HIGHLANDS ENGINEERING

STORMWATER REPORT

ENERGY CENTER 6TH ADD'N

CITY OF DICKINSON, ND

PROJECT NUMBER: 241279

DATE ISSUED: February 6, 2026

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HIGHLANDS ENGINEERING

CERTIFICATION

I hereby certify that this report was prepared by me or under my direct supervision and that I am a duly registered professional engineer under the laws of the State of North Dakota.

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REFERENCED DOCUMENTS

[1] SANITARY SEWER AND SITE IMPROVEMENT PLANS FOR ENERGY CENTER 6TH ADDITION

- STAMPED BY: ANDREW SCHRANK, PE - HIGHLANDS ENGINEERING
- PLAN DATE: 02/06/26
- PROJECT NUMBER: 241279

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NARRATIVE

This report addresses the existing and proposed flow conditions and the routing of stormwater for the proposed stormwater management facility to be located in Tract 1, Block 1 of Energy Center 6th Addition in the City of Dickinson, ND. A detention pond is proposed within this Tract to detain runoff to pre-development rates from Lots 3, 4, and 5, Block 1, of Energy Center 6th Addition. For exact details of the proposed site improvements and layout of this pond, please refer to the *Sanitary Sewer and Site Improvement Plans for Energy Center 6th Addition*[1] that were prepared for this project.

Design Methodology

Runoff values were calculated using the SCS TR-55 hydrology method with Type II rainfall distribution. Time of concentration values for pre-development basins were calculated using SCS TR-55 methodology with a minimum value of 5-minutes. Post-developed drainage basins for Lots were modeled with an assumed time of concentration of 15-minutes, and the stormwater Tract was modeled with the minimum time of concentration value of 5-minutes. Curve Numbers used were obtained from values in Table 2-2a within the "Urban Hydrology for Small Watersheds Technical Release 55" published by the NRCS in June of 1986. Manning's n-values for the time of concentration calculations were based on values obtained from, Table 3-1 of the same document, and from tables for recommended values from the "Autodesk® Storm and Sanitary Analysis 2024" software that were developed from the USACE, 1998, HEC-1 Flood Hydrograph Package User's Manual, Hydrologic Engineering Center and the previously mentioned TR-55 Manual. These values are shown in Appendix J. Rainfall depths and intensities used for design were 1.90, 3.08, and 4.58-inches for the 2-, 10-, and 100-year, 24-hour rainfall events, respectively. "Autodesk® Storm and Sanitary Analysis 2024" software was used to model storm water runoff using the hydrodynamic link routing method. Normal depth flow was assumed at the site outfall location. Hydrologic Soil Groups for pre-and-post-development models were based on information obtained from the USDA Web Soil Survey site as shown in Appendix I.

Pre-Development Conditions

The pre-development site analyzed by this report consists of the area that drains through the proposed Tract 1 to the existing culvert in East Villard Street at the low point in this roadway just south of this Tract. This area currently consists of herbaceous rangeland in good condition. The pre-developed site was broken into one (1) drainage basin to include this entire area.

The pre-development runoff peak flows were modeled using the previously outlined design methodology. The table below lists the calculated pre-development 2-, 10-, and 100-year peak runoff flows for the site outfall location analyzed by our pre-development model.

Table 1: Pre-Development Peak Runoff Flows

Storm Event	EX_Out-01 Peak Flow (cfs)
2-year	13.09
10-year	39.49
100-year	79.42

Post-Development Conditions

A detention pond is proposed within Tract 1, Block 1 of Energy Center 6th Addition to detain runoff to pre-development rates from Lots 3, 4, and 5, Block 1, of Energy Center 6th Addition. For exact details of the proposed pond, please refer to the *Sanitary Sewer and Site Improvement Plans for Energy Center 6th Addition*[1] that were prepared for this project.

These lots are zoned General Industrial (GI), which has a maximum impervious area of 100% according to the City of Dickinson Zoning Code. Since we can reasonably anticipate that these lots will not realistically develop with entirely impervious surfaces, an assumption of 85% impervious was assumed for the post-developed Lots.

The proposed site was broken into two (2) subbasins, P_Sub-01 encompassing Lots 3 and 4, and P_Sub-02 encompassing Lot 5. These basins drain directly to the proposed detention pond modeled as P_Stor-01. This detention pond will include an appropriately sized outlet structure to discharge runoff at no more than the pre-development runoff rates to the outfall location, P_Out-01, being the culvert inlet at the low-point of East Villard Street just south of Tract 1.

The table below lists the calculated post-development 2-, 10-, and 100-year peak runoff flows for the outfall location analyzed by our post-development model. The maximum water storage elevation in the detention pond is also indicated by this table. For reference, the stormwater management facility was analyzed with a bottom elevation of 2396.75', and a top of berm elevation of 2402.00'. The pond is proposed to be constructed with a bottom elevation of 2396.50', but the storage in this bottom 6-inches was not analyzed as part of the proposed storage volume to allow for potential sediment accumulation at the bottom of the pond.

Table 2: Post-Development Peak Runoff Flows

Storm Event	PR_Out-01 Peak Flow (cfs)	Storage Area Max. Water El.
2-year	12.04	2398.71'
10-year	37.40	2399.82'
100-year	70.25	2400.95'

Pre-vs-Post Development Analysis

The tables below summarize the pre-and-post-development 2-, 10-, and 100-year peak runoff for the outfall location analyzed as well as the calculated change in flow. These values in these tables are based on the calculations from the previous two sections of this report and provide a direct comparison of the pre-vs-post development runoff at the site outfall location.

Table 3: Pre-vs-Post-Development Peak Runoff Flows for Out-01

Storm Event	EX_Out-01 Peak Flow (cfs)	PR_Out-01 Peak Flow (cfs)	Change in Peak Flow (cfs)
2-year	13.09	12.04	-1.05
10-year	39.49	37.40	-2.09
100-year	79.42	70.25	-9.17

As shown, the pre-vs-post-development runoff decreases for all storm events analyzed. Therefore, the stormwater management facility as designed and depicted by the *Sanitary Sewer and Site Improvement Plans for Energy Center 6th Addition*[1] is sufficient to detain runoff to pre-development rates for Lots 3, 4, and 5, Block 1 of Energy Center 6th Addition assuming these lots drain site runoff to this proposed tract, and the impervious area of these lots does not exceed 85% when developed.

Environmental Considerations

Temporary and permanent erosion control measures will be provided according to local and state regulations for any disturbed soil. Minimum erosion and sediment control measures are depicted by the *Sanitary Sewer and Site Improvement Plans for Energy Center 6th Addition*[1] prepared for this subdivision. The Contractor will be responsible for preparing a SWPPP and providing and maintaining erosion and sediment control items in accordance with the NDPDES Permit that they are to obtain for this project.

No documented wetlands are present within this site as shown by the USFWS National Wetland Inventory map included in Appendix K.

A small portion of the southwest corner of this property is currently located within Special Flood Hazard Area (SFHA) Zone AE as shown by the FIRMette for this site included in Appendix L.

--- END OF NARRATIVE ---

APPENDIX A

Pre-Development Model Inputs

Project Description

File Name	241279_SSA Model-EX.SPF

Project Options

Flow Units	CFS
Elevation Type	Elevation
Hydrology Method	SCS TR-55
Time of Concentration (TOC) Method	SCS TR-55
Link Routing Method	Hydrodynamic
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	5	seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins	1
Nodes	1
Junctions	0
Outfalls	1
Flow Diversions	0
Inlets	0
Storage Nodes	0
Links	0
Channels	0
Pipes	0
Pumps	0
Orifices	0
Weirs	0
Outlets	0
Pollutants	0
Land Uses	0

Subbasin Hydrology

Subbasin : E_Sub-01

Input Data

Area (ac) 32.06
Peak Rate Factor 0
Weighted Curve Number 78.79
Rain Gage ID ..... *

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
Herbaceous range, Good	0	B	62
Herbaceous range, Good	18.09	C	74
Herbaceous range, Good	13.97	D	85
Composite Area & Weighted CN	32.06		78.79

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where :

Tc = Time of Concentration (hr)
n = Manning's roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where :

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft^2)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's roughness

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.15	0	0
Flow Length (ft) :	150	0	0
Slope (%) :	2.3	0	0
2 yr, 24 hr Rainfall (in) :	1.9	0	0
Velocity (ft/sec) :	0.15	0	0
Computed Flow Time (min) :	16.63	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	620	740	0
Slope (%) :	6.3	3.5	0
Surface Type :	Unpaved	Unpaved	Unpaved
Velocity (ft/sec) :	4.05	3.02	0
Computed Flow Time (min) :	2.55	4.08	0

Total TOC (min) 23.27


BLOCK 1
E_Sub-01
E_Out-01
EASTVILLARD

APPENDIX B

Pre-Development 2-Year Storm Event Results

Subbasin Summary

SN	Subbasin ID	Area (ac)	Peak Rate Factor	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	E_Sub-01	32.06	0.00	78.79	1.90	0.46	14.65	13.09	0 00:23:16

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	E_Out-01	Outfall	2395.50					0.00	0.00					

Subbasin Hydrology

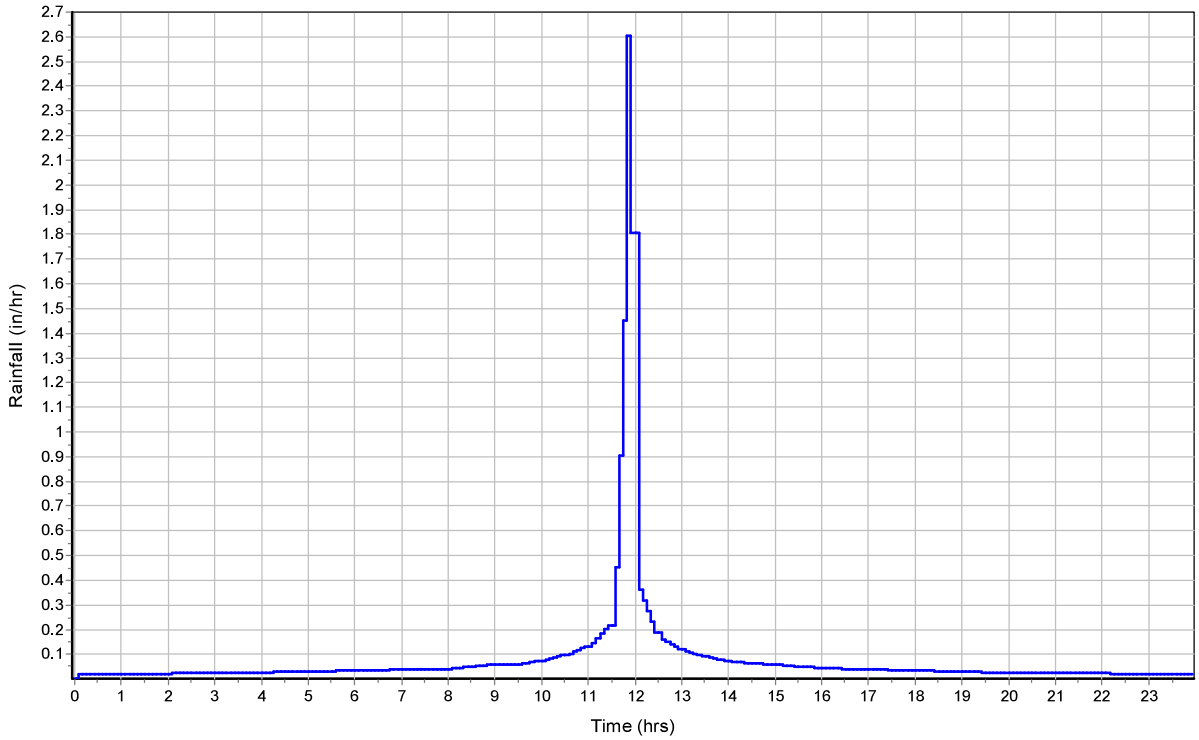
Subbasin : E_Sub-01

Subbasin Runoff Results

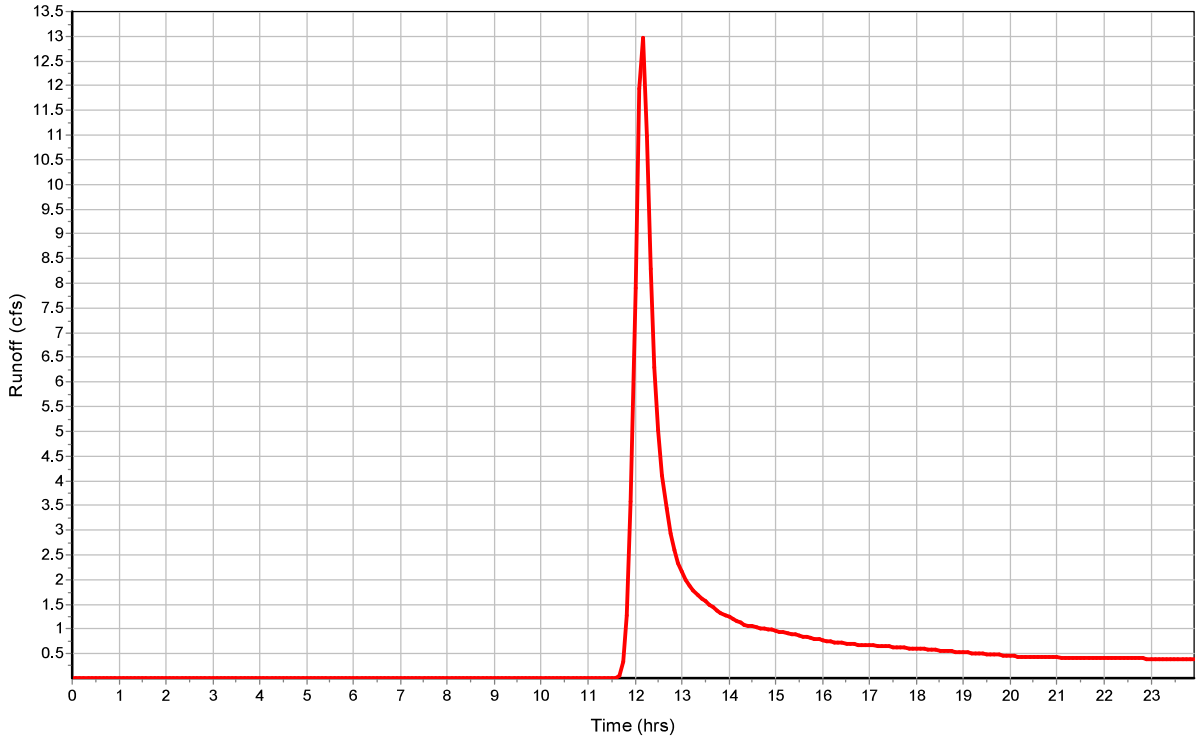
Total Rainfall (in)	1.9
Total Runoff (in)	0.46
Peak Runoff (cfs)	13.09
Weighted Curve Number	78.79
Time of Concentration (days hh:mm:ss)	0 00:23:16

Subbasin : E_Sub-01

Rainfall Intensity Graph



Runoff Hydrograph



APPENDIX C

Pre-Development 10-Year Storm Event Results

Subbasin Summary

SN	Subbasin ID	Area (ac)	Peak Rate Factor	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	E_Sub-01	32.06	0.00	78.79	3.08	1.23	39.56	39.49	0 00:23:16

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	E_Out-01	Outfall	2395.50					0.00	0.00					

Subbasin Hydrology

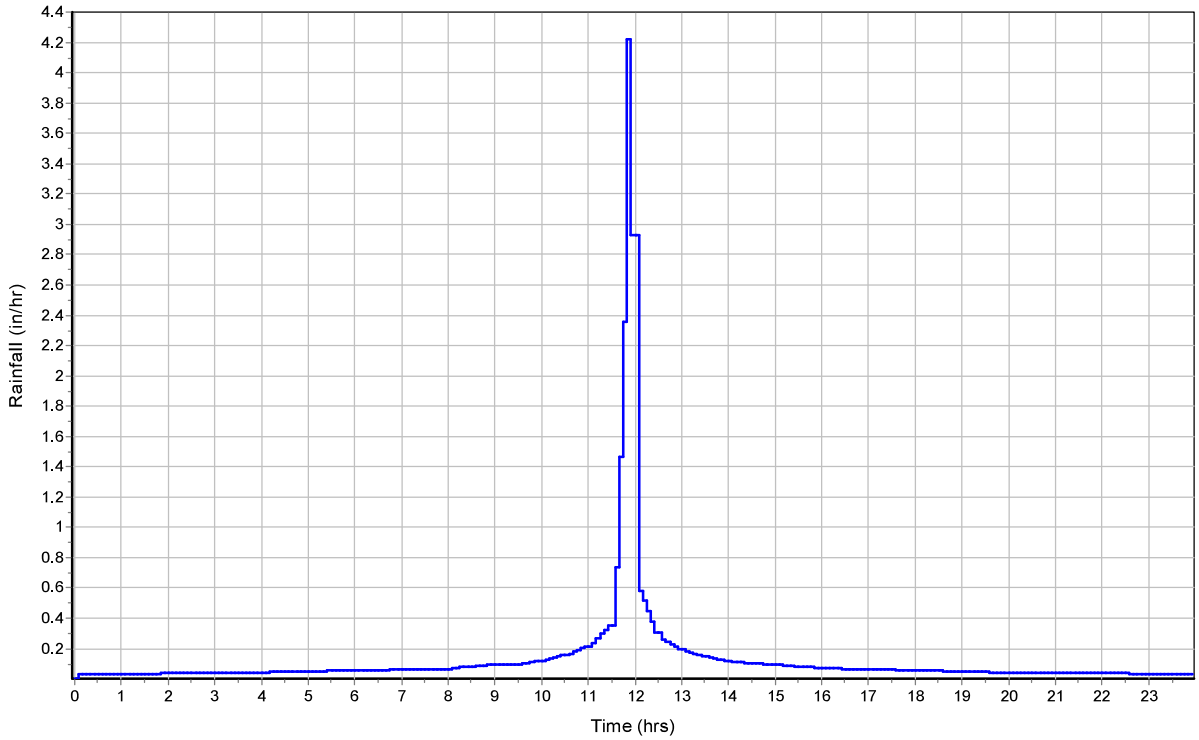
Subbasin : E_Sub-01

Subbasin Runoff Results

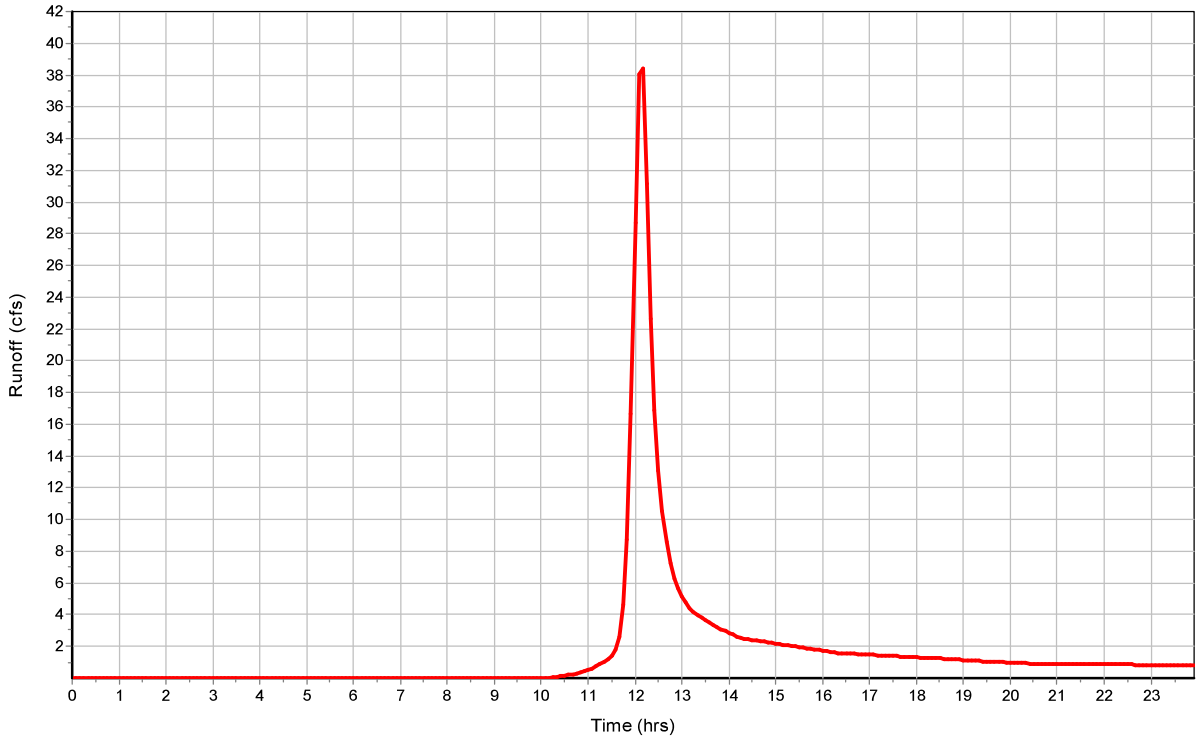
Total Rainfall (in)	3.08
Total Runoff (in)	1.23
Peak Runoff (cfs)	39.49
Weighted Curve Number	78.79
Time of Concentration (days hh:mm:ss)	0 00:23:16

Subbasin : E_Sub-01

Rainfall Intensity Graph



Runoff Hydrograph



APPENDIX D

Pre-Development 100-Year Storm Event Results

Subbasin Summary

SN	Subbasin ID	Area (ac)	Peak Rate Factor	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	E_Sub-01	32.06	0.00	78.79	4.58	2.43	77.78	79.42	0 00:23:16

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	E_Out-01	Outfall	2395.50					0.00	0.00					

Subbasin Hydrology

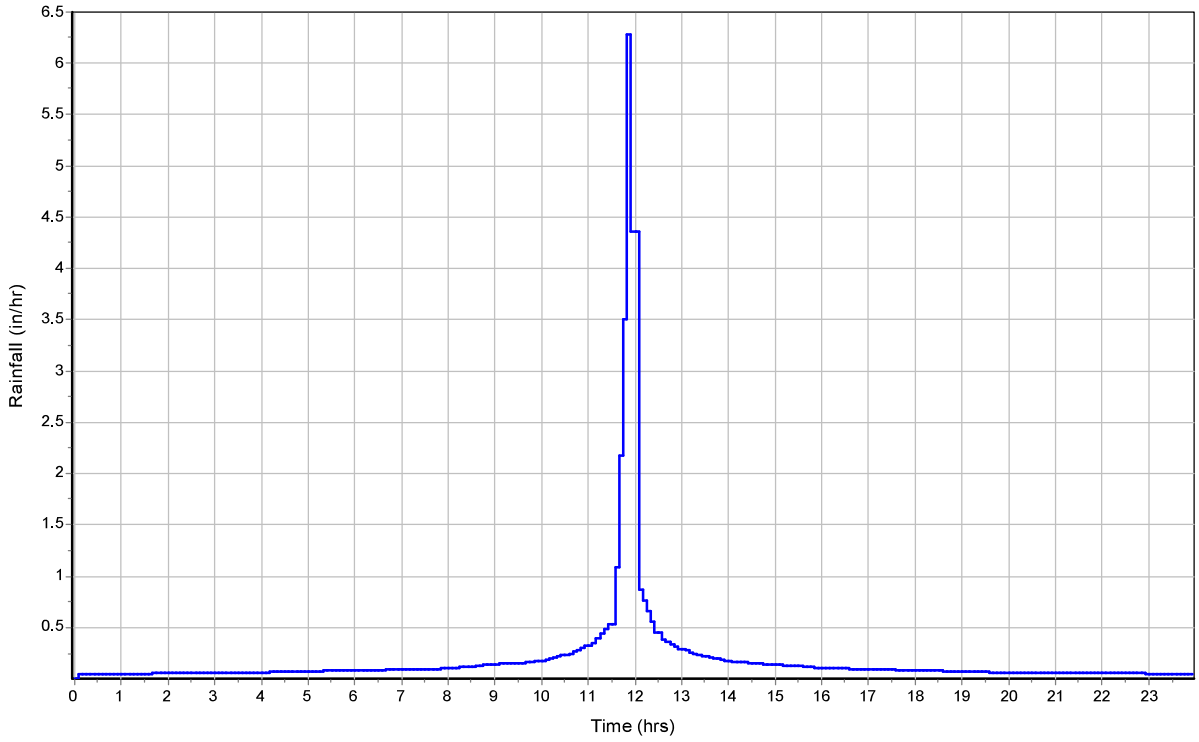
Subbasin : E_Sub-01

Subbasin Runoff Results

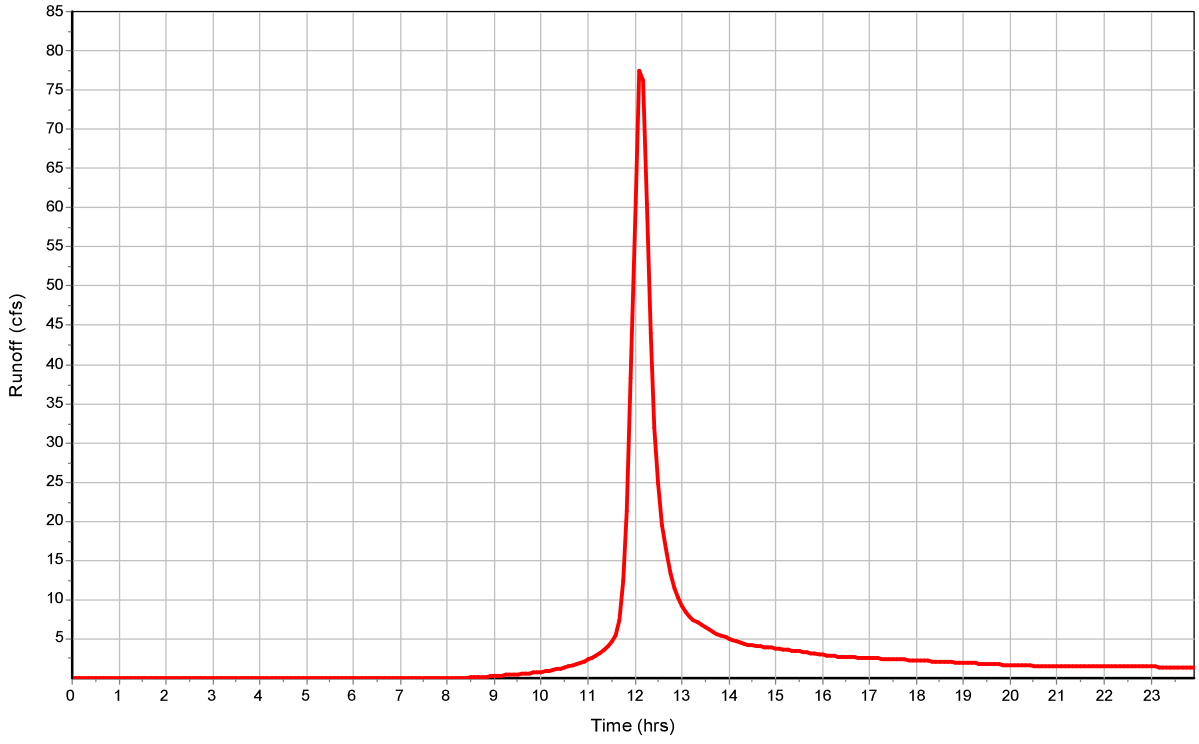
Total Rainfall (in)	4.58
Total Runoff (in)	2.43
Peak Runoff (cfs)	79.42
Weighted Curve Number	78.79
Time of Concentration (days hh:mm:ss)	0 00:23:16

Subbasin : E_Sub-01

Rainfall Intensity Graph



Runoff Hydrograph



APPENDIX E

Post-Development Model Inputs

Project Description

File Name	241279_SSA Model-PR.SPF

Project Options

Flow Units	CFS
Elevation Type	Elevation
Hydrology Method	SCS TR-55
Time of Concentration (TOC) Method	User-Defined
Link Routing Method	Hydrodynamic
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	5	seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins	3
Nodes	4
Junctions	2
Outfalls	1
Flow Diversions	0
Inlets	0
Storage Nodes	1
Links	5
Channels	1
Pipes	1
Pumps	0
Orifices	2
Weirs	1
Outlets	0
Pollutants	0
Land Uses	0

Subbasin Hydrology

Subbasin : P_Sub-01

Input Data

Area (ac)	23.38
Peak Rate Factor	0
Weighted Curve Number	94.39
Rain Gage ID	*

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Urban commercial, 85% imp	14.35	C	94
Urban commercial, 85% imp	9.03	D	95
Composite Area & Weighted CN	23.38		94.39

Subbasin : P_Sub-02

Input Data

Area (ac)	12.37
Peak Rate Factor	0
Weighted Curve Number	94.06
Rain Gage ID	*

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Urban commercial, 85% imp	1.49	B	92
Urban commercial, 85% imp	7.13	C	94
Urban commercial, 85% imp	3.74	D	95
Composite Area & Weighted CN	12.36		94.06

Subbasin : P_Sub-03

Input Data

Area (ac)	1.93
Peak Rate Factor	0
Weighted Curve Number	80
Rain Gage ID	*

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
> 75% grass cover, Good	1.93	D	80
Composite Area & Weighted CN	1.93		80

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	P_Jun-01	2394.50	2402.00	7.50	0.00	-2394.50	2402.00	0.00	0.00	
2	P_Jun-02	2394.00	2402.00	8.00	0.00	-2394.00	2402.00	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	P_Channel-01	41.18	2394.00	0.00	2393.00	0.00	1.00	2.4300	Parabolic	2.000	100.000	0.0320	0.0000	0.0000	0.0000	0.00	No

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	P_Pipe-01	66.38	2394.50	0.00	2394.00	0.00	0.50	0.7500	CIRCULAR									

Storage Nodes

Storage Node : P_Stor-01

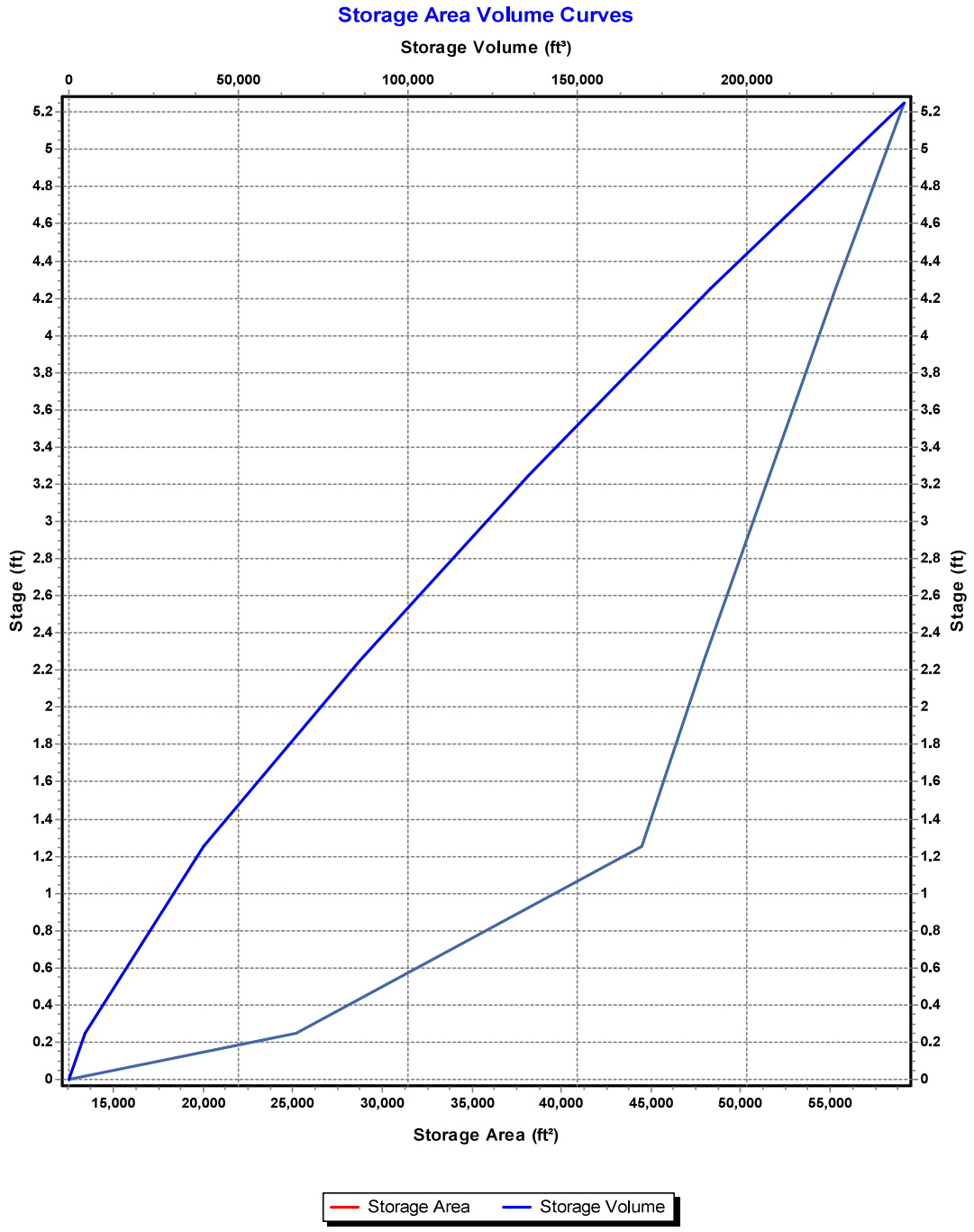
Input Data

Invert Elevation (ft)	2396.75
Max (Rim) Elevation (ft)	2402.00
Max (Rim) Offset (ft)	5.25
Initial Water Elevation (ft)	0.00
Initial Water Depth (ft)	-2396.75
Ponded Area (ft^2)	45000.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : Storage-01

Stage (ft)	Storage Area (ft^2)	Storage Volume (ft^3)
0	12500	0
0.25	25226	4715.75
1.25	44462	39559.75
2.25	47986	85783.75
3.25	51609	135581.25
4.25	55330	189050.75
5.25	59147	246289.25


Storage Area Volume Curves
Storage Volume (ft³)
0
50,000
100,000
150,000
200,000
Stage (ft)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
2.2
2.4
2.6
2.8
3
3.2
3.4
3.6
3.8
4
4.2
4.4
4.6
4.8
5
5.2
Storage Area (ft²)
15,000
20,000
25,000
30,000
35,000
40,000
45,000
50,000
55,000
Storage Area
Storage Volume

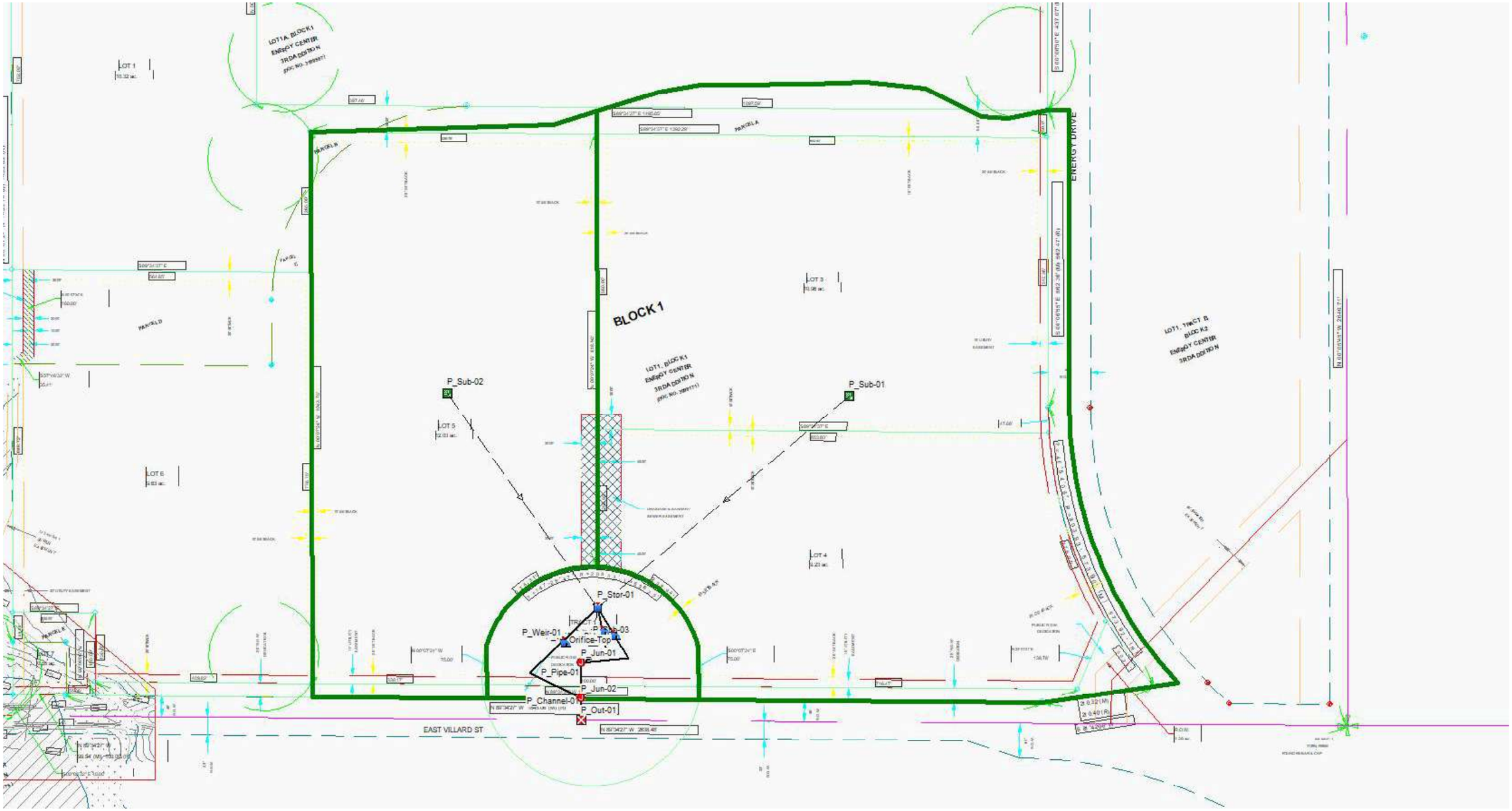
Storage Node : P_Stor-01 (continued)

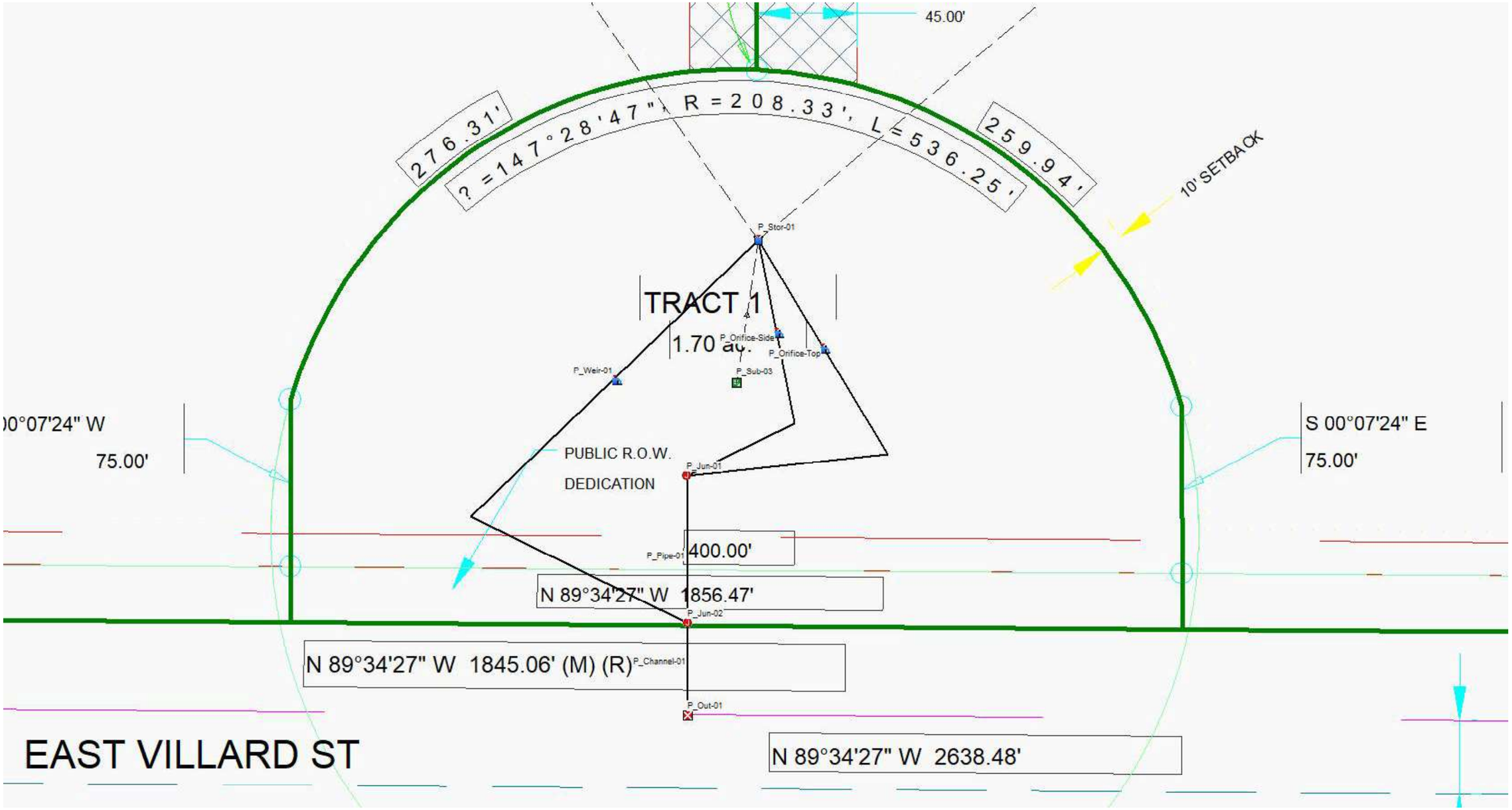
Outflow Weirs

SN	Element ID	Weir Type	Flap Gate	Crest Elevation (ft)	Crest Offset (ft)	Length (ft)	Weir Total Height (ft)	Discharge Coefficient
1	P_Weir-01	Trapezoidal	No	2400.67	3.92	25.00	1.50	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	P_Orifice-Side	Side	Rectangular	No					
2	P_Orifice-Top	Bottom	CIRCULAR	No					


LOT 1
LOT 1 A, BLOCK 1
ENERGY CENTER
3RDA DD/TIO N
LOT 3
BLOCK 1
LOT 1, BLOCK K1
ENERGY CENTER
3RDA DD/TIO N
LOT 1, THACT B
BLOCK K2
ENERGY CENTER
3RDA DD/TIO N
ENERGY DRIVE
P_Sub-02
P_Sub-01
LOT 5
LOT 6
LOT 4
P_Stor-01
P_Weir-01
Orifice-Top
P_Sub-03
P_Jun-01
P_Pipe-01
P_Jun-02
P_Channel-01
P_Out-01
EAST VILLARD ST
PARCEL A
PARCEL B
PARCEL C
PARCEL D
R.O.W.


45.00'
276.31'
Δ = 147°28'47", R = 208.33', L = 536.25'
259.94'
10' SETBACK
P_Stor-01
TRACT 1
1.70 ac.
P_Orifice-Side
P_Orifice-Top
P_Weir-01
P_Sub-03
PUBLIC R.O.W.
DEDICATION
P_Jun-01
P_Pipe-01
400.00'
N 89°34'27" W 1856.47'
P_Jun-02
N 89°34'27" W 1845.06' (M) (R)
P_Channel-01
P_Out-01
)0°07'24" W
75.00'
S 00°07'24" E
75.00'
EAST VILLARD ST
N 89°34'27" W 2638.48'

APPENDIX F

Post-Development 2-Year Storm Event Results

Subbasin Summary

SN	Subbasin ID	Area (ac)	Peak Rate Factor	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	P_Sub-01	23.38	0.00	94.39	1.90	1.34	31.21	37.96	0 00:15:00
2	P_Sub-02	12.37	0.00	94.06	1.90	1.31	16.18	19.76	0 00:15:00
3	P_Sub-03	1.93	0.00	80.00	1.90	0.50	0.97	1.43	0 00:05:00

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	P_Jun-01	Junction	2394.50	2402.00	0.00	2402.00	0.00	12.04	2395.89	0.00	6.11	0 00:00	0.00	0.00
2	P_Jun-02	Junction	2394.00	2402.00	0.00	2402.00	0.00	12.04	2394.24	0.00	7.76	0 00:00	0.00	0.00
3	P_Out-01	Outfall	2393.00					12.04	2393.24					
4	P_Stor-01	Storage Node	2396.75	2402.00	0.00		45000.00	57.03	2398.71				0.00	0.00

Subbasin Hydrology

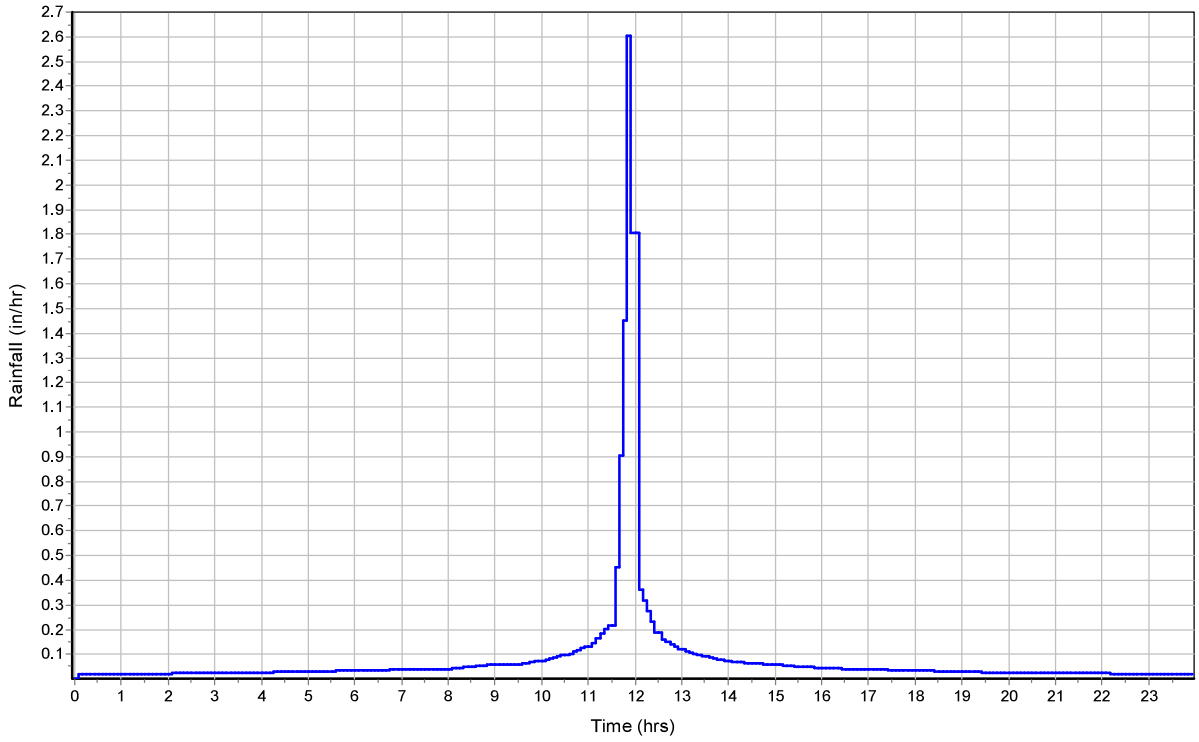
Subbasin : P_Sub-01

Subbasin Runoff Results

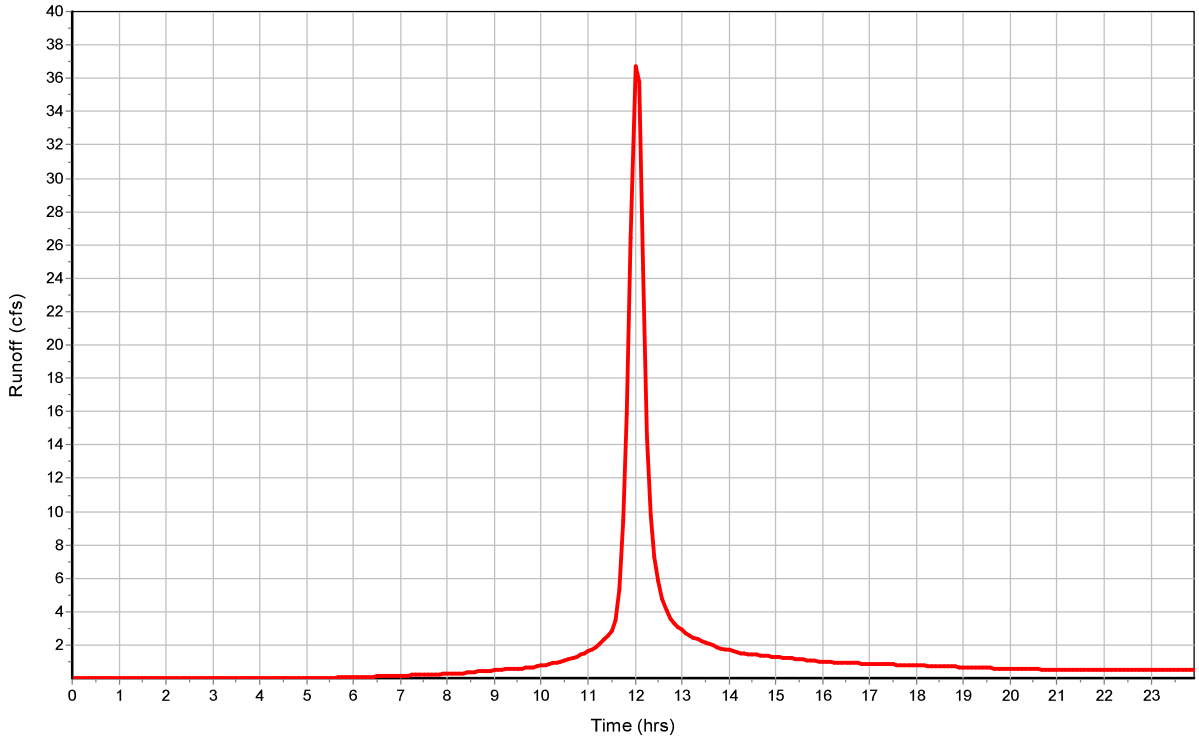
Total Rainfall (in)	1.9
Total Runoff (in)	1.34
Peak Runoff (cfs)	37.96
Weighted Curve Number	94.39
Time of Concentration (days hh:mm:ss)	0 00:15:00

Subbasin : P_Sub-01

Rainfall Intensity Graph



Runoff Hydrograph



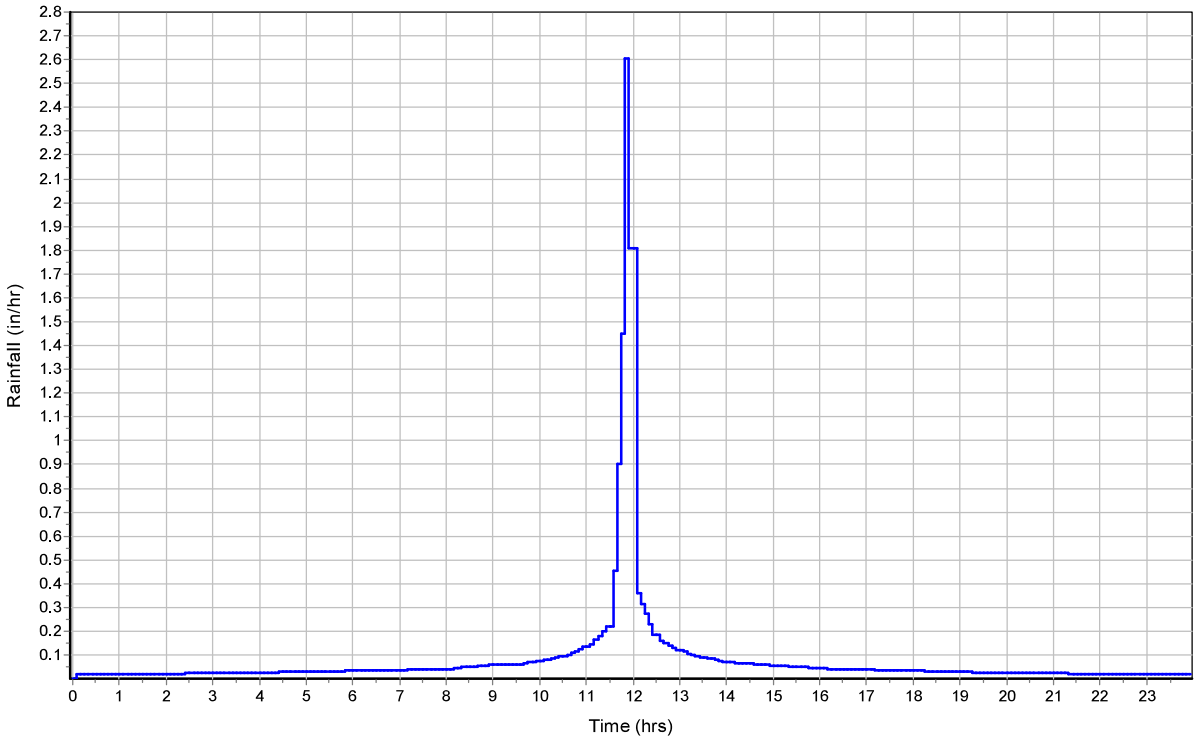
Subbasin : P_Sub-02

Subbasin Runoff Results

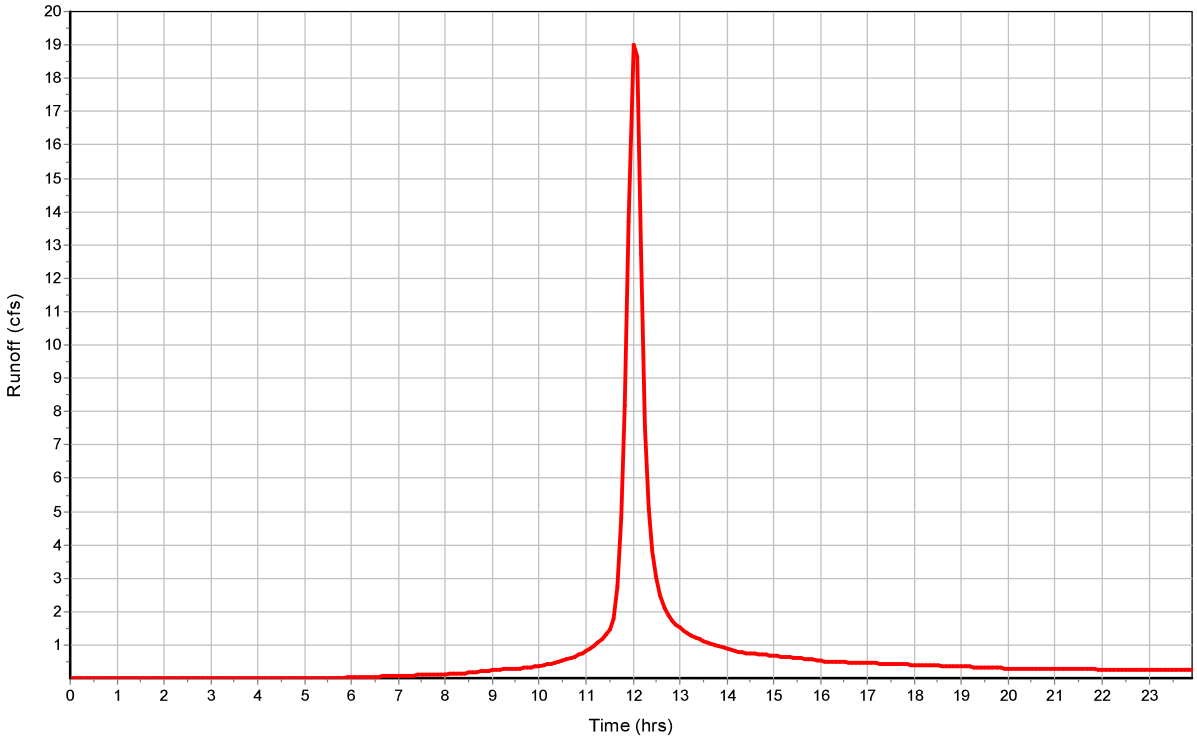
Total Rainfall (in)	1.9
Total Runoff (in)	1.31
Peak Runoff (cfs)	19.76
Weighted Curve Number	94.06
Time of Concentration (days hh:mm:ss)	0 00:15:00

Subbasin : P_Sub-02

Rainfall Intensity Graph



Runoff Hydrograph



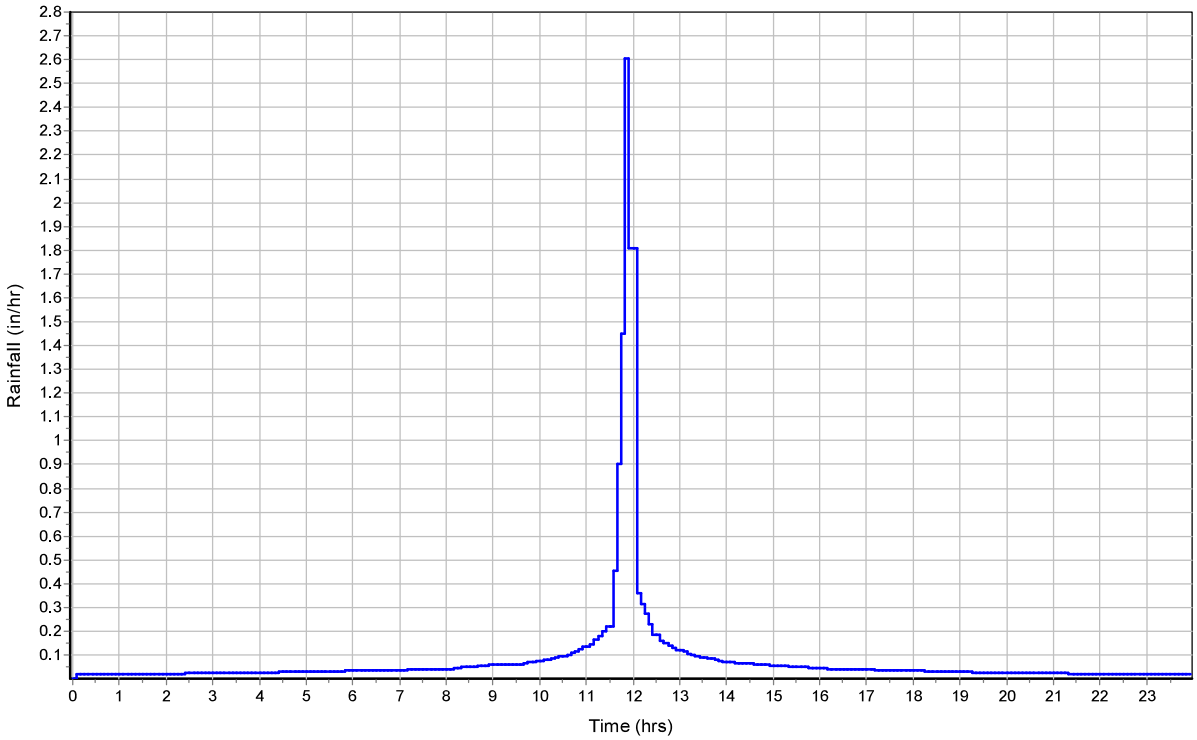
Subbasin : P_Sub-03

Subbasin Runoff Results

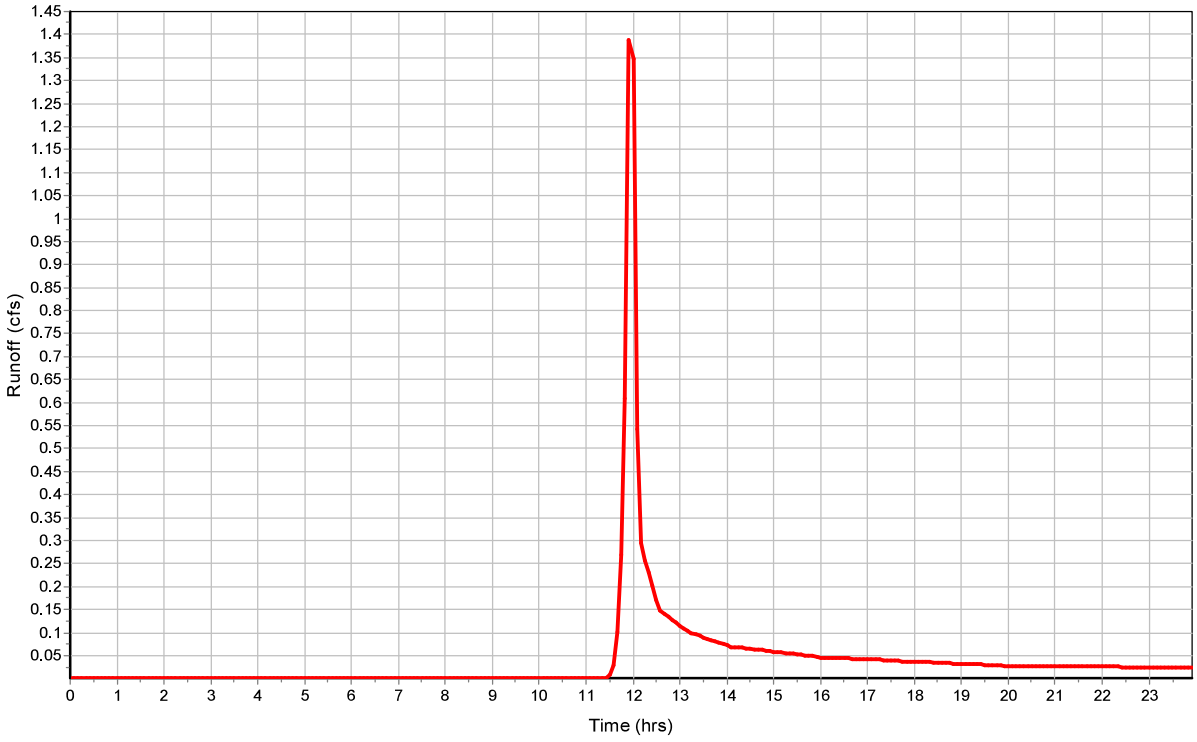
Total Rainfall (in)	1.9
Total Runoff (in)	0.5
Peak Runoff (cfs)	1.43
Weighted Curve Number	80
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : P_Sub-03

Rainfall Intensity Graph



Runoff Hydrograph



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	P_Jun-01	12.04	0.00	2395.89	1.39	0.00	6.11	2394.88	0.38	0 12:29	0 00:00	0.00	0.00
2	P_Jun-02	12.04	0.00	2394.24	0.24	0.00	7.76	2394.08	0.08	0 12:29	0 00:00	0.00	0.00

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	P_Channel-01	12.04	0 12:29	1168.02	0.01	2.14	0.32	0.24	0.12	0.00		

Pipe 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	P_Pipe-01	12.04	0 12:29	57.89	0.21	7.73	0.14	0.82	0.27	0.00		Calculated

Storage Nodes

Storage Node : P_Stor-01

Output Summary Results

Peak Inflow (cfs)	57.03
Peak Lateral Inflow (cfs)	57.03
Peak Outflow (cfs)	12.04
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	2398.71
Max HGL Depth Attained (ft)	1.96
Average HGL Elevation Attained (ft)	2397.12
Average HGL Depth Attained (ft)	0.37
Time of Max HGL Occurrence (days hh:mm)	0 12:29
Total Exfiltration Volume (1000-ft^3)	0
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

APPENDIX G

Post-Development 10-Year Storm Event Results

Subbasin Summary

SN	Subbasin ID	Area (ac)	Peak Rate Factor	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	P_Sub-01	23.38	0.00	94.39	3.08	2.47	57.65	68.00	0 00:15:00
2	P_Sub-02	12.37	0.00	94.06	3.08	2.43	30.10	35.70	0 00:15:00
3	P_Sub-03	1.93	0.00	80.00	3.08	1.31	2.53	4.00	0 00:05:00

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	P_Jun-01	Junction	2394.50	2402.00	0.00	2402.00	0.00	37.42	2397.64	0.00	4.36	0 00:00	0.00	0.00
2	P_Jun-02	Junction	2394.00	2402.00	0.00	2402.00	0.00	37.40	2394.41	0.00	7.59	0 00:00	0.00	0.00
3	P_Out-01	Outfall	2393.00					37.40	2393.41					
4	P_Stor-01	Storage Node	2396.75	2402.00	0.00		45000.00	104.20	2399.82				0.00	0.00

Subbasin Hydrology

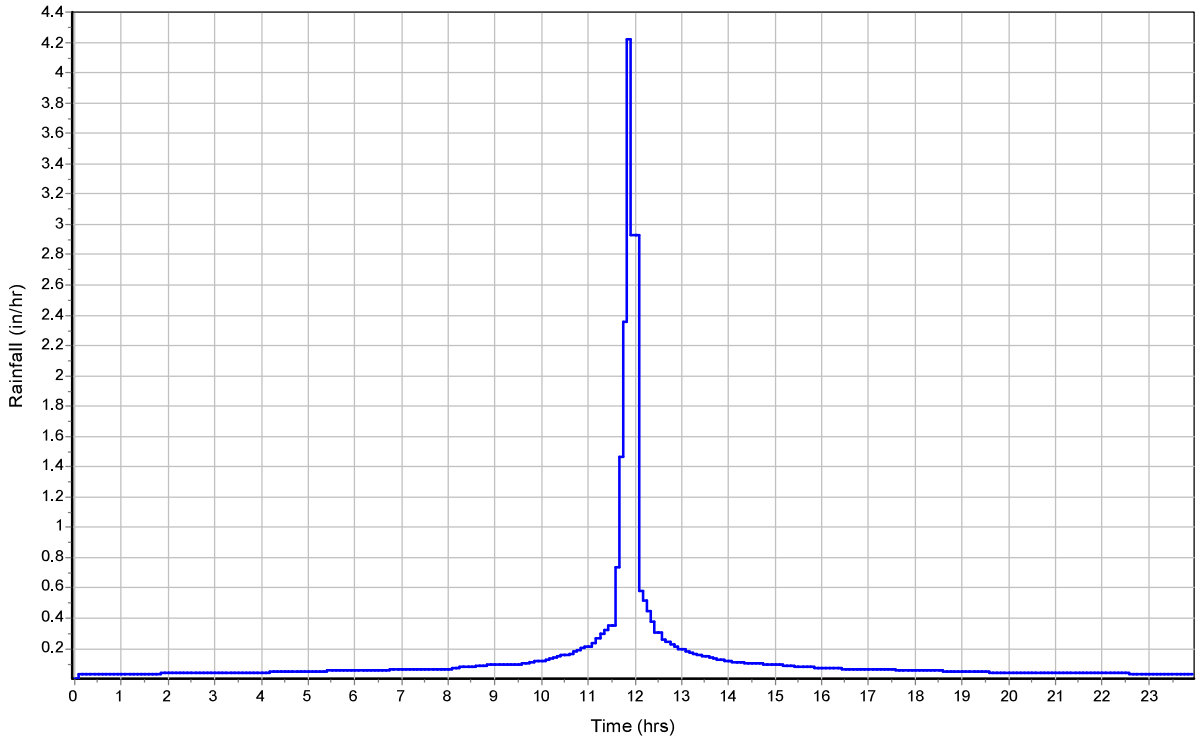
Subbasin : P_Sub-01

Subbasin Runoff Results

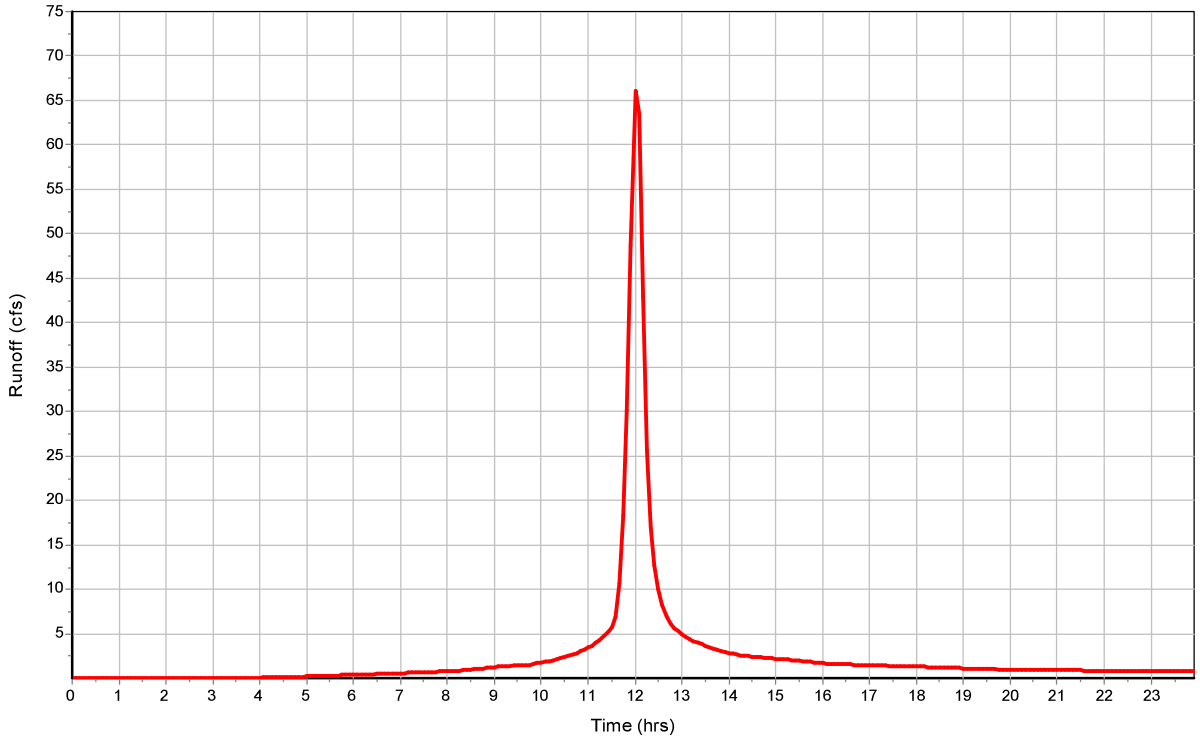
Total Rainfall (in)	3.08
Total Runoff (in)	2.47
Peak Runoff (cfs)	68
Weighted Curve Number	94.39
Time of Concentration (days hh:mm:ss)	0 00:15:00

Subbasin : P_Sub-01

Rainfall Intensity Graph



Runoff Hydrograph



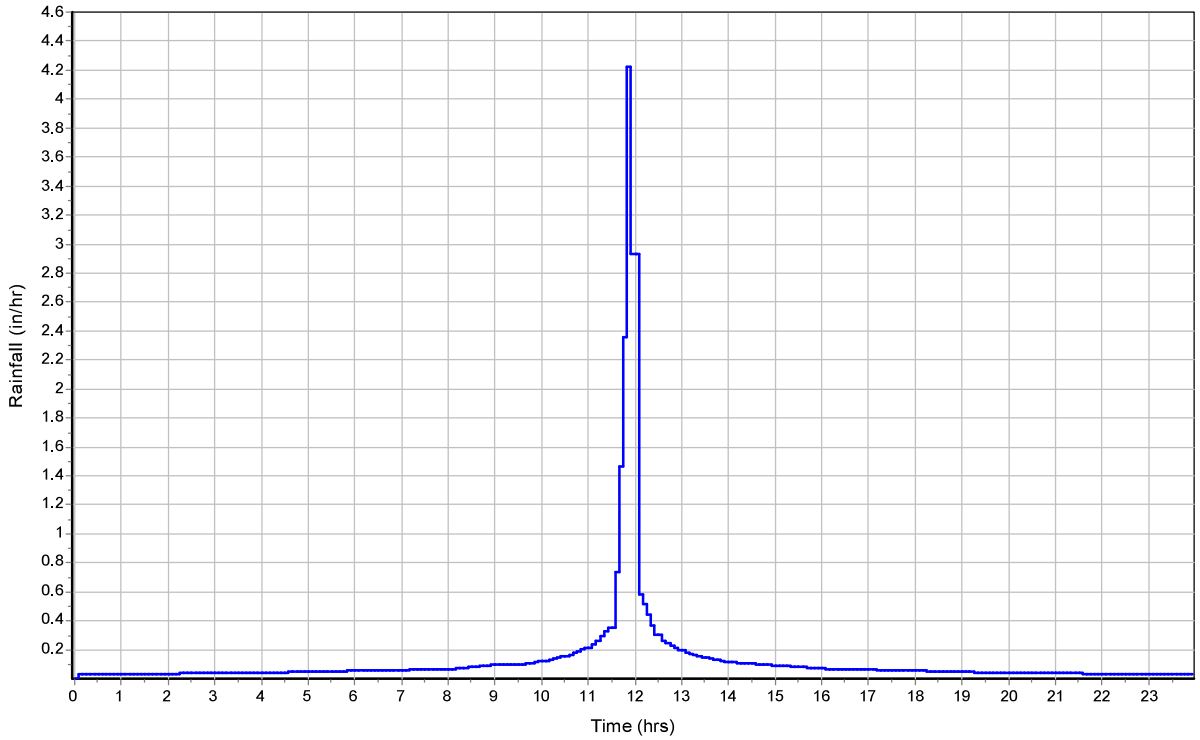
Subbasin : P_Sub-02

Subbasin Runoff Results

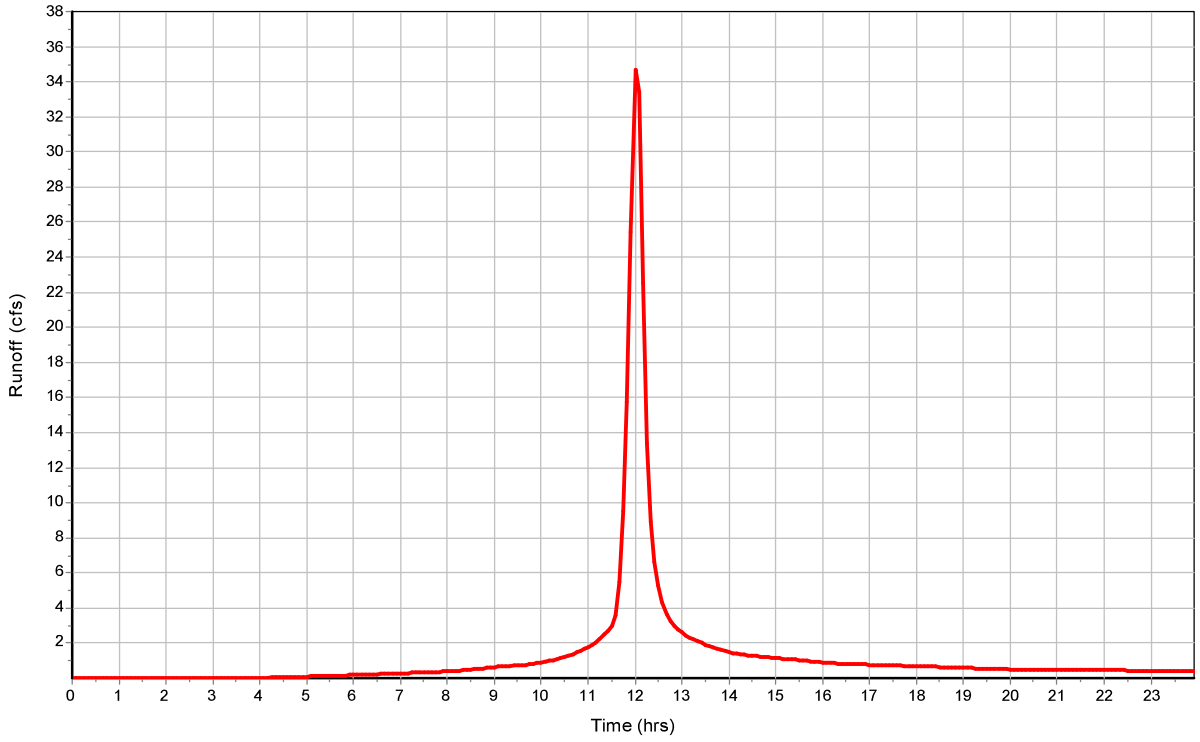
Total Rainfall (in)	3.08
Total Runoff (in)	2.43
Peak Runoff (cfs)	35.7
Weighted Curve Number	94.06
Time of Concentration (days hh:mm:ss)	0 00:15:00

Subbasin : P_Sub-02

Rainfall Intensity Graph



Runoff Hydrograph



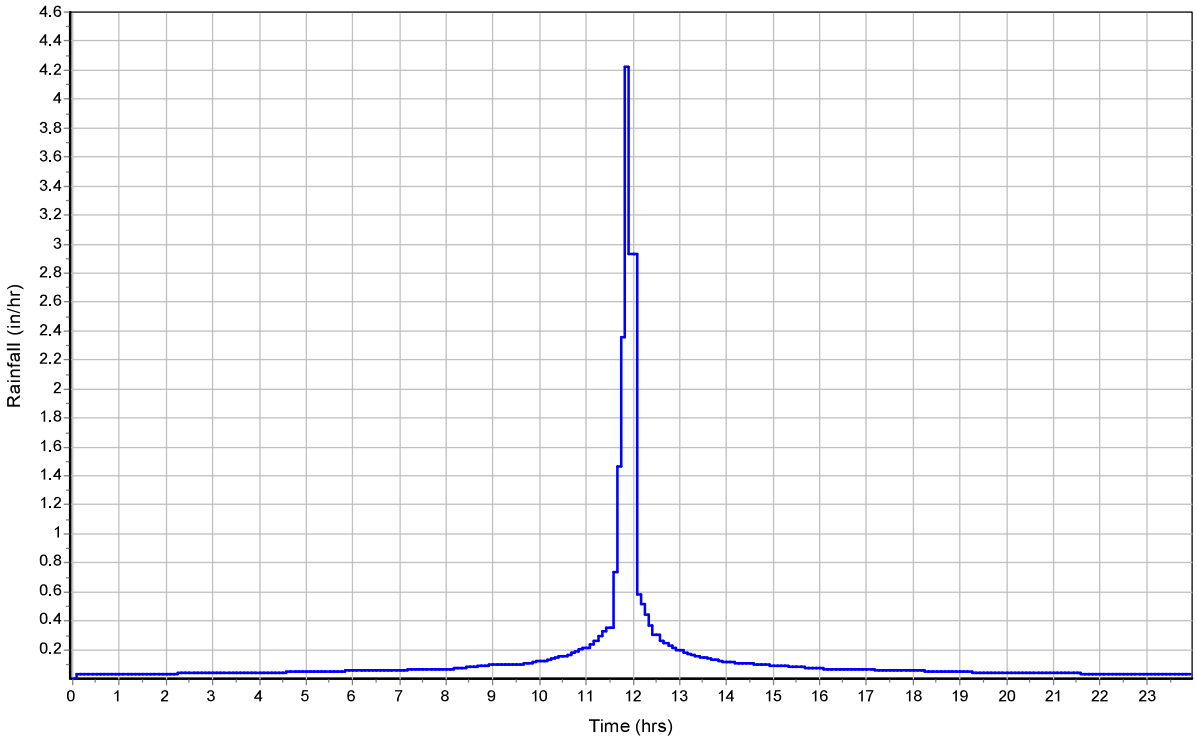
Subbasin : P_Sub-03

Subbasin Runoff Results

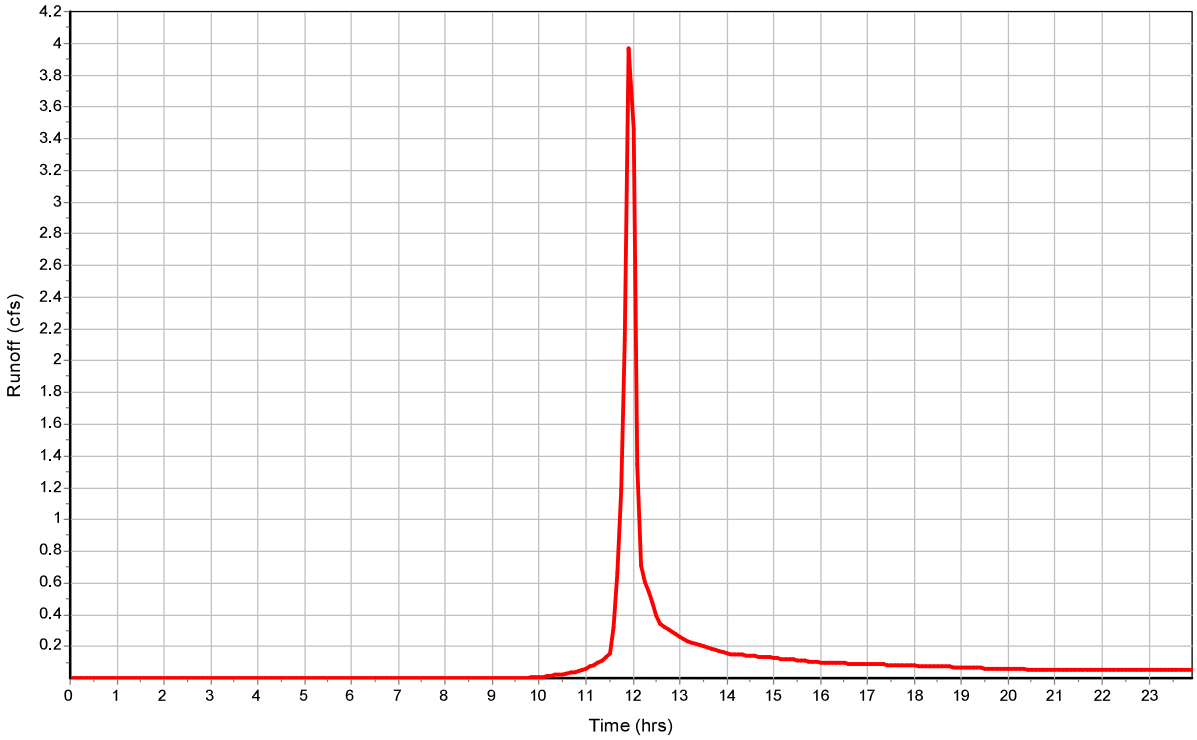
Total Rainfall (in)	3.08
Total Runoff (in)	1.31
Peak Runoff (cfs)	4
Weighted Curve Number	80
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : P_Sub-03

Rainfall Intensity Graph



Runoff Hydrograph



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	P_Jun-01	37.42	0.00	2397.64	3.14	0.00	4.36	2395.09	0.59	0 12:21	0 00:00	0.00	0.00
2	P_Jun-02	37.40	0.00	2394.41	0.41	0.00	7.59	2394.11	0.11	0 12:21	0 00:00	0.00	0.00

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	P_Channel-01	37.40	0 12:21	1168.02	0.03	3.04	0.23	0.41	0.20	0.00		

Pipe 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	P_Pipe-01	37.40	0 12:21	57.89	0.65	9.02	0.12	1.70	0.57	0.00		Calculated

Storage Nodes

Storage Node : P_Stor-01

Output Summary Results

Peak Inflow (cfs)	104.2
Peak Lateral Inflow (cfs)	104.2
Peak Outflow (cfs)	37.42
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	2399.82
Max HGL Depth Attained (ft)	3.07
Average HGL Elevation Attained (ft)	2397.39
Average HGL Depth Attained (ft)	0.64
Time of Max HGL Occurrence (days hh:mm)	0 12:20
Total Exfiltration Volume (1000-ft^3)	0
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

APPENDIX H

Post-Development 100-Year Storm Event Results

Subbasin Summary

SN	Subbasin ID	Area (ac)	Peak Rate Factor	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	P_Sub-01	23.38	0.00	94.39	4.58	3.94	92.04	105.79	0 00:15:00
2	P_Sub-02	12.37	0.00	94.06	4.58	3.90	48.26	55.63	0 00:15:00
3	P_Sub-03	1.93	0.00	80.00	4.58	2.53	4.89	7.77	0 00:05:00

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	P_Jun-01	Junction	2394.50	2402.00	0.00	2402.00	0.00	57.25	2399.94	0.00	2.06	0 00:00	0.00	0.00
2	P_Jun-02	Junction	2394.00	2402.00	0.00	2402.00	0.00	70.25	2394.55	0.00	7.45	0 00:00	0.00	0.00
3	P_Out-01	Outfall	2393.00					70.25	2393.55					
4	P_Stor-01	Storage Node	2396.75	2402.00	0.00		45000.00	163.87	2400.95				0.00	0.00

Subbasin Hydrology

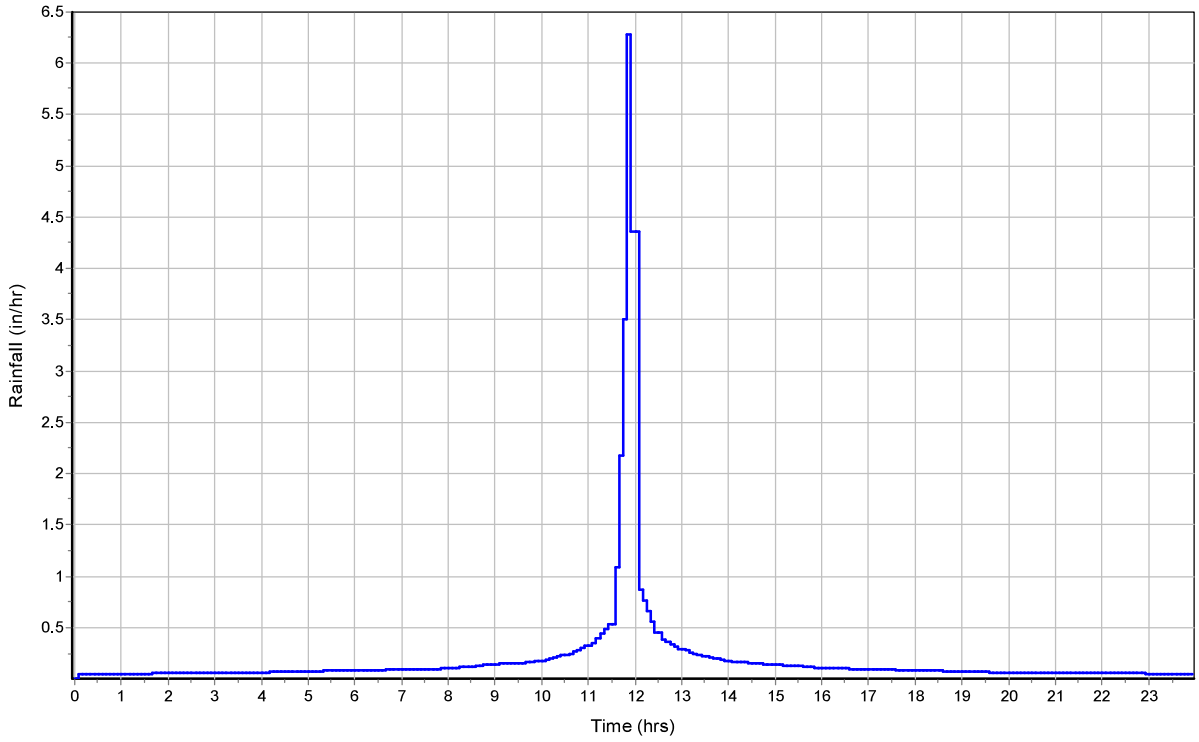
Subbasin : P_Sub-01

Subbasin Runoff Results

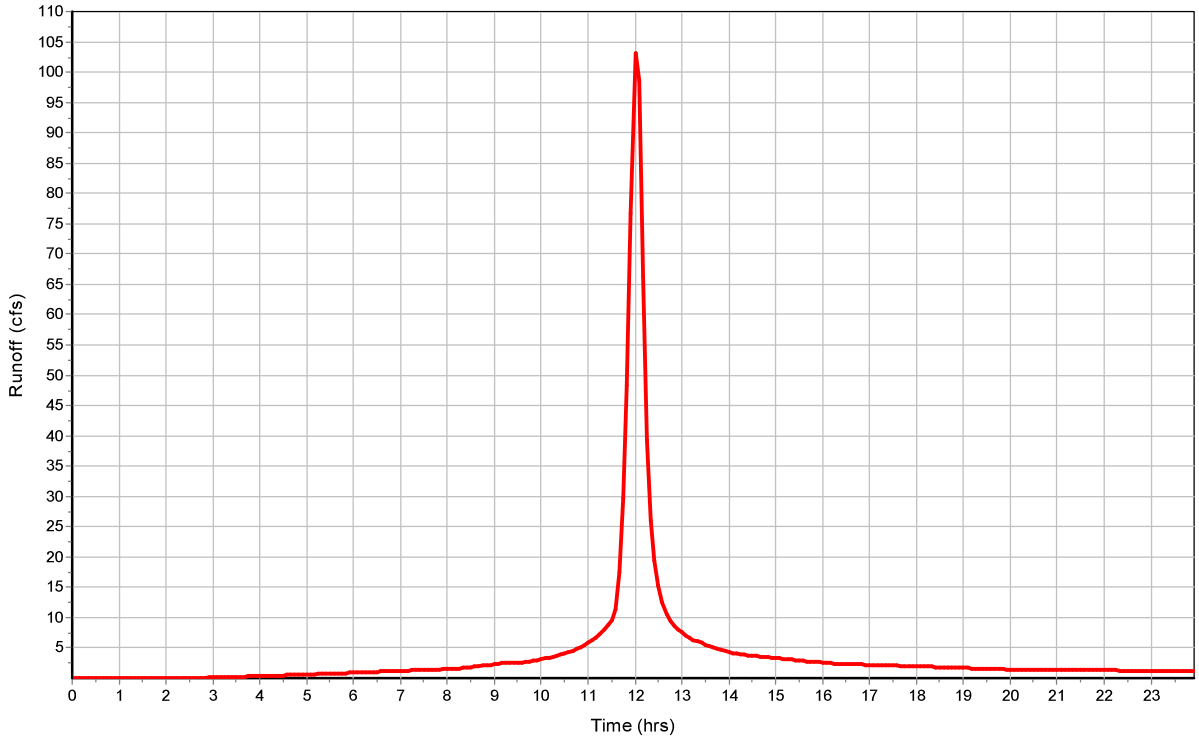
Total Rainfall (in)	4.58
Total Runoff (in)	3.94
Peak Runoff (cfs)	105.79
Weighted Curve Number	94.39
Time of Concentration (days hh:mm:ss)	0 00:15:00

Subbasin : P_Sub-01

Rainfall Intensity Graph



Runoff Hydrograph



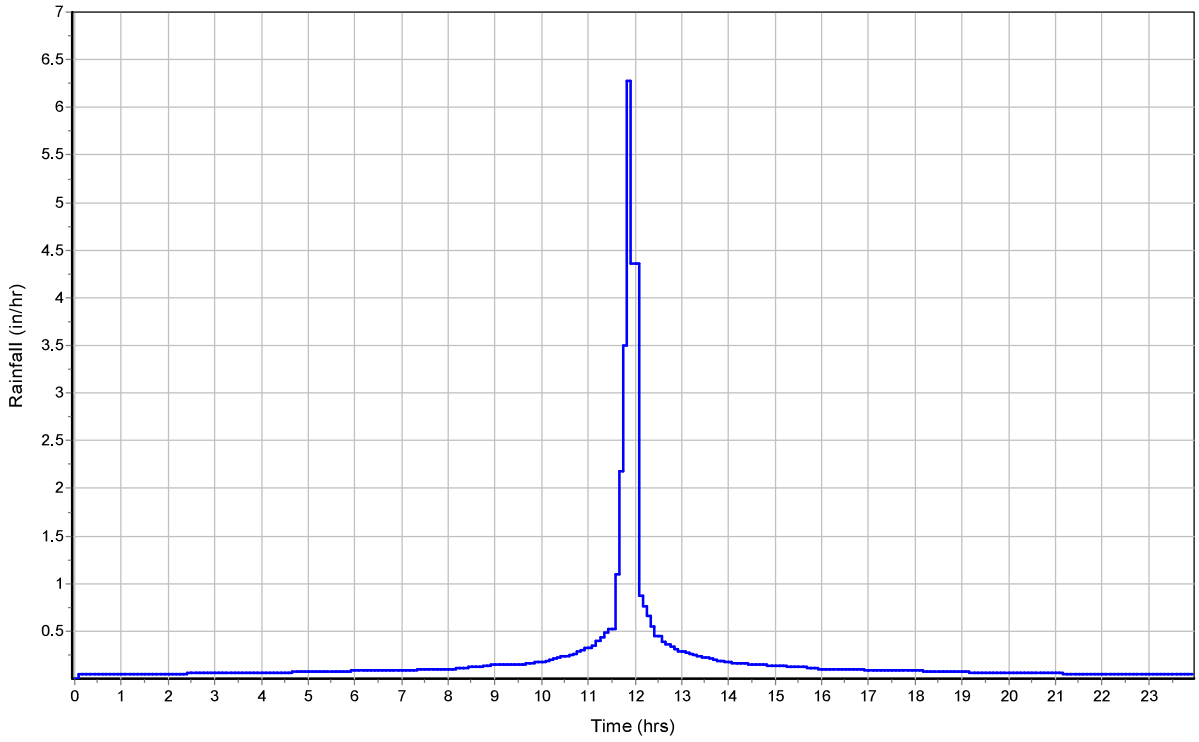
Subbasin : P_Sub-02

Subbasin Runoff Results

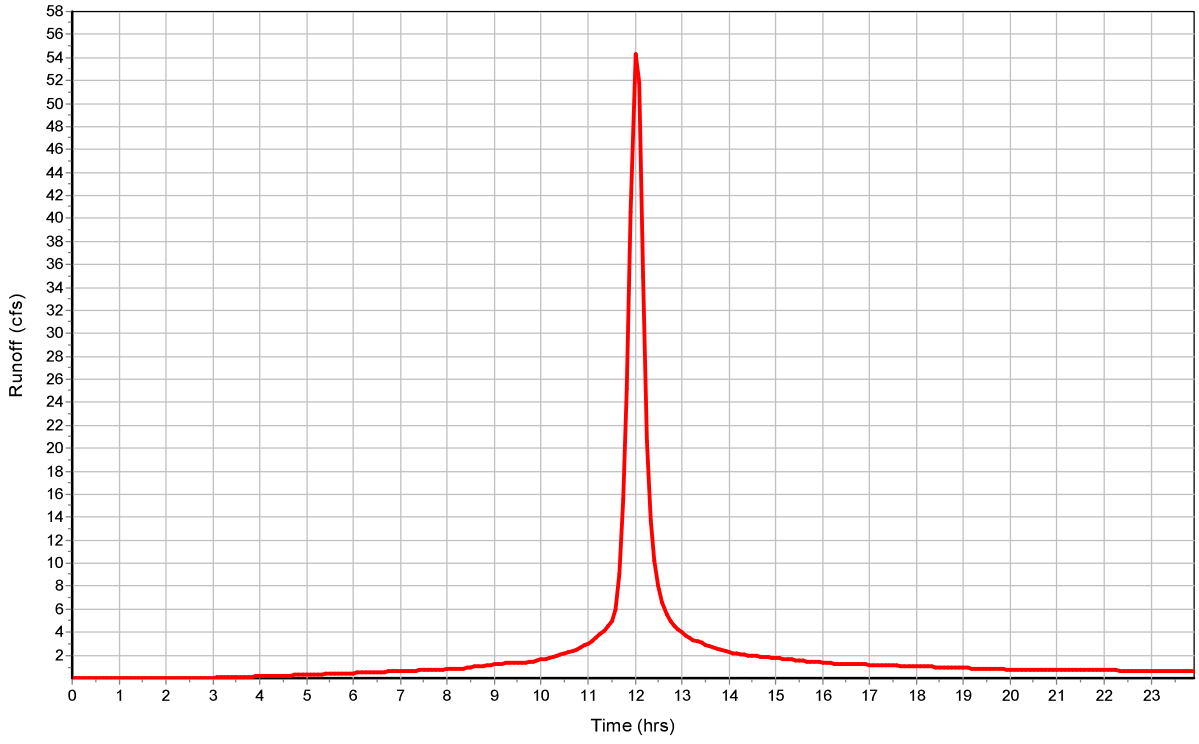
Total Rainfall (in)	4.58
Total Runoff (in)	3.9
Peak Runoff (cfs)	55.63
Weighted Curve Number	94.06
Time of Concentration (days hh:mm:ss)	0 00:15:00

Subbasin : P_Sub-02

Rainfall Intensity Graph



Runoff Hydrograph



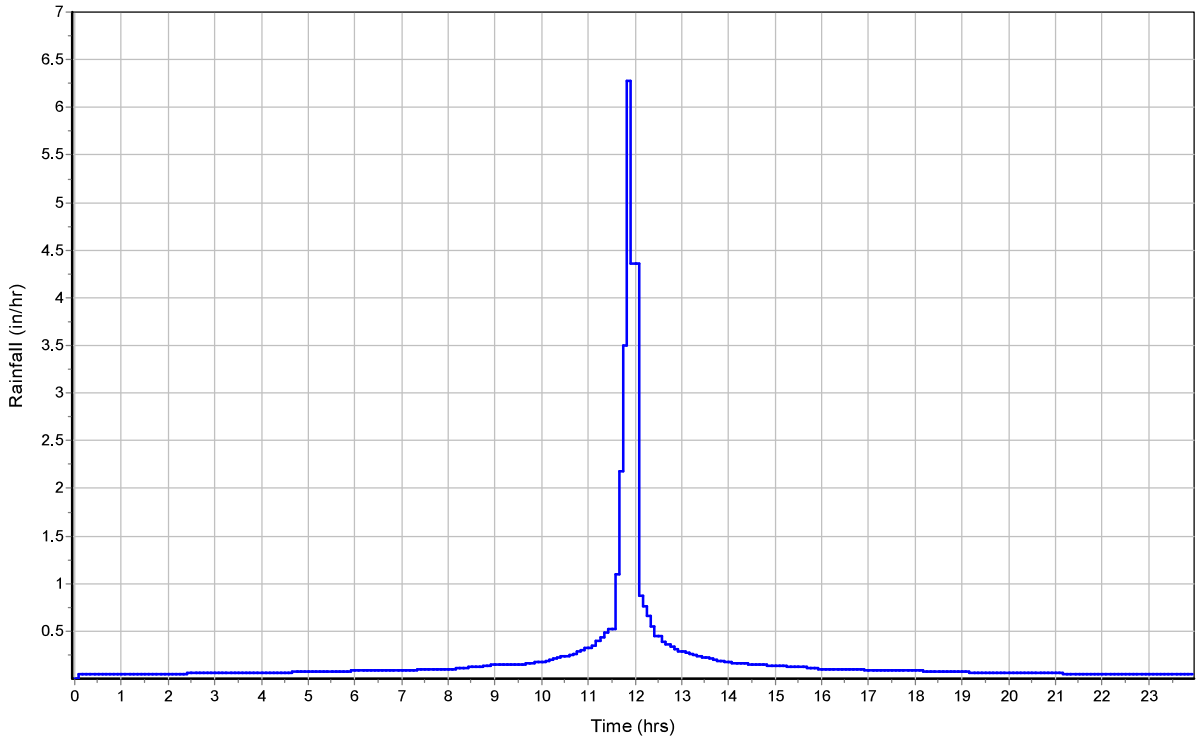
Subbasin : P_Sub-03

Subbasin Runoff Results

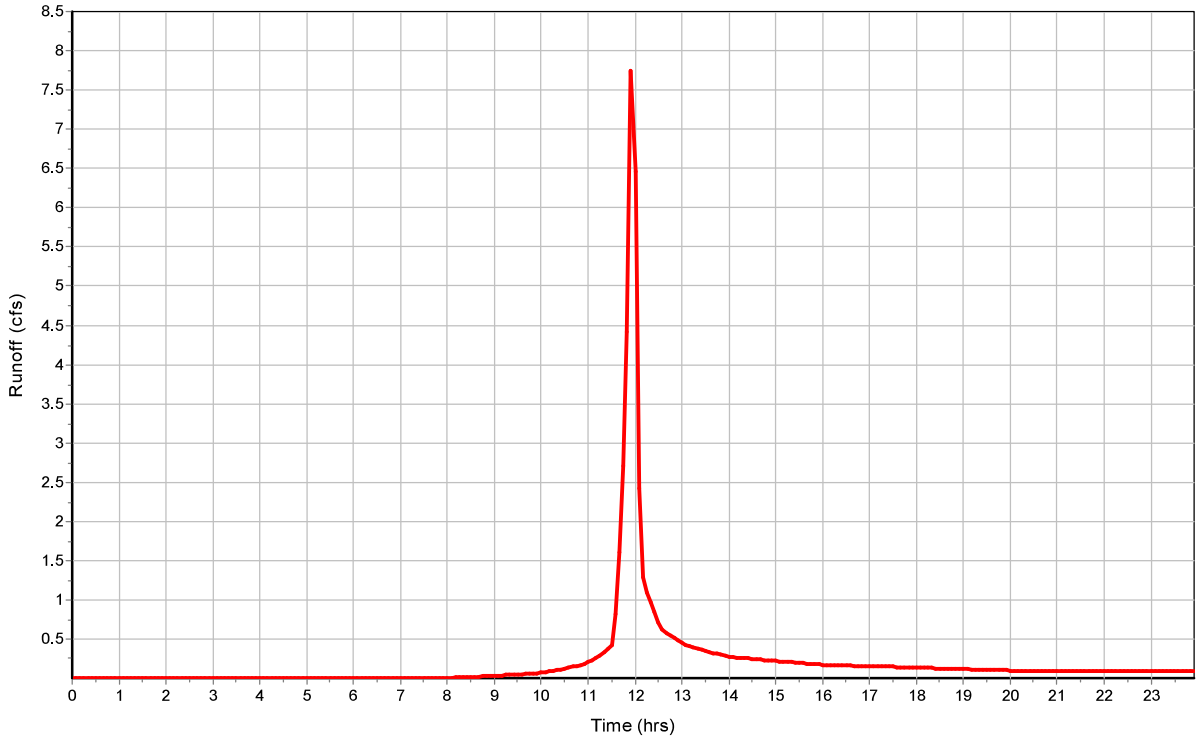
Total Rainfall (in)	4.58
Total Runoff (in)	2.53
Peak Runoff (cfs)	7.77
Weighted Curve Number	80
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : P_Sub-03

Rainfall Intensity Graph



Runoff Hydrograph



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	P_Jun-01	57.25	0.00	2399.94	5.44	0.00	2.06	2395.46	0.96	0 12:18	0 00:00	0.00	0.00
2	P_Jun-02	70.25	0.00	2394.55	0.55	0.00	7.45	2394.15	0.15	0 12:18	0 00:00	0.00	0.00

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	P_Channel-01	70.25	0 12:19	1168.02	0.06	3.69	0.19	0.54	0.27	0.00		

Pipe 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	P_Pipe-01	57.25	0 12:18	57.89	0.99	13.16	0.08	1.77	0.59	0.00		Calculated

Storage Nodes

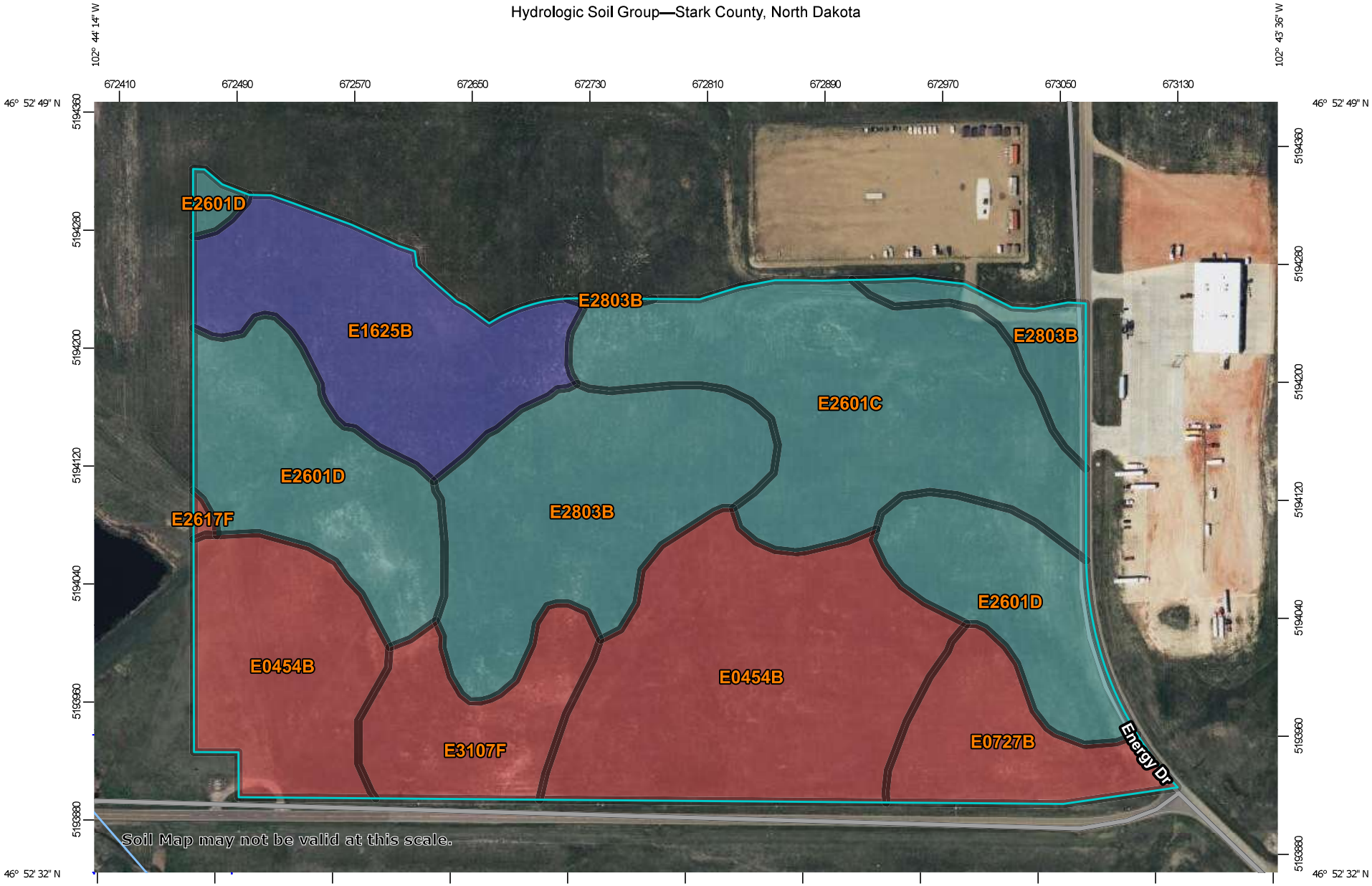
Storage Node : P_Stor-01

Output Summary Results

Peak Inflow (cfs)	163.87
Peak Lateral Inflow (cfs)	163.87
Peak Outflow (cfs)	70.25
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	2400.95
Max HGL Depth Attained (ft)	4.2
Average HGL Elevation Attained (ft)	2397.69
Average HGL Depth Attained (ft)	0.94
Time of Max HGL Occurrence (days hh:mm)	0 12:18
Total Exfiltration Volume (1000-ft^3)	0
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

APPENDIX I

Hydrologic Soil Groups



Map Scale: 1:3,680 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

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 Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

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 1:20,000.

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: Stark County, North Dakota
Survey Area Data: Version 23, Sep 7, 2023

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

Date(s) aerial images were photographed: Jun 2, 2021—Jun 7, 2021

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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
E0454B	Daglum-Rhoades complex, 0 to 6 percent slopes	D	14.5	26.5%
E0727B	Barkof-Janesburg complex, 3 to 6 percent slopes	D	3.1	5.7%
E1625B	Vebar-Parshall fine sandy loams, 3 to 6 percent slopes	B	6.4	11.7%
E2601C	Amor-Cabba loams, 6 to 9 percent slopes	C	9.4	17.2%
E2601D	Amor-Cabba loams, 9 to 15 percent slopes	C	9.1	16.7%
E2617F	Cabba-Chama-Shambo loams, 9 to 50 percent slopes	D	0.1	0.2%
E2803B	Amor-Shambo loams, 3 to 6 percent slopes	C	8.7	15.9%
E3107F	Cabba-Badland complex, 6 to 70 percent slopes	D	3.4	6.2%
Totals for Area of Interest			**54.6**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

APPENDIX J

Table of Recommended Manning's N-Values

Manning's Roughness for Overland Flow	
Land Surface Type	**Manning n**
Urban:	
Concrete, Asphalt, or Gravel	0.005 - 0.015
Average Grass Cover	0.40
Rural Residential (1 - 10 acre lots, maintenance or grazing assumed)	0.40
Urban Residential (maintained lawns assumed, with effects of landscaping, driveways, roofs included in combined value):	
1 - 3 building units/acre	0.30
3 - 10 building units/acre	0.20
> 10 building units/acre	0.15
Commercial/Industrial (effects of landscaping, driveways, roofs included in combined value)	0.11
Grass:	
Average Grass Cover	0.40
Poor Grass Cover, Moderately Rough Surface	0.30 - 0.40
Light Turf	0.20
Dense Turf	0.17 - 0.80
Dense Grass	0.17 - 0.30
Bermuda Grass	0.30 - 0.48
Dense Shrubbery and Forest Litter	0.40
Natural:	
Short Grass Prairie	0.10 - 0.20
Poor Grass Cover, Moderately Rough Surface	0.30 - 0.40
Sparse Vegetation	0.05 - 0.13
Oak Grasslands, Open Grasslands	0.60
Dense Cover of Trees and Bushes	0.80
Rangeland:	
Typical	0.13
No Debris Cover	0.09 - 0.34
20% Debris Cover	0.05 - 0.25
Woods:	
Light Underbrush	0.40
Dense Underbrush	0.80
Rural Residential (1 - 10 acre lots, maintenance or grazing assumed)	0.40
Cultivated Areas:	
Bare Packed Soil (free of stone)	0.10
Fallow (no residue)	0.05
Conventional Tillage:	
No Residue	0.06 - 0.12
With Residue	0.16 - 0.22
Chisel Plow:	
No Residue	0.06 - 0.12
With Residue	0.10 - 0.16
Fall Disking (with residue)	0.30 - 0.50
No Till:	
No Residue Cover	0.04 - 0.10
20 - 40% Residue Cover	0.07 - 0.17
60 - 100% Residue Cover	0.17 - 0.47
Rural Residential (1 - 10 acre lots, maintenance or grazing assumed)	0.40

Sources:
-USACE, 1998, HEC-1 Flood Hydrograph Package User's Manual, Hydrologic Engineering Center, Davis, CA
-Soil Conservation Service, 1986, Urban Hydrology for Small Watersheds, Technical Release 55, U.S. Department of Agriculture, Washington, DC

APPENDIX K

USFWS National Wetland Inventory

U.S. Fish and Wildlife Service

National Wetlands Inventory

Energy Center 6th Addition

February 4, 2026

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

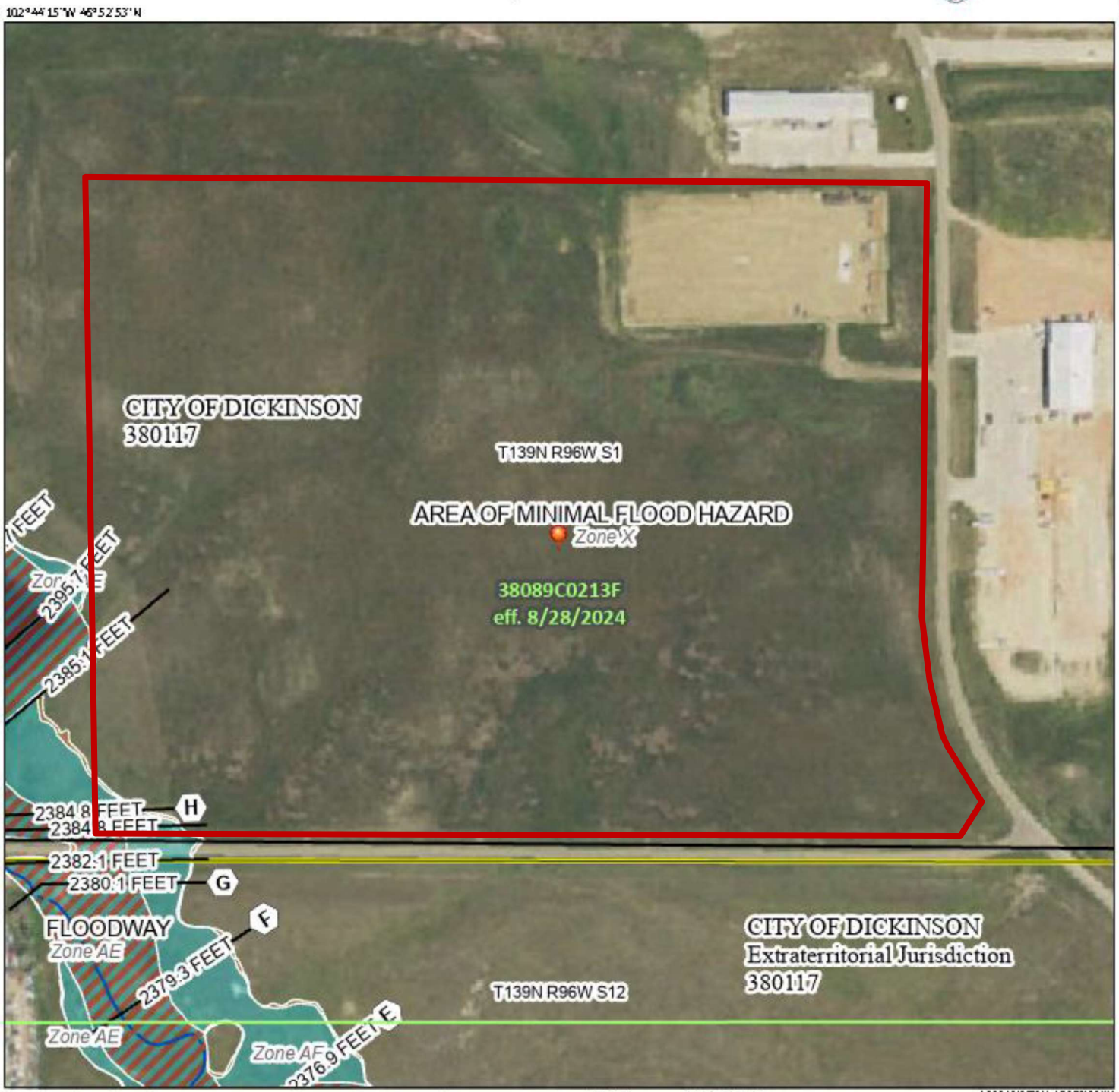
This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

APPENDIX L

FEMA FIRMETTE

National Flood Hazard Layer FIRMette

FEMA



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 Cross Sections with 1% Annual Chance
- 17.5 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 12/3/2025 at 9:54 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.