peak Runoff (cfs)	2.4
Rainfall Intensity	6.93
Weighted Runoff Coefficient	0.36
Time of Concentration (days hh:mm:ss)	0 00:10:00

Rolling Meadows Substation
100-Year Storm

Subbasin : EX-2



Subbasin : EX-3

Input Data

Area (ac)	0.46
Weighted Runoff Coefficient	0.36

Runoff Coefficient

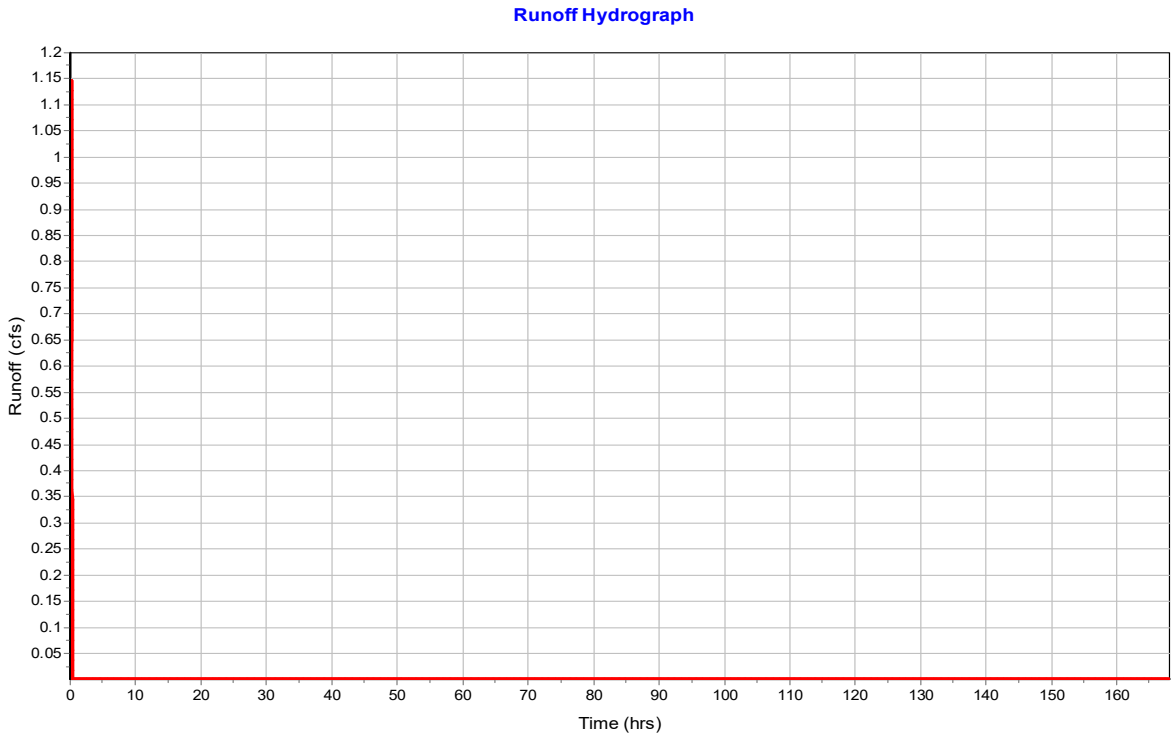
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.52	-	0.36
Composite Area & Weighted Runoff Coeff.	0.52		0.36

Subbasin Runoff Results

Total Rainfall (in)	1.16
Total Runoff (in)	0.42
Peak Runoff (cfs)	1.15
Rainfall Intensity	6.93
Weighted Runoff Coefficient	0.36
Time of Concentration (days hh:mm:ss)	0 00:10:00

Rolling Meadows Substation
100-Year Storm

Subbasin : EX-3



Subbasin : EXCL-1

Input Data

Area (ac)	0.96
Weighted Runoff Coefficient	0.52

Runoff Coefficient

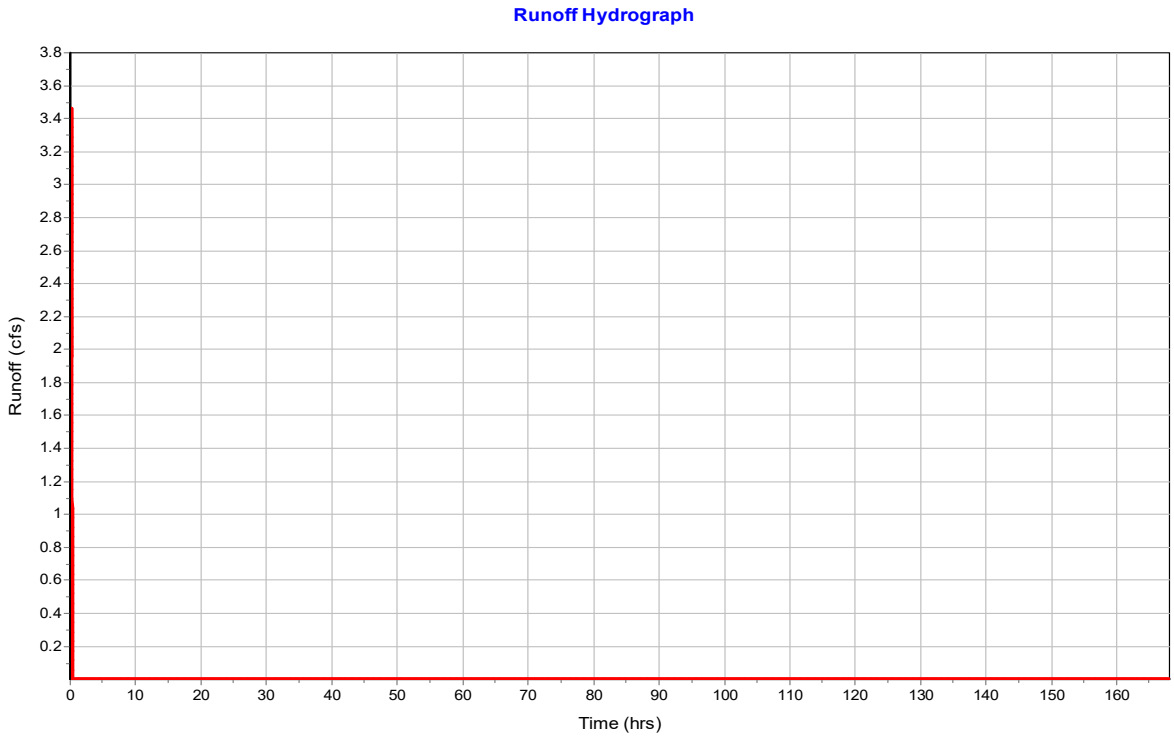
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.95	-	0.52
Composite Area & Weighted Runoff Coeff.	0.95		0.52

Subbasin Runoff Results

Total Rainfall (in)	1.16
Total Runoff (in)	0.6
Peak Runoff (cfs)	3.46
Rainfall Intensity	6.93
Weighted Runoff Coefficient	0.52
Time of Concentration (days hh:mm:ss)	0 00:10:00

Rolling Meadows Substation
100-Year Storm

Subbasin : EXCL-1



Subbasin : EXCL-2

Input Data

Area (ac)	0.46
Weighted Runoff Coefficient	0.49

Runoff Coefficient

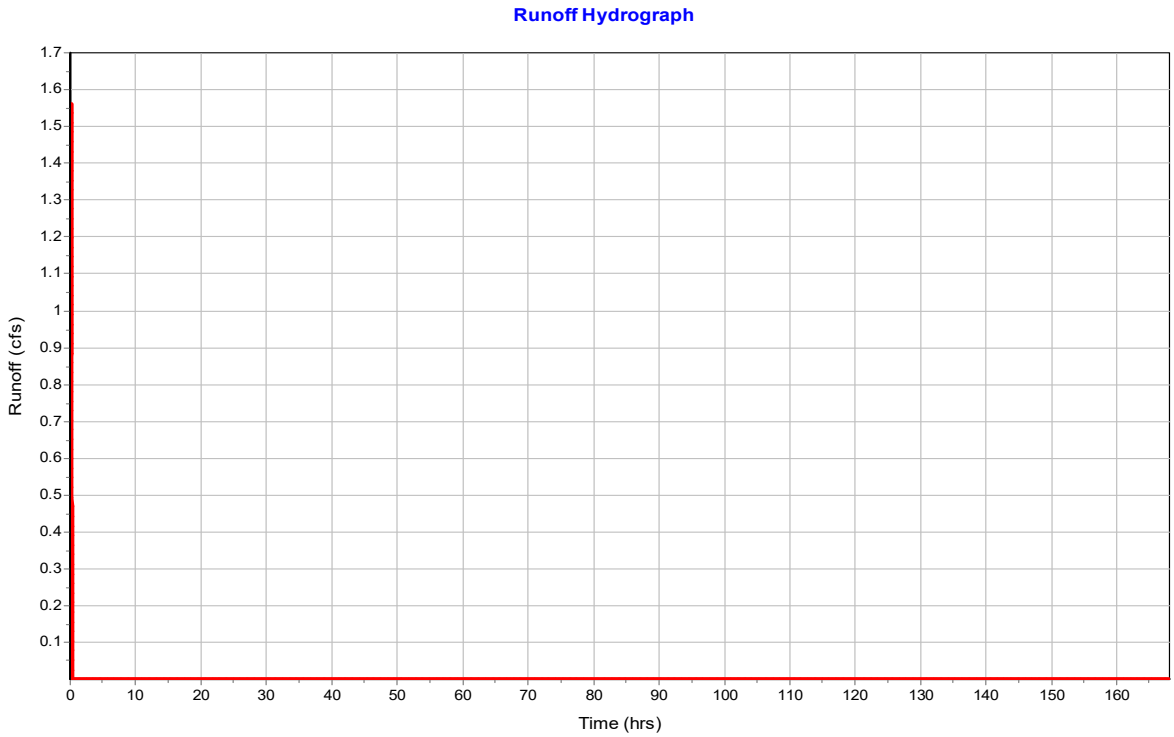
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.52	-	0.49
-	0	-	0
Composite Area & Weighted Runoff Coeff.	0.52		0.49

Subbasin Runoff Results

Total Rainfall (in)	1.16
Total Runoff (in)	0.57
Peak Runoff (cfs)	1.56
Rainfall Intensity	6.93
Weighted Runoff Coefficient	0.49
Time of Concentration (days hh:mm:ss)	0 00:10:00

Rolling Meadows Substation
100-Year Storm

Subbasin : EXCL-2



Rolling Meadows Substation
100-Year Storm

Subbasin : P1

Input Data

Area (ac) 0.63
Weighted Runoff Coefficient 0.41

Runoff Coefficient

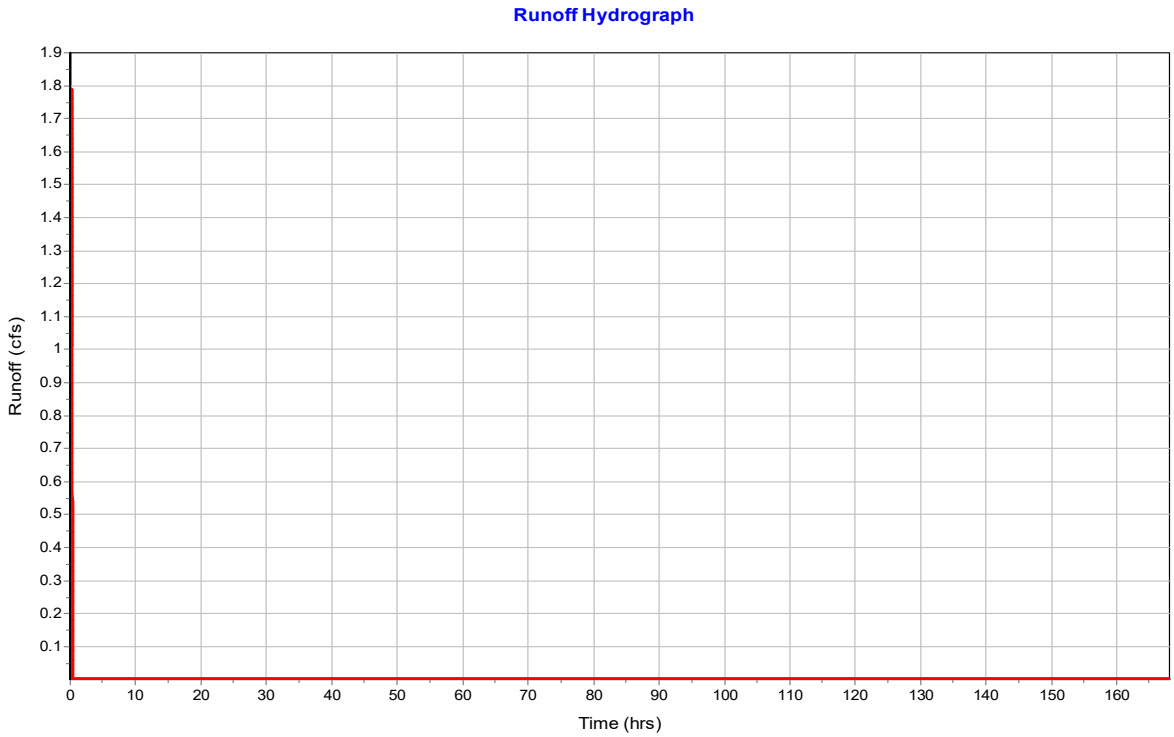
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.63	-	0.41
Composite Area & Weighted Runoff Coeff.	0.63		0.41

Subbasin Runoff Results

Total Rainfall (in) 1.16
Total Runoff (in) 0.47
Peak Runoff (cfs) 1.79
Rainfall Intensity 6.93
Weighted Runoff Coefficient 0.41
Time of Concentration (days hh:mm:ss) 0 00:10:00

Rolling Meadows Substation
100-Year Storm

Subbasin : P1



Subbasin : P2

Input Data

Area (ac)	0.97
Weighted Runoff Coefficient	0.36

Runoff Coefficient

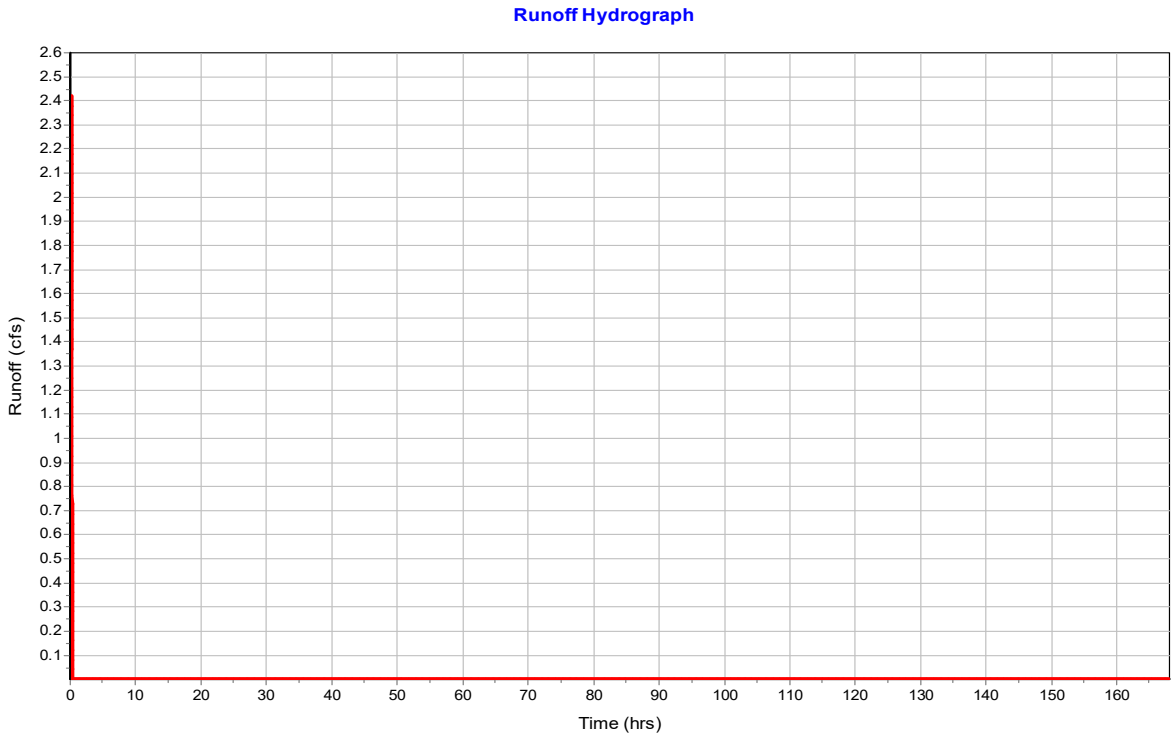
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.97	-	0.36
Composite Area & Weighted Runoff Coeff.	0.97		0.36

Subbasin Runoff Results

Total Rainfall (in)	1.16
Total Runoff (in)	0.42
Peak Runoff (cfs)	2.42
Rainfall Intensity	6.93
Weighted Runoff Coefficient	0.36
Time of Concentration (days hh:mm:ss)	0 00:10:00

Rolling Meadows Substation
100-Year Storm

Subbasin : P2



Subbasin : P3

Input Data

Area (ac)	0.72
Weighted Runoff Coefficient	0.41

Runoff Coefficient

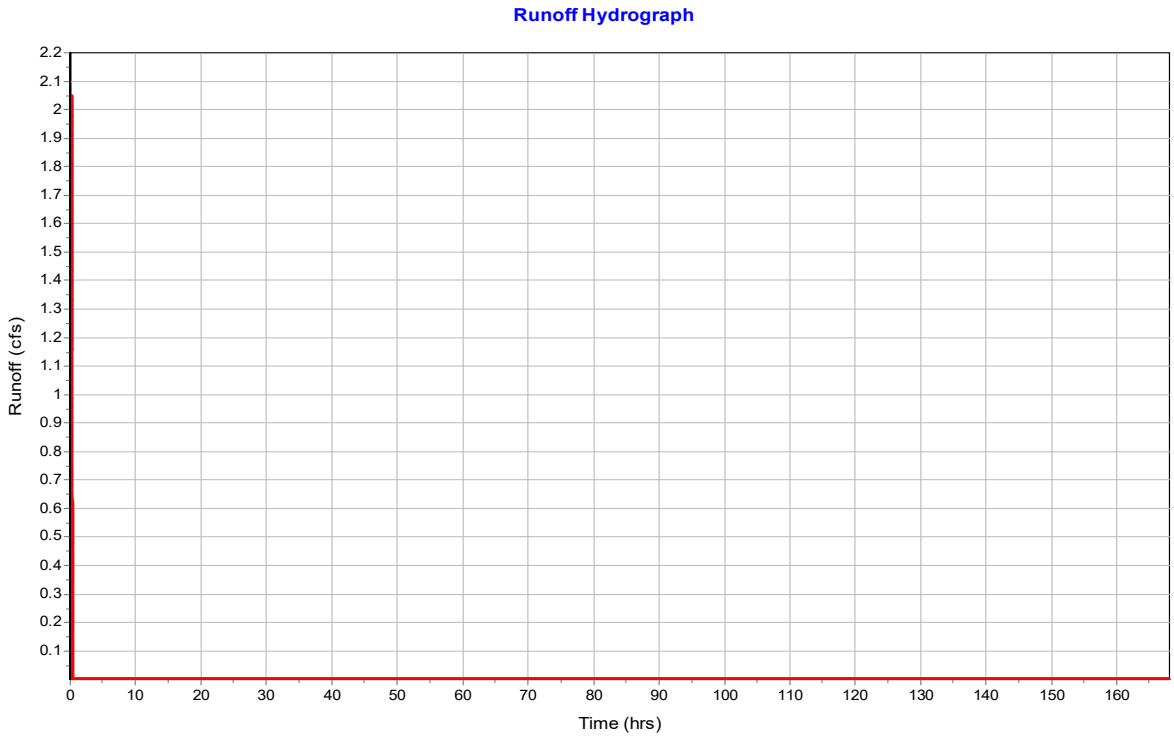
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.72	-	0.41
Composite Area & Weighted Runoff Coeff.	0.72		0.41

Subbasin Runoff Results

Total Rainfall (in)	1.16
Total Runoff (in)	0.47
Peak Runoff (cfs)	2.05
Rainfall Intensity	6.93
Weighted Runoff Coefficient	0.41
Time of Concentration (days hh:mm:ss)	0 00:10:00

Rolling Meadows Substation
100-Year Storm

Subbasin : P3



Rolling Meadows Substation
100-Year Storm

Subbasin : P4

Input Data

Area (ac)	0.75
Weighted Runoff Coefficient	0.96

Runoff Coefficient

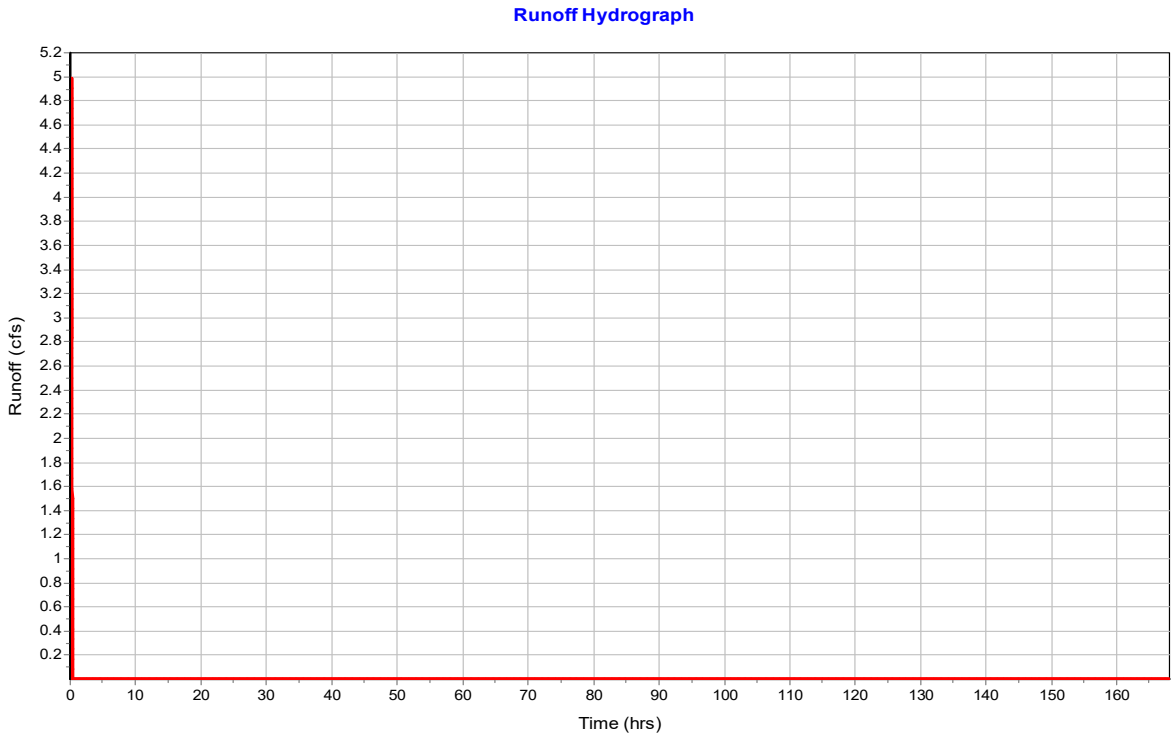
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.68	-	0.96
Composite Area & Weighted Runoff Coeff.	0.68		0.96

Subbasin Runoff Results

Total Rainfall (in)	1.16
Total Runoff (in)	1.11
Peak Runoff (cfs)	4.99
Rainfall Intensity	6.93
Weighted Runoff Coefficient	0.96
Time of Concentration (days hh:mm:ss)	0 00:10:00

Rolling Meadows Substation
100-Year Storm

Subbasin : P4



Rolling Meadows Substation
100-Year Storm

Subbasin : Y1

Input Data

Area (ac)	0.43
Weighted Runoff Coefficient	0.7

Runoff Coefficient

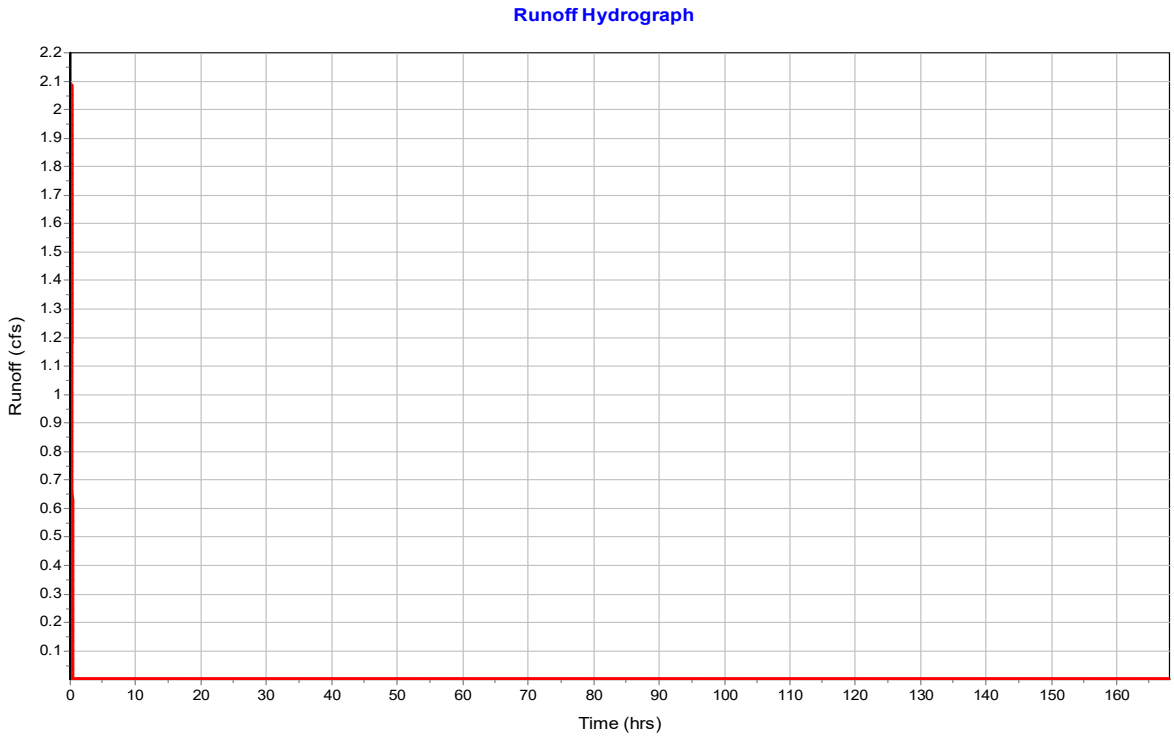
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.43	-	0.7
Composite Area & Weighted Runoff Coeff.	0.43		0.7

Subbasin Runoff Results

Total Rainfall (in)	1.16
Total Runoff (in)	0.81
Peak Runoff (cfs)	2.09
Rainfall Intensity	6.93
Weighted Runoff Coefficient	0.7
Time of Concentration (days hh:mm:ss)	0 00:10:00

Rolling Meadows Substation
100-Year Storm

Subbasin : Y1



Rolling Meadows Substation
100-Year Storm

Subbasin : Y2

Input Data

Area (ac) 0.61
Weighted Runoff Coefficient 0.7

Runoff Coefficient

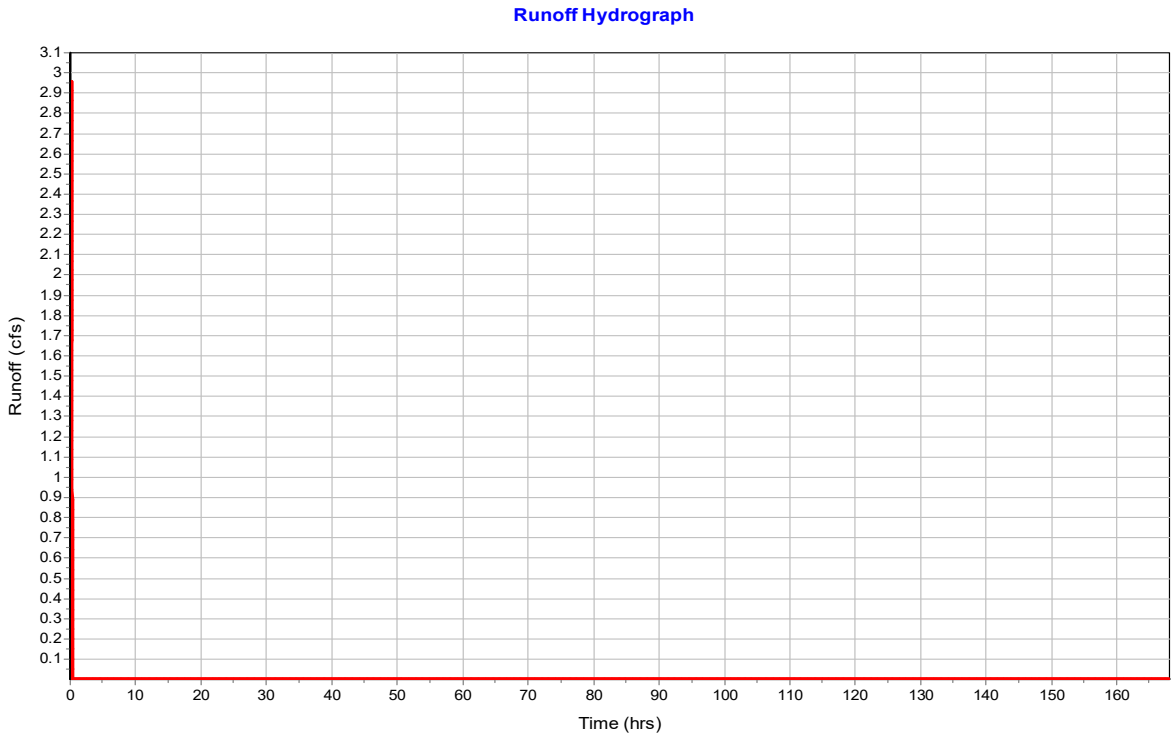
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.61	-	0.7
Composite Area & Weighted Runoff Coeff.	0.61		0.7

Subbasin Runoff Results

Total Rainfall (in) 1.16
Total Runoff (in) 0.81
Peak Runoff (cfs) 2.96
Rainfall Intensity 6.93
Weighted Runoff Coefficient 0.7
Time of Concentration (days hh:mm:ss) 0 00:10:00

Rolling Meadows Substation
100-Year Storm

Subbasin : Y2



Subbasin : Y3

Input Data

Area (ac) 0.72
Weighted Runoff Coefficient 0.7

Runoff Coefficient

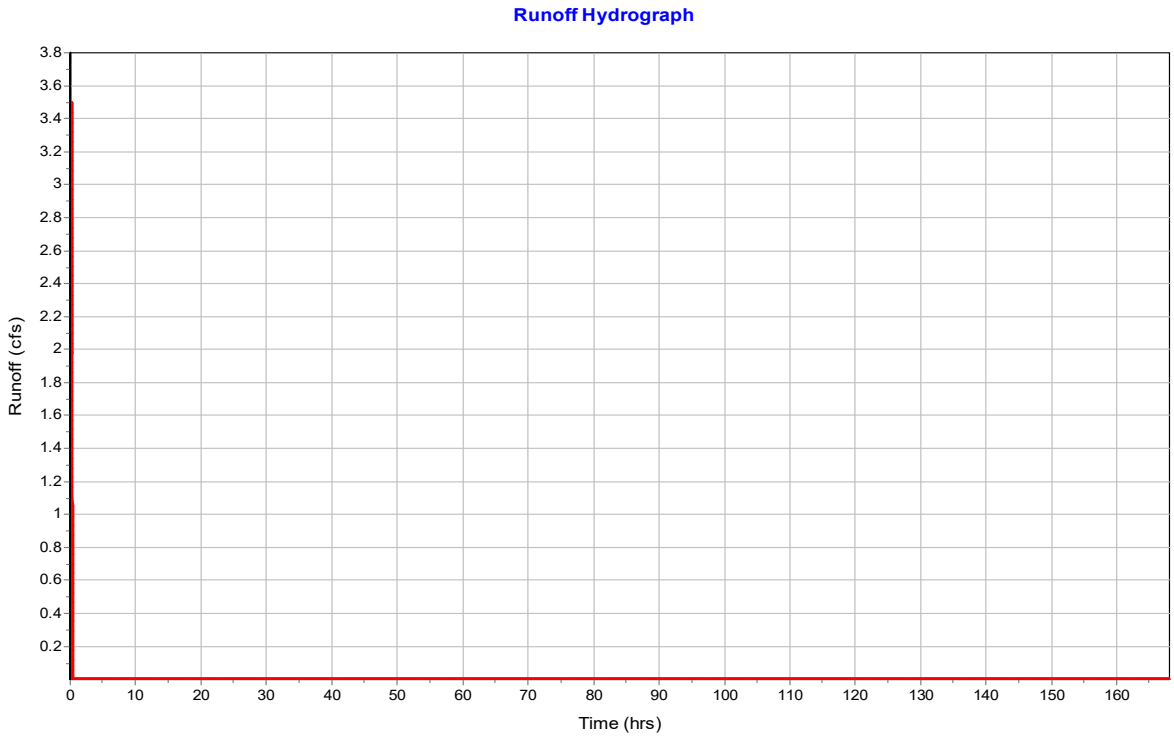
Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	5	-	0.7
Composite Area & Weighted Runoff Coeff.	5		0.7

Subbasin Runoff Results

Total Rainfall (in) 1.16
Total Runoff (in) 0.81
Peak Runoff (cfs) 3.49
Rainfall Intensity 6.93
Weighted Runoff Coefficient 0.7
Time of Concentration (days hh:mm:ss) 0 00:10:00

Rolling Meadows Substation
100-Year Storm

Subbasin : Y3



Rolling Meadows Substation
100-Year Storm

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	5812.39	5815.82	3.43	0.00	-5812.39	6.00	-5809.82	0.00	26.16
2	2-Jun	5810.99	5814.56	3.57	0.00	-5810.99	6.00	-5808.56	0.00	24.84
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	30.96
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	5811.90	5818.00	6.10	5812.00	0.10	0.00	-5818.00	0.00	58.20
11	12-Jun	5812.97	5815.57	2.60	0.00	-5812.97	0.00	-5815.57	0.00	21.00
12	13-Jun	5813.82	5815.99	2.17	5813.82	0.00	0.00	-5815.99	0.00	18.00
13	14-Jun	0.00	6.00	6.00	0.00	0.00	6.00	0.00	0.00	0.00
14	15-Jun	0.00	6.00	6.00	0.00	0.00	6.00	0.00	0.00	0.00
15	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

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	3.78	0.00	5813.29	0.90	0.00	2.53	5812.39	0.00	0 00:10	0 00:00	0.00	0.00
2	2-Jun	6.43	2.96	5811.98	0.99	0.00	2.58	5810.99	0.00	0 00:10	0 00:00	0.00	0.00
3	3-Jun	6.43	0.00	5811.48	0.99	0.00	0.51	5810.49	0.00	0 00:11	0 00:00	0.00	0.00
4	5-Jun	3.44	0.00	5812.20	0.71	0.00	2.40	5811.49	0.00	0 00:10	0 00:00	0.00	0.00
5	6-Jun	1.79	1.79	5813.65	0.48	0.00	0.52	5813.17	0.00	0 00:10	0 00:00	0.00	0.00
6	7-Jun	1.90	0.00	5811.52	0.17	0.00	0.84	5811.36	0.01	0 00:14	0 00:00	0.00	0.00
7	8-Jun	1.64	0.00	5811.62	3.62	0.00	0.85	5811.47	3.47	0 00:14	0 00:00	0.00	0.00
8	9-Jun	1.28	0.00	5808.22	3.80	0.00	1.05	5807.81	3.39	0 00:23	0 00:00	0.00	0.00
9	10-Jun	1.28	0.00	5807.99	3.99	0.00	1.05	5807.58	3.58	0 00:23	0 00:00	0.00	0.00
10	11-Jun	3.77	0.00	5812.80	0.90	0.00	5.20	5811.90	0.00	0 00:10	0 00:00	0.00	0.00
11	12-Jun	3.49	3.49	5813.69	0.72	0.00	1.88	5812.97	0.00	0 00:10	0 00:00	0.00	0.00
12	13-Jun	2.09	2.09	5814.47	0.65	0.00	1.52	5813.82	0.00	0 00:10	0 00:00	0.00	0.00
13	14-Jun	2.42	2.42	5815.18	5815.18	0.00	0.81	5814.99	5814.99	0 00:10	0 00:00	0.00	0.00
14	15-Jun	2.05	2.05	5814.55	5814.55	0.00	0.83	5814.38	5814.38	0 00:10	0 00:00	0.00	0.00
15	SD-N-Out	3.44	0.00	5810.24	0.62	0.00	0.72	5809.71	0.09	0 00:10	0 00:00	0.00	0.00

Channel 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 (%)	Shape	Height (ft)	Width (ft)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate
1	Swale-N	525.18	5814.99	5814.99	5811.36	0.01	3.63	0.6900	Trapezoidal	1.000	18.000	0.0320	0.5000	0.5000	0.0000	0.00	No
2	Swale-S	446.88	5814.38	5814.38	5811.47	3.47	2.91	0.6500	Trapezoidal	1.000	18.000	0.0320	0.5000	0.5000	0.0000	0.00	No

Rolling Meadows Substation
100-Year Storm

Channel Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	Swale-N	1.90	0 00:14	45.30	0.04	2.13	4.11	0.16	0.16	0.00		
2	Swale-S	1.64	0 00:14	43.97	0.04	1.93	3.86	0.15	0.15	0.00		

Rolling Meadows Substation
100-Year Storm

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	5812.39	0.00	0.78	1.5600	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	5812.39	0.00	1.10	0.6100	CIRCULAR	12.000	12.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
3	03-15-NP	80.00	5812.39	0.00	5811.90	0.00	0.49	0.6100	CIRCULAR	15.000	15.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
4	04-15-P	150.00	5811.90	0.00	5810.99	0.00	0.91	0.6100	CIRCULAR	15.000	15.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
5	05-18-NP	60.61	5810.99	0.00	5810.38	-0.11	0.61	1.0100	CIRCULAR	18.000	18.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
6	06-15-P	150.00	5812.57	-0.40	5810.77	-0.72	1.80	1.2000	CIRCULAR	15.000	15.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
7	07-15-NP	64.51	5810.77	-0.72	5809.71	0.09	1.06	1.6400	CIRCULAR	15.000	15.000	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

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	1.78	0 00:10	3.86	0.46	5.19	0.16	0.48	0.48	0.00		Calculated
2	02-12-P	2.04	0 00:10	2.75	0.74	5.89	0.51	0.64	0.64	0.00		Calculated
3	03-15-NP	3.77	0 00:10	4.38	0.86	4.04	0.33	0.89	0.71	0.00		Calculated
4	04-15-P	3.74	0 00:11	4.36	0.86	4.05	0.62	0.89	0.71	0.00		Calculated
5	05-18-NP	6.43	0 00:11	8.27	0.78	5.18	0.20	0.99	0.66	0.00		Calculated
6	06-15-P	3.44	0 00:10	5.56	0.62	6.66	0.38	0.71	0.57	0.00		Calculated
7	07-15-NP	3.44	0 00:10	9.30	0.37	7.01	0.15	0.53	0.42	0.00		Calculated
8	08-18-NP	1.28	0 00:23	6.45	0.20	2.84	0.27	0.45	0.30	0.00		Calculated
9	Link-04	1.90	0 00:14	0.00	0.20	0.00		0.45	0.30	0.00		Calculated
10	Link-05	3.44	0 00:10	0.00	0.20	0.00		0.45	0.30	0.00		Calculated
11	Link-06	6.43	0 00:11	0.00	0.20	0.00		0.45	0.30	0.00		Calculated
12	Link-07	1.64	0 00:14	0.00	0.20	0.00		0.45	0.30	0.00		Calculated
13	Link-10	1.28	0 00:23	0.00	0.20	0.00		0.45	0.30	0.00		Calculated

Storage Nodes

Storage Node : EDB

Input Data

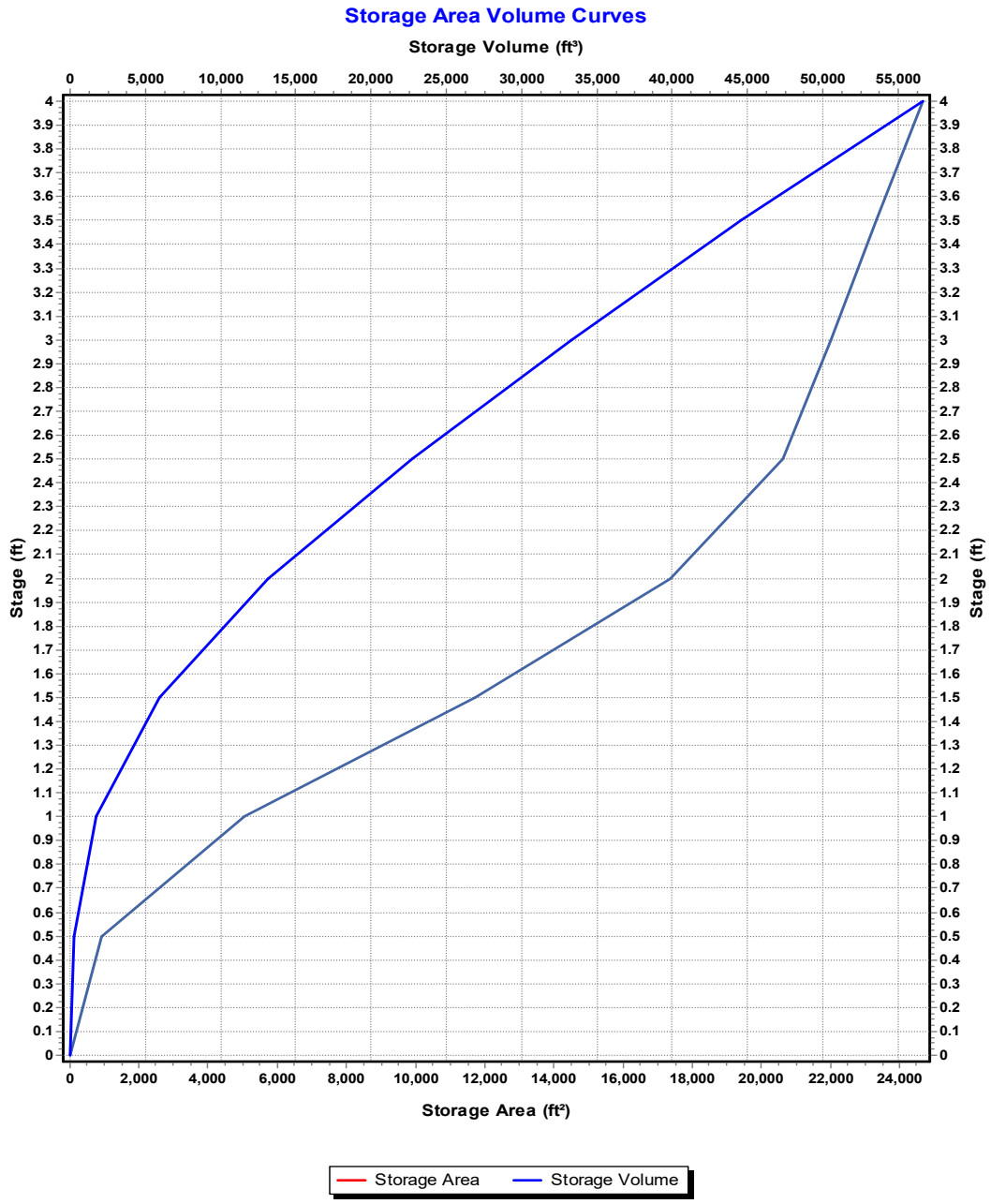
Invert Elevation (ft)	5808.35
Max (Rim) Elevation (ft)	5812.35
Max (Rim) Offset (ft)	4.00
Initial Water Elevation (ft)	0.00
Initial Water Depth (ft)	-5808.35
Ponded Area (ft^2)	0.00
Evaporation Loss	0.00

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



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	15.00	1.25	3.33
2	Weir-01	Rectangular	No	5810.02	1.67	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)	16.79
Peak Lateral Inflow (cfs)	4.99
Peak Outflow (cfs)	1.28
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	5810.22
Max HGL Depth Attained (ft)	1.87
Average HGL Elevation Attained (ft)	5808.82
Average HGL Depth Attained (ft)	0.47
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

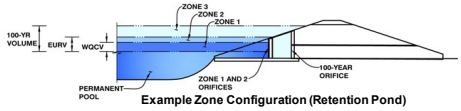
Detention Basin and Storm Drainage Calculations

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	

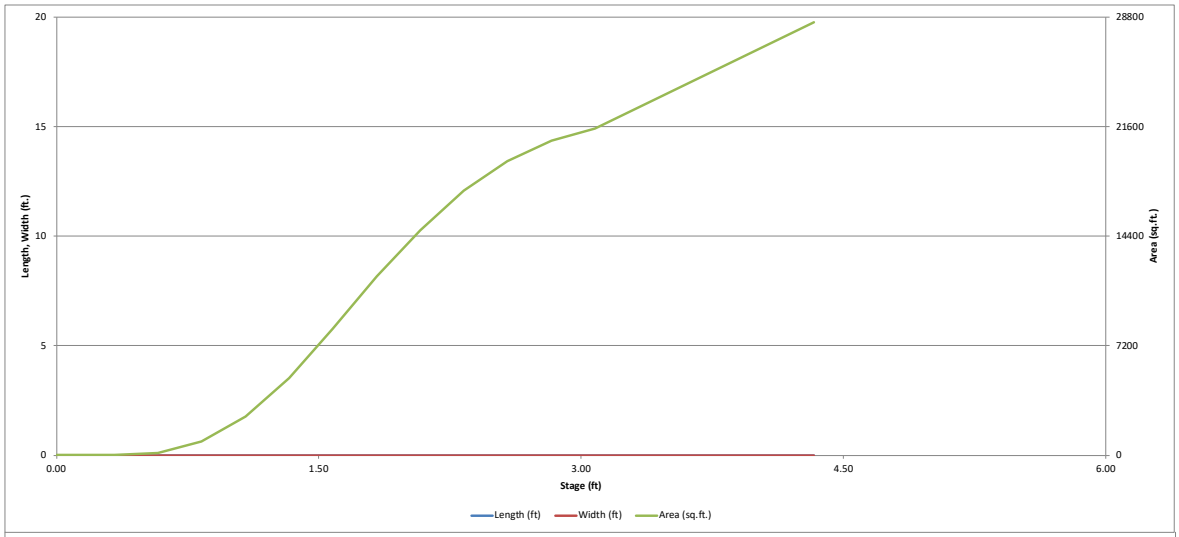
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	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

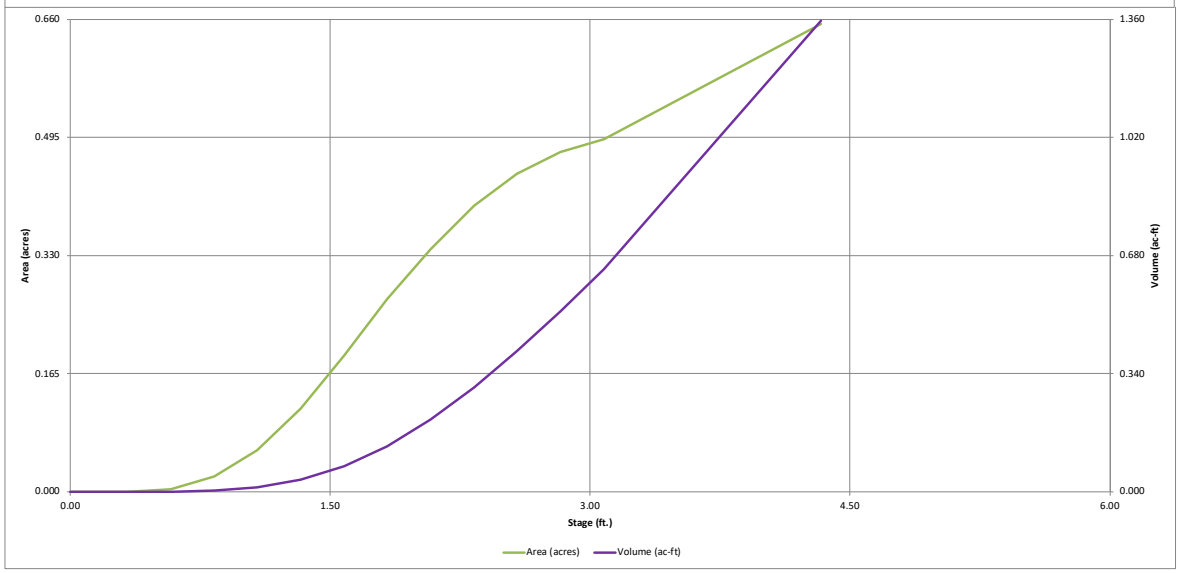
Depth Increment = ft

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
5808.6	--	0.58	--	--	--	158	0.004	24	0.001
5808.85	--	0.83	--	--	--	916	0.021	159	0.004
5809.1	--	1.08	--	--	--	2,546	0.058	591	0.014
5809.35	--	1.33	--	--	--	5,046	0.116	1,540	0.035
5809.6	--	1.58	--	--	--	8,287	0.190	3,207	0.074
5809.85	--	1.83	--	--	--	11,734	0.269	5,709	0.131
5810.1	--	2.08	--	--	--	14,771	0.339	9,023	0.207
5810.35	--	2.33	--	--	--	17,395	0.399	13,043	0.299
5810.6	--	2.58	--	--	--	19,333	0.444	17,634	0.405
5810.85	--	2.83	--	--	--	20,660	0.474	22,633	0.520
5811.1	--	3.08	--	--	--	21,453	0.492	27,898	0.640
5812.35 (Top of Ban	--	4.33	--	--	--	28,470	0.654	59,100	1.357

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.07 (June 2025)





✓ = calcs match details in plans

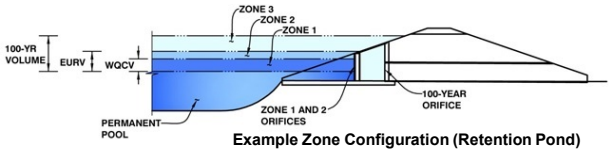
X = calcs do not match details in plans

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)	1.63	0.082	Orifice Plate
Zone 2 (EURV)	2.21	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 =	2.00	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	2.50	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 =	5.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	4.02	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 =	0.25	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	1.77	N/A	ft²
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.75	N/A	feet
Restrictor Plate Height Above Pipe Invert =	18.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	3.14	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	3.08	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.49	feet
Spillway Crest Length =	15.00	feet	Stage at Top of Freeboard =	4.57	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.65	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	1.36	acre-ft

Calculated Parameters for Spillway

Verify and update drainage report or plans to match

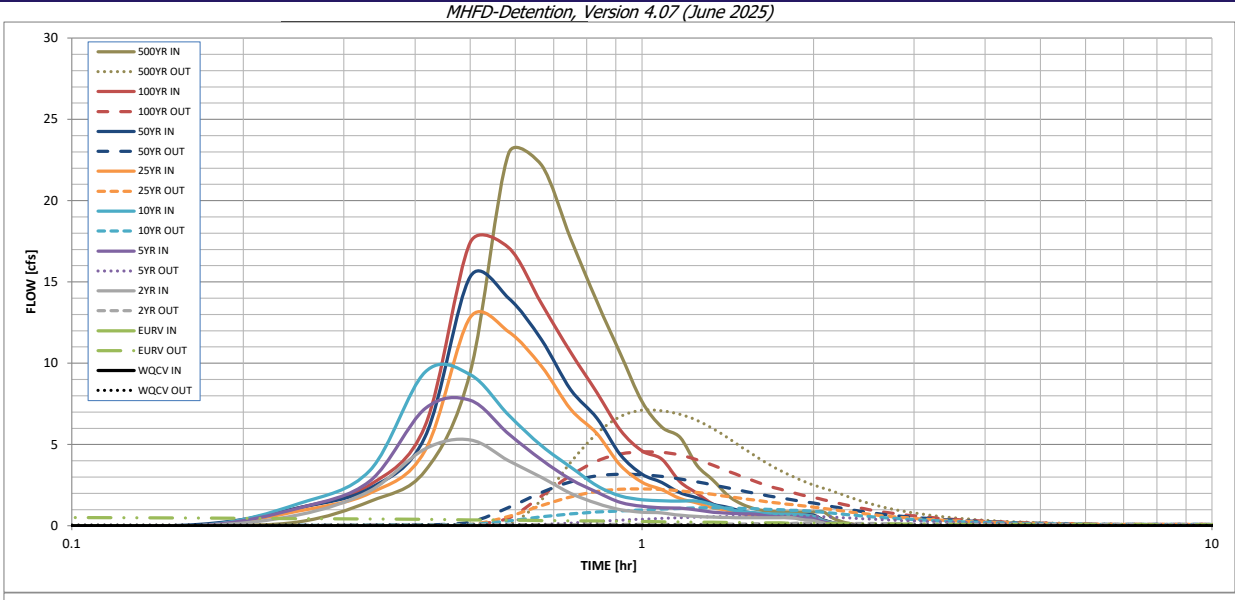
Routed Hydrograph Results

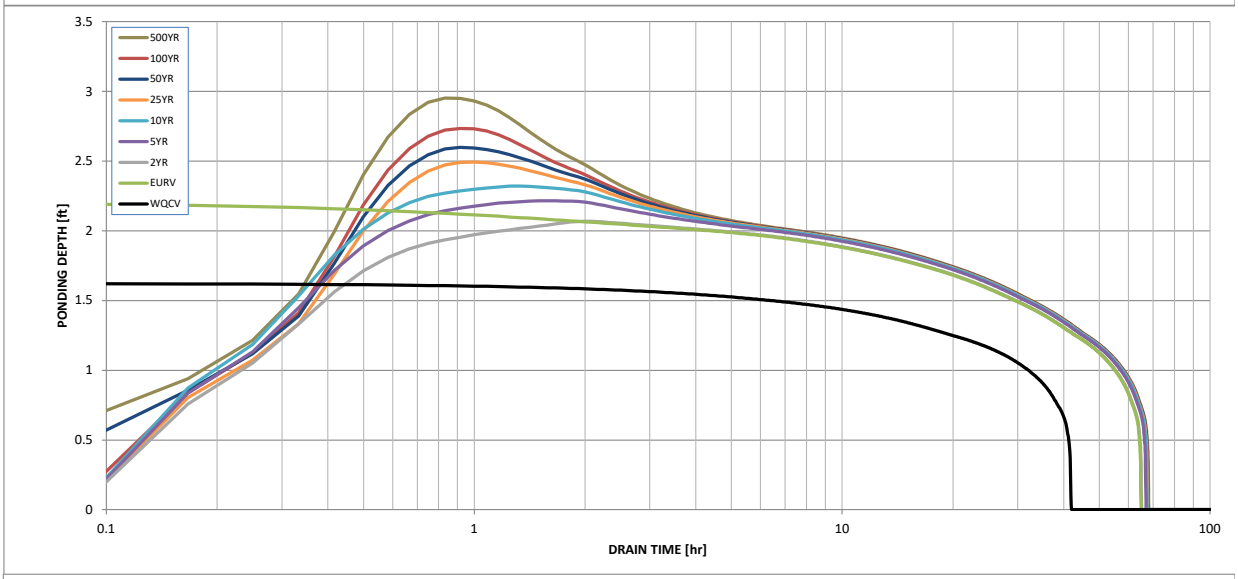
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

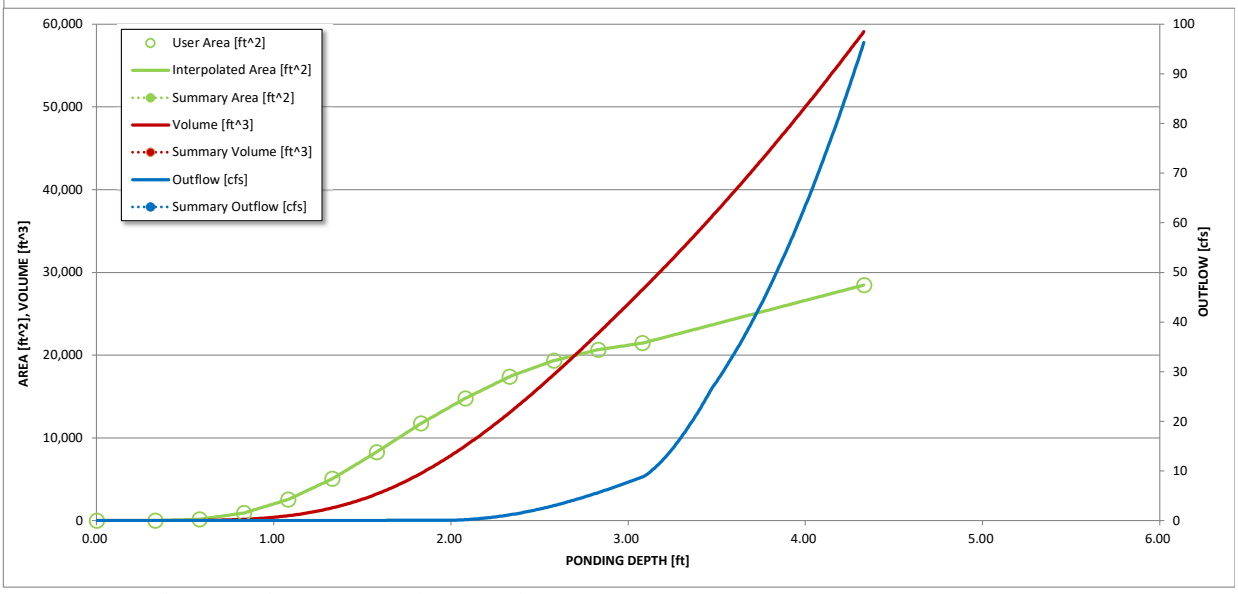
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.082	0.252	0.218	0.312	0.395	0.508	0.598	0.714	0.947
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.218	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	0.6	0.2	0.6	1.1	2.3	3.2	4.5	7.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.2	0.3	0.3	0.4	0.4	0.5
Structure Controlling Flow =	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1
Max Velocity through Grate 1 (fps) =	N/A	0.07	0.01	0.1	0.1	0.3	0.4	0.6	1.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	57	58	57	56	54	52	50	45
Time to Drain 99% of Inflow Volume (hours) =	**41**	61	62	63	62	62	61	60	58
Maximum Ponding Depth (ft) =	1.63	2.21	2.07	2.21	2.32	2.49	2.60	2.73	2.95
Area at Maximum Ponding Depth (acres) =	0.21	0.37	0.33	0.37	0.40	0.43	0.45	0.46	0.48
Maximum Volume Stored (acre-ft) =	0.084	0.253	0.200	0.253	0.295	0.366	0.409	0.473	0.577

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.07 (June 2025)







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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).

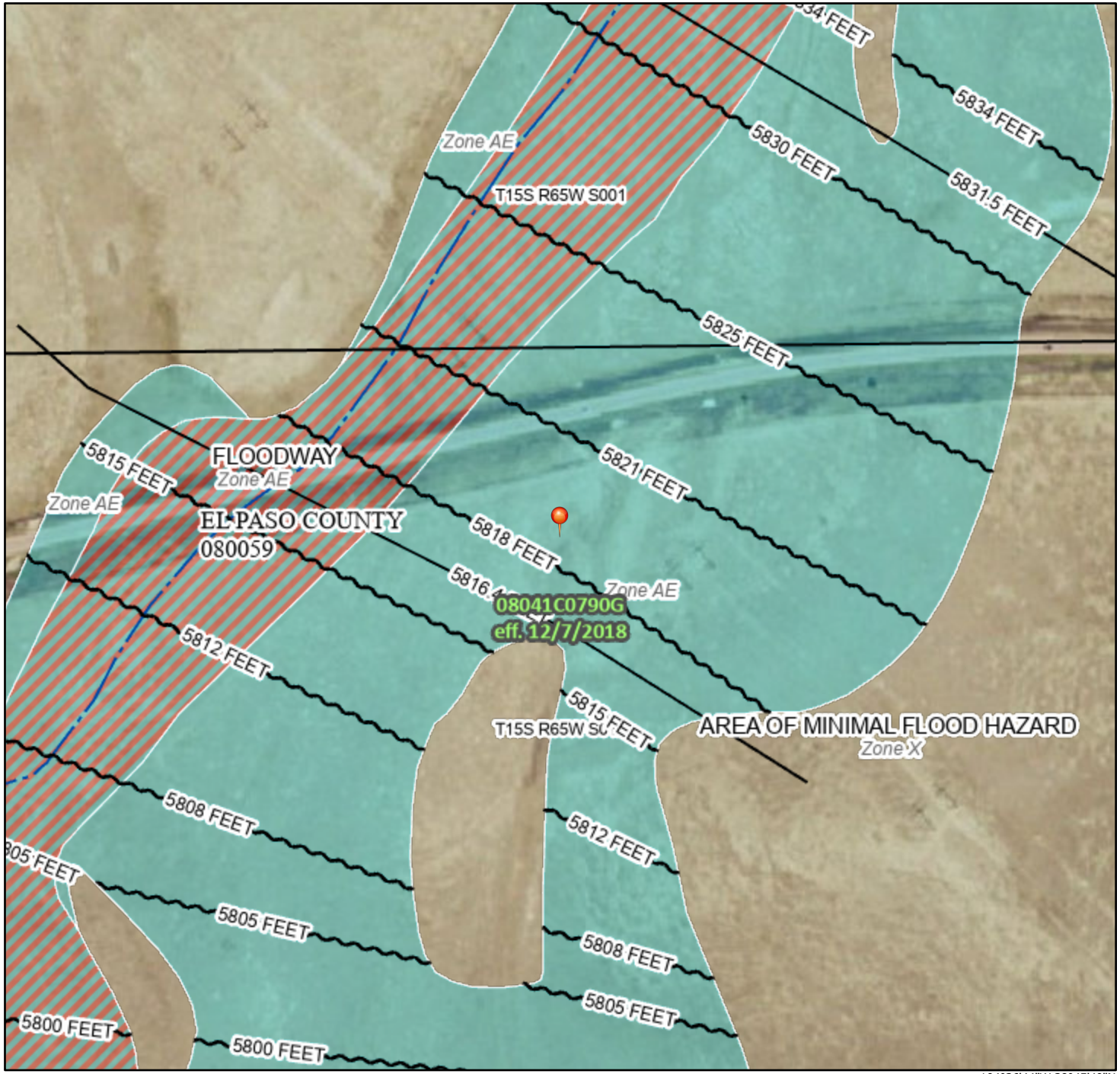
Appendix D

Design Drawings, SCS Soils Reports, Flood Plain Map

National Flood Hazard Layer FIRMette

FEMA

104°37'22"W 38°46'8"N



104°36'44"W 38°45'40"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

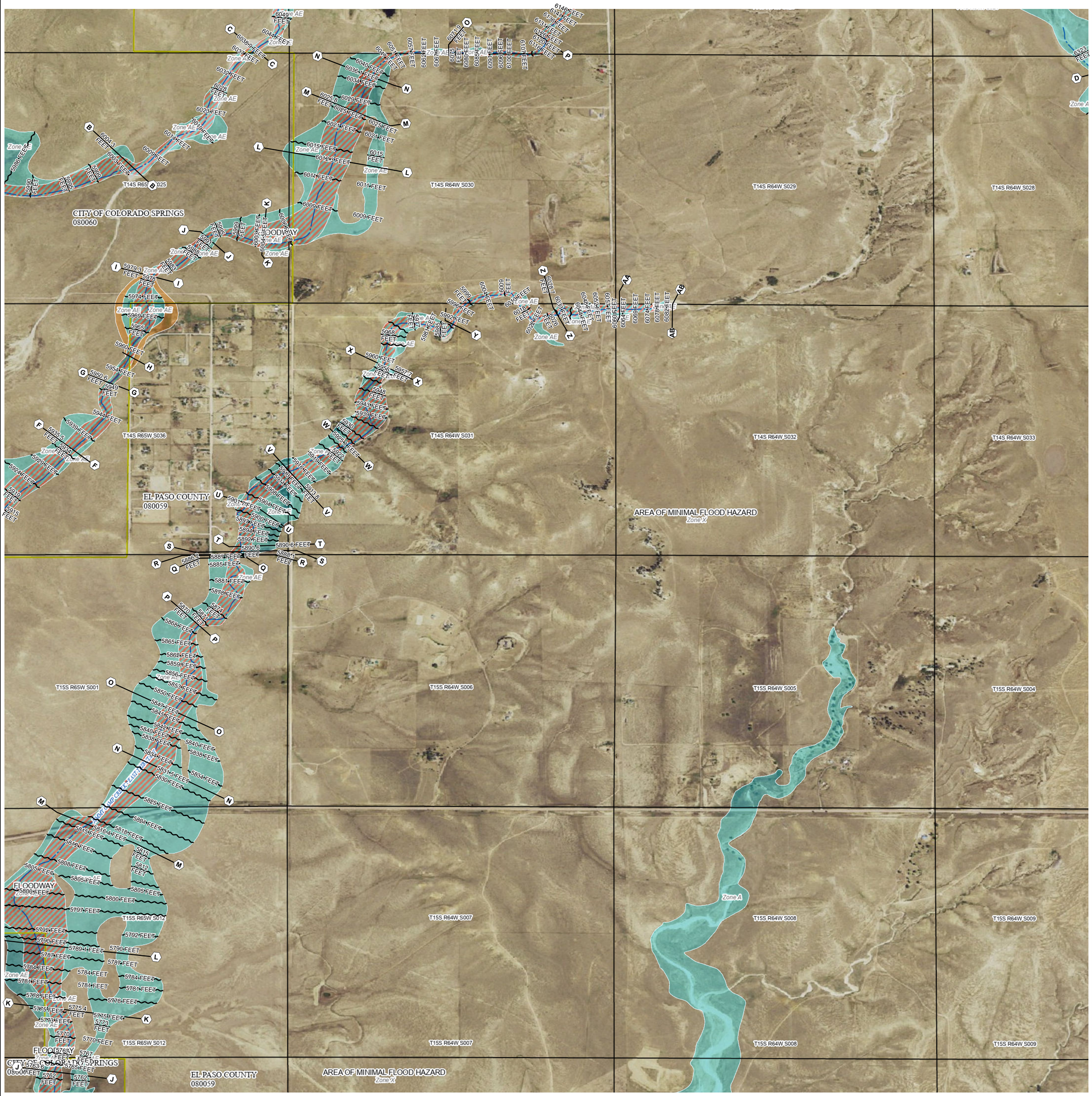
The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 12/16/2025 at 9:20 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

104°37'30.89"W 38°48'58.2"N



104°33'44.18"W 38°44'46.85"N

FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR DRAFT FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee See Notes *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at https://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates, refer to the Flood Insurance Study Report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Basemap information shown on this FIRM was provided in digital format by USDA, Farm Service Agency (FSA). This information was derived from NAIP, dated April 11, 2018.

This map was exported from FEMA's National Flood Hazard Layer (NFHL) on **12/16/2025 9:06 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time. For additional information, please see the Flood Hazard Mapping Updates Overview Fact Sheet at https://www.fema.gov/media-library/assets/documents/118418

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards. This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date.

SCALE

Map Projection:
GCS, Geodetic Reference System 1980;
Vertical Datum: NAVD88

For information about the specific vertical datum for elevation features, datum conversions, or vertical monuments used to create this map, please see the Flood Insurance Study (FIS) Report for your community at https://msc.fema.gov

N

1 inch = 1,000 feet 1:12,000

0 500 1,000 2,000 3,000 4,000 Feet

0 105 210 420 630 840 Meters

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

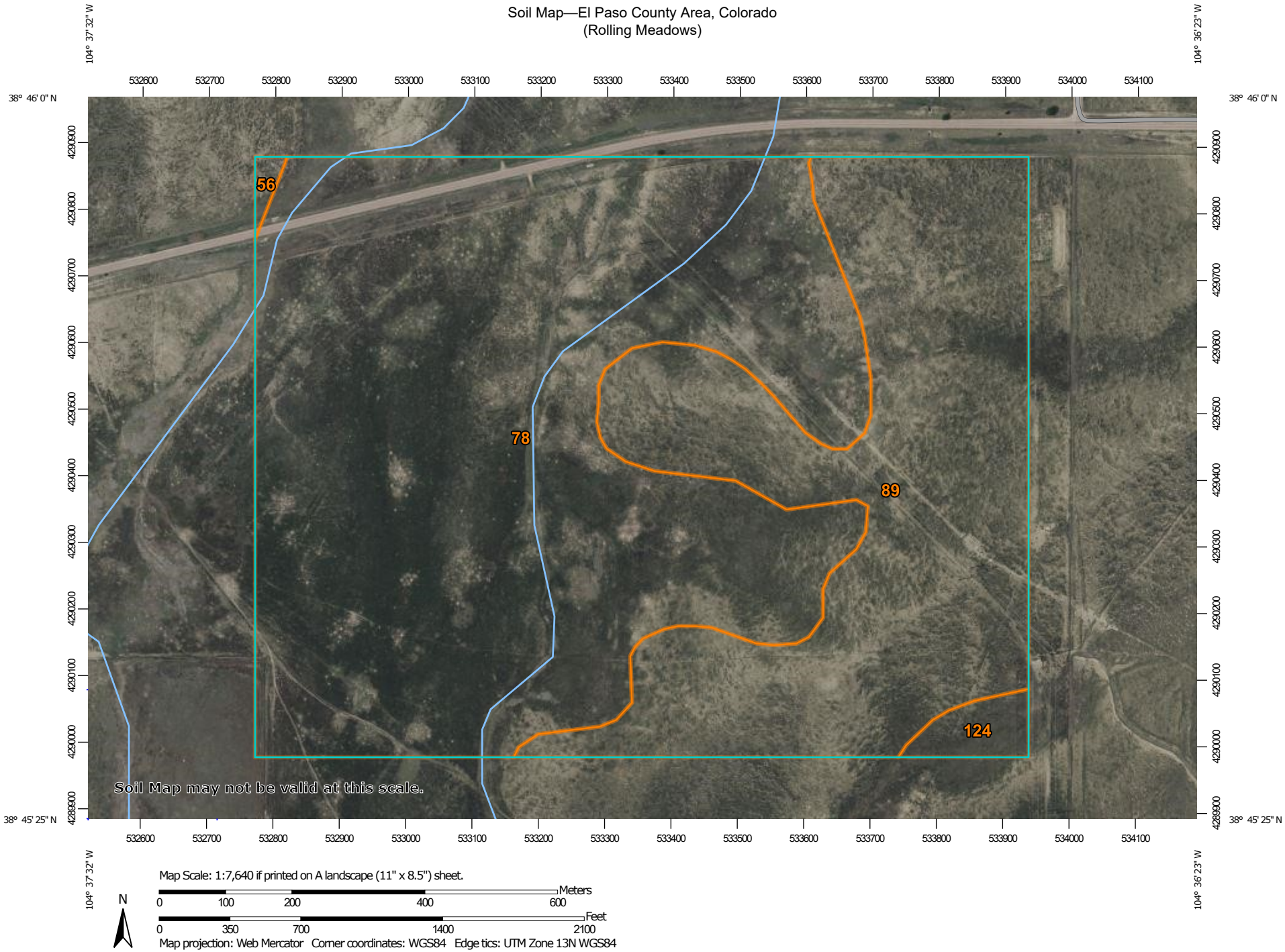
PANEL 790 OF 1275

Panel Contains:

COMMUNITY	NUMBER	PANEL
EL PASO COUNTY	080059	0790
CITY OF COLORADO SPRINGS	080060	0790

MAP NUMBER
08041C0790G
EFFECTIVE DATE
December 07, 2018

Soil Map—El Paso County Area, Colorado
(Rolling Meadows)



Map Scale: 1:7,640 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 100 200 400 600

Feet
0 350 700 1400 2100

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 23, Aug 29, 2025

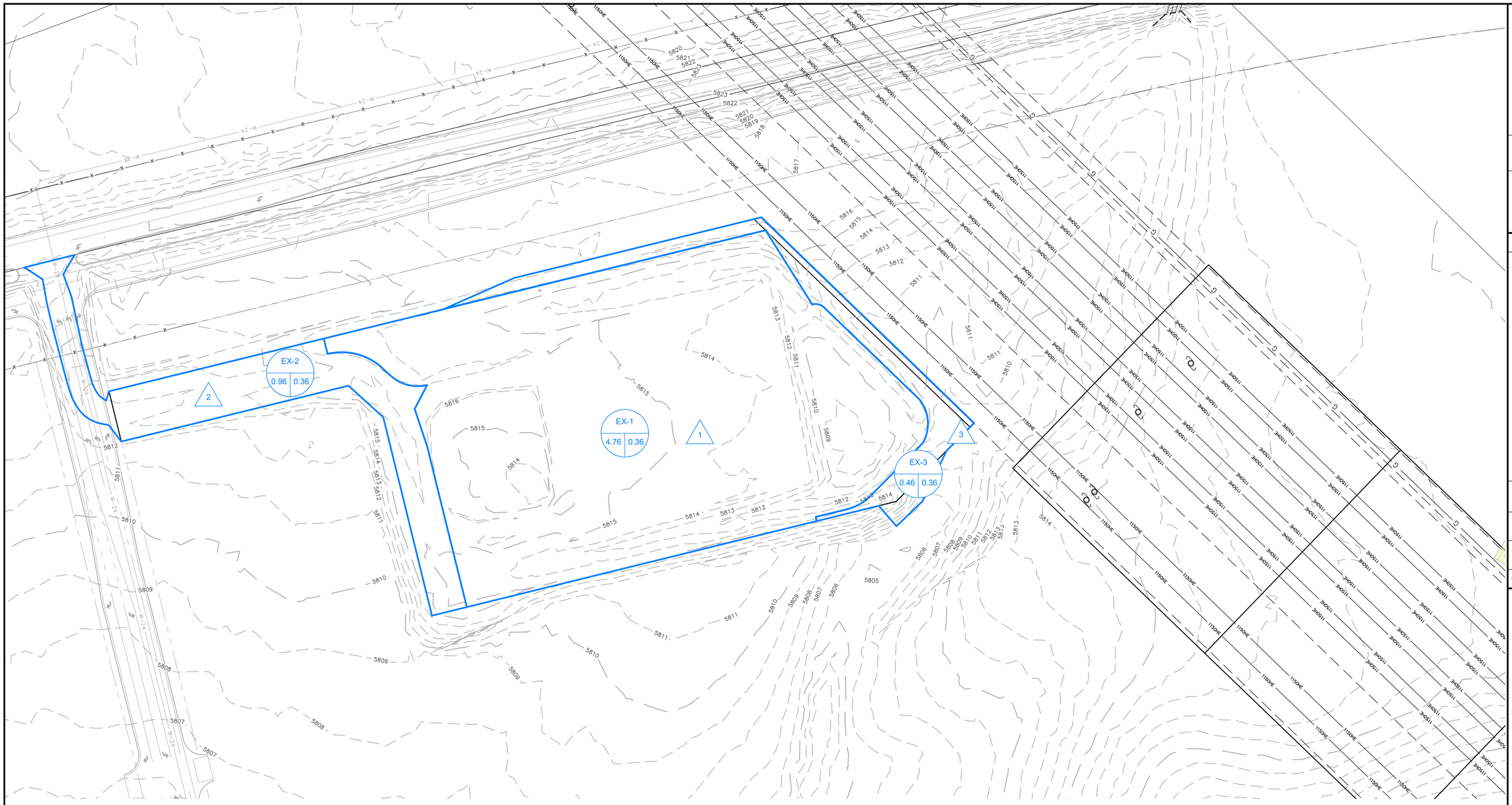
Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 23, 2024—Aug 4, 2024

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
56	Nelson-Tassel fine sandy loams, 3 to 18 percent slopes	0.8	0.3%
78	Sampson loam, 0 to 3 percent slopes	167.2	64.1%
89	Tassel fine sandy loam, 3 to 18 percent slopes	89.4	34.3%
124	Olnest sandy loam, 0 to 3 percent slopes	3.4	1.3%
Totals for Area of Interest		**260.8**	**100.0%**



LEGEND

5800 — EXISTING INDEX CONTOUR
5796 — EXISTING INTERMEDIATE CONTOUR
EXISTING DRAINAGE FLOWLINE
FLOW ARROW
DRAINAGE BASIN

A
B C

A = BASIN
B = AREA IN ACRES
C = WEIGHTED 100–YEAR RUNOFF COEFFICIENT

Summary Runoff Tables

Existing

Design Point	Contributing Area (acres)	Runoff Peak 5-year Event (cfs)	Runoff Peak 100-year Event (cfs)
1	4.76	1.77	11.88
2	0.80	0.290	1.95
3	0.52	2.210	1.02

Basin Summary Table

Existing

Basin ID	Contributing Area (acres)	Disturbed Area (acres)	Weighted Impervious (%)	Runoff Coefficient 5–Year (cfs)	Runoff Coefficient 100–Year (cfs)
EX–1	4.76	4.76	2	0.09	0.36
EX–2	0.80	0.80	2	0.09	0.36
EX–3	0.52	0.52	2	0.09	0.36
TOTAL	6.08	6.08	–	–	–

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

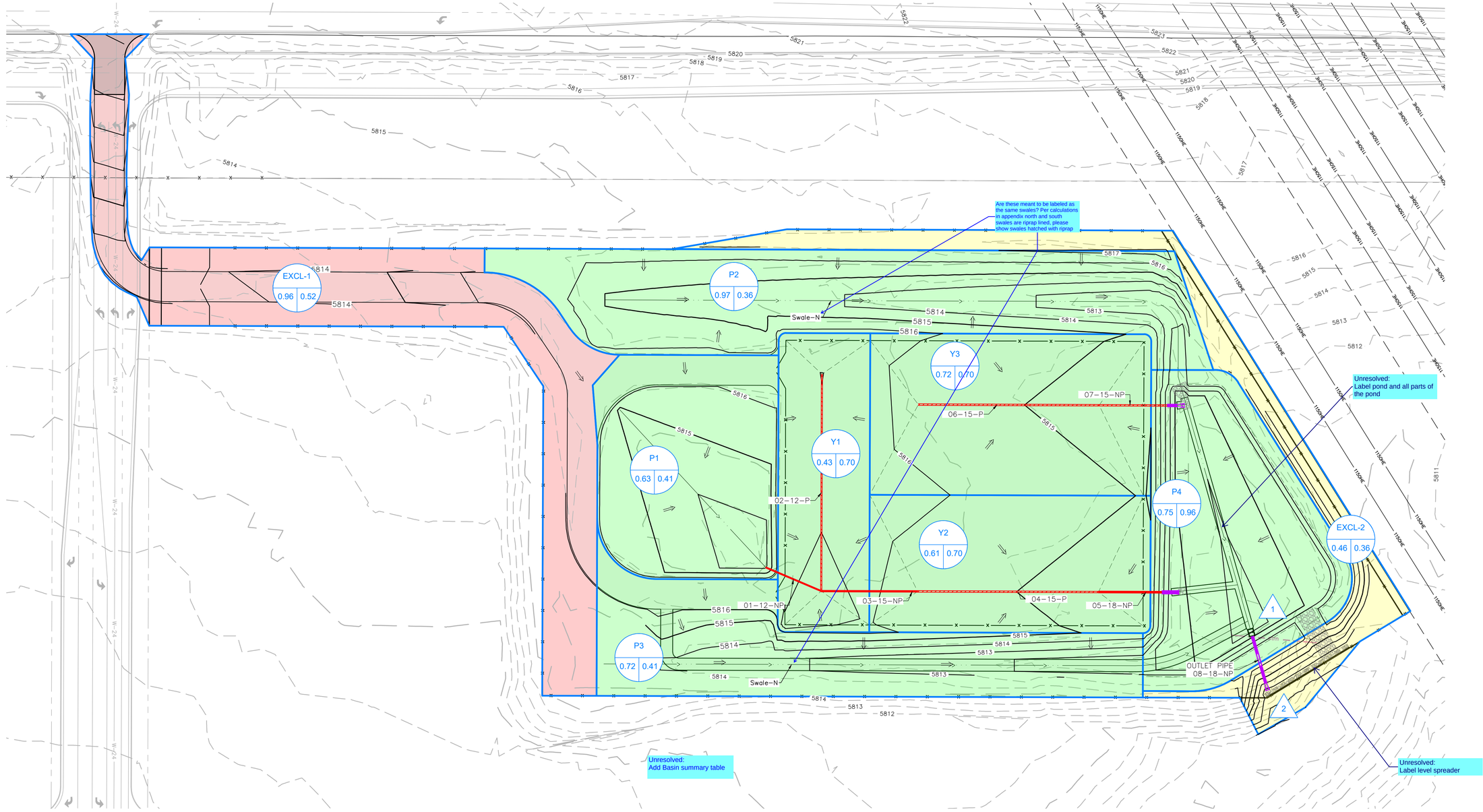
UPDATED BY: WLIDGATE 8/27/2026 12:47 PM | Contract: 4713

PATH: \\DMS1A\Projects\Active Projects\2024\24028-TSGT Rolling Meadows Substation\Facility\Civil\Sheets\S11183-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	08/28/26
Appd:	Date:
DWS	08/28/26

EXISTING BASINS



LEGEND

EXISTING INDEX CONTOUR
EXISTING INTERMEDIATE CONTOUR
EXISTING DRAINAGE FLOWLINE
FLOW ARROW
DRAINAGE BASIN

A = BASIN
B = AREA IN ACRES
C = WEIGHTED 100–YEAR RUNOFF COEFFICIENT

D = DESIGN POINT DESIGNATION

Summary Runoff Tables

Proposed

Design Point	Contributing Area	Runoff Peak 5-year Event	Runoff Peak 100-year Event
	(acres)	(cfs)	(cfs)
1	4.76	1.77	11.88
2	4.76	0.49	1.27

Water Quality Treatment Summary Table

Basin ID	PCM Tributary Area	Area Trib to EDB–1	Disturbed Area Excluded from WQ	Applicable WQ Exclusion
	(acres)	(acres)	(acres)	
Y1	0.43	0.43		
Y2	0.61	0.61		
Y3	0.72	0.72		
P1	0.63	0.63		
P2	0.97	0.97		
P3	0.72	0.72		
P4	0.75	0.75		
EXCL-1	0.96		0.96	ECM App I.7.1.C.1
EXCL-2	0.46		0.46	ECM App I.7.1.B.7

1" = 40'

Scale in feet
40' 0 40' 80'

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

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

ROLLING MEADOWS SUBSTATION
115/12.47kV
PROPOSED BASINS

TRI–STATE GENERATION & TRANSMISSION ASSOCIATION, INCORPORATED

UPDATED BY: WLUDGATE | 8/27/2026 12:47 PM | Contract: 47.13
PATH: \\DMS1\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	08/28/26
Appd:	Date:
DWS	08/28/26

PROPOSED BASINS

P2
Swale-N
J-13
J-12
06-15-P
07-15-NP
J-05
J-07
SD-N-OUT
Y3
Y1
02-12-P
J-06
J-01
03-15-NP
04-15-P
J-02
05-18-NP
J-03
P4
DetentionPond
Weir
Emergency Spillway
Orifice-01-05
Outlet Structure
OUTLET PIPE
08-18-NP
J-08
Outlet Pipe
P3
Swale-N
Outfall Out-01

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" = 30'

Scale in feet
30' 0 30' 60'

Drawing Title
Mfgr. Reference Drawings
Dwg. No.

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

ROLLING MEADOWS SUBSTATION
115/12.47kV
BASIN SCHEMATIC

TRI-STATE GENERATION & TRANSMISSION ASSOCIATION, INCORPORATED

UPDATED BY: WLUDGATE 8/27/2026 12:47 PM Contract: 47113

PATH: \\DNS1A\Projects\Active Projects\2024\24028-TSGT Rolling Meadows Substation\Facility\Civil\Sheets\S1183-A-01-SHEETS.dwg

TRI-STATE
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Denver, Colorado 80233
303-452-6111

Dwn: TMC	Date: 08/28/26
Appd: DWS	Date: 08/28/26

BASIN SCHEMATIC