Stormwater Management Plan

Southtown Shopping Center
Bloomington, Minnesota

City of Bloomington
Nine Mile Creek Watershed District

Prepared for:
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Prepared on:
June 18, 2024

Table of Contents

1.0. Introduction

This stormwater management report was prepared in conjunction with the proposed site development plans the redevelopment of the Southtown Shopping Center (Southtown) in Bloomington, Minnesota. The project site is located on the southeast corner of the intersection of Interstate Highway 494 and Penn Avenue. The total area of the site is approximately 30 acres, and the proposed disturbed area is 14.51 acres.

The proposed project scope will include the demolition of a portion of the site's existing parking field, existing building, and subsequent construction of a new retail building. Along with the construction of the building, connecting sidewalks, parking stalls, supporting underground utilities, stormwater management, and landscaping is proposed to be constructed.

In concurrence with the production of the site development plans, hydrologic and hydraulic models were developed to generate the data presented within this report. This project will require review by Nine Mile Creed Watershed District and is subject to stormwater rate, water quality requirements, annual TP removals, and annual TSS removals.

Kimley-Horn has analyzed the drainage conditions of the Site and provides computations for applicable NMCWD and City of Bloomington stormwater requirements in this report. The analysis of the pre-development and post-development drainage models was completed using HydroCAD, Version 10.20, a computer aided design system for modeling the hydrology and hydraulics of stormwater runoff and MIDS Calculator GUI v4. These calculations are largely based on the hydrology techniques developed by the Soil Conservation Service (SCS/NRCS), combined with other hydrology and hydraulics calculations. All calculations, hydrographs, and drainage area maps are provided in the appendix of this report.

2.0. Pre-development Conditions

The existing site is comprised of buildings and associated parking lot areas. During the winter of 2024, the existing Toy's "R" Us and Herberger's buildings were demolished. These areas were restabilized as pervious surfaces. However, based on coordination with Nine Mile Creek Watershed staff, the "existing condition" of the site has been based on the condition prior to the demolition. Based on the geotechnical report, soils on-site are to be classified as Hydrologic Soil Group C. Type C soils have a slow infiltration rate and a high runoff potential.

The existing site drainage area generally consists of four (4) drainage areas. The table below summarizes the characteristics of the drainage areas for the existing conditions as illustrated on the Pre-Development Drainage Area Map in the Appendices.

Pre-Development Drainage Area Summary			
Drainage Area	Impervious Area (ac)	Pervious Area (ac)	Total Area (ac)
EXDA-1	5.80	0.24	6.04
EXDA-2	0.68	0.01	0.69
EXDA-3	0.11	0.08	0.19
EXDA-4	7.32	0.27	7.59
Total	13.91	0.60	14.51

3.0. Post-development Conditions

The proposed site will consist of a sporting goods retail building, associated athletic field, and reconstructed parking lot, sidewalk, as well as underground utilities, stormwater management, and landscaping. The proposed development will be approximately 88% impervious. The remaining 12% of the property is proposed to consist of lawn or landscaping. A large portion of the site (directly east of the sporting goods retail store) is not proposed to be redeveloped as part of the first phase. However, to plan stormwater management BMPs to have sufficient capacity for this area, the entire unplanned area has been assumed to be 90% impervious surface coverage. Overall, the proposed drainage area is 14.51 acres and consists of five (5) separate drainage areas. The table below summarizes the characteristics of each drainage area. Proposed PDA-1 represents the drainage area that drains on-site into the proposed underground stormwater management BMP #1 while PDA-2 is comprised of the area that drains to the proposed underground stormwater management BMP #2. PDA-3, PDA-4, & PDA-5 represent drainage areas that drain off-site to various conveyance systems.

Post-Development Drainage Area Summary			
Drainage Area	Impervious Area (ac)	Pervious Area (ac)	Total Area (ac)
PDA-1	6.48	0.80	7.28
PDA-2	0.39	0.19	0.58
PDA-3	0.14	0.04	0.18
PDA-4	5.04	0.62	5.66
PDA-5	0.70	0.11	0.81
Total	12.75	1.76	14.51

4.0. Rate Attenuation Summary

The NMCWD requires that the project limit peak runoff rates from the post-development condition to be less than or equal to that of the pre-development runoff rates for the 2-, 10-, and 100-year 24-hour rainfall events. The below table summarizes the rates to each of the site's outfalls, highlighting the reduction in rate for each outfall, and each storm event:

Rate Attenuation Summary			
	2 Year		
	Penn Ave.	American Blvd.	Knox Ave.
Pre-Development Rate	23.20 cfs	26.12 cfs	0.48 cfs
Post-Development Rate	0.88 cfs	9.28 cfs	0.25 cfs
	10 Year		
	Penn Ave.	American Blvd.	Knox Ave.
Pre-Development Rate	35.30 cfs	39.78 cfs	0.83 cfs
Post-Development Rate	1.58 cfs	39.78 cfs	0.44 cfs
	100 Year		
	Penn Ave.	American Blvd.	Knox Ave.
Pre-Development Rate	62.87 cfs	70.88 cfs	1.65 cfs
Post-Development Rate	3.20 cfs	59.01 cfs	0.87 cfs

5.0. Volume Reduction Summary

Due to the existing soils on the Site, filtration techniques are proposed be used to achieve volume reduction in lieu of infiltration.

The City of Bloomington and NMCWD require that the stormwater runoff volume shall be reduced in the amount of 1.1 inches over the entire site if more than 50% of the site is being redeveloped. At only 14.51 acres of site disturbance, only approximately 40% of the site is proposed to be redeveloped. Thus, per NMCWD rules, the stormwater runoff volume shall be reduced in the amount of 1.1 inches over the newly created or reconstructed impervious surface coverage when implementing a filtration stormwater practice.

The total full-depth reconstructed impervious area is 12.75 acres.

New Development required volume reduction = 1.1" x 12.75 acres = 50,911 cubic feet

The required runoff volume control is provided by on-site volume reduction through the following pair of best management practices:

- Extended Release underground filtration (System #1)
  - 108 sections of 60" perforated CMP with outlet at elevation 820.00
  - 2' sand section between elevations 820.00 and 822.00 with associated 6' perforated draintile
  - The system is designed to drawdown within 48 hours of the end of a storm event
  - Lowest Orifice in the Outlet Control Structure at elevation 823.51
  - Volume Reduction = 29,245 cubic feet

- Extended Release underground filtration (System #2)
    - 80 sections of 60" perforated CMP with outlet at elevation 821.00
    - 2' sand section between elevations 821.00 and 823.00 with associated 6' perforated draintile
    - The system is designed to drawdown within 48 hours of the end of a storm event
    - Lowest Orifice in the Outlet Control Structure at elevation 824.60
    - Volume Reduction = 22,507 cubic feet

Total volume reduction provided = ***51,752 cubic feet***

Reduction Provided > Reduction Required

Additionally, NMCWD and the City of Bloomington require pretreatment measures prior to stormwater entering the filtration system. To meet this requirement, structures with sumps and SAFL Baffles are proposed immediately upstream of the underground filtration systems.

Finally, 60% of the annual total phosphorus load and 90% of the annual total suspended solids leaving all point on the site must be removed. To meet this requirement, a Bayfilter structure with filter cartridges are proposed downstream from the Underground Filtration Systems and before entering the public storm sewer system. This design removes 65% of the annual total phosphorus load and 90% of the TSS leaving the site as referenced in the MIDS Model Appendix.

Appendices

Appendix 1. Drainage Exhibits

EXDA-2
PENN AVE
0.68 AC IMPERVIOUS
0.01 AC PERVIOUS

EXDA-1
PENN AVE
5.80 AC IMPERVIOUS
0.24 AC PERVIOUS

EXDA-3
KNOX AVE
0.11 AC IMPERVIOUS
0.08 AC PERVIOUS

EXDA-4
AMERICAN BLVD
7.32 AC IMPERVIOUS
0.27 AC PERVIOUS

THIS AREA WAS EXISTING BUILDING, DEMOLISHED IN THE WINTER OF 2024. THROUGH COORDINATION WITH NMCWD, THIS AREA SHALL BE MODELED AS IMPERVIOUS PER THE PREVIOUS PRE-DEMOLITION CONDITION

TO PENN AVE
TO AMERICAN BLVD
TO KNOX AVE

1800 AMERICAN BOULEVARD
MINNEAPOLIS, MINNESOTA 55431

7800 SOUTHTOWN DRIVE
MINNEAPOLIS, MINNESOTA 55431

7961 SOUTHTOWN DRIVE
MINNEAPOLIS, MINNESOTA 55431

7995 SOUTHTOWN DRIVE
MINNEAPOLIS, MINNESOTA 55431

AMERICAN BOULEVARD NORTHWEST

KNOX AVENUE SOUTH

LEGEND

- DRAINAGE AREA DIVIDE
- PROPERTY LINE
- 928 EXISTING CONTOUR

NORTH

GRAPHIC SCALE IN FEET
0 25 50 100

PRELIMINARY - NOT FOR CONSTRUCTION

No.	REVISIONS	DATE	BY

Kimley»Horn
2023 KIMLEY-HORN AND ASSOCIATES, INC.
767 EUSTIS STREET, SUITE 100, ST. PAUL, MN 55114
PHONE: 651-645-4197
WWW.KIMLEY-HORN.COM

KHA PROJECT 160551038
DATE 06/18/2024
SCALE AS SHOWN
DESIGNED BY MJB
DRAWN BY AMZ
CHECKED BY ACL

PRE-DEVELOPMENT DRAINAGE AREA MAP

SOUTHTOWN REDEVELOPMENT
PREPARED FOR
KRAUS ANDERSON
BLOOMINGTON MN

SHEET NUMBER
EX-1

MATCHLINE - SEE SHEET C201

PDA-1
UNDERGROUND SYSTEM #1
6.56 AC IMPERVIOUS
0.80 AC PERVIOUS

PDA-2
PENN AVE
0.19 AC IMPERVIOUS
0.19 AC PERVIOUS

PDA-3
KNOX AVE
0.06 AC IMPERVIOUS
0.04 AC PERVIOUS

PDA-4
UNDERGROUND SYSTEM #2
5.24 AC IMPERVIOUS
0.62 AC PERVIOUS

PDA-5
AMERICAN BLVD
0.70 AC IMPERVIOUS
0.11 AC PERVIOUS

PROPOSED RETAIL
BUILDING
FFE: 834.50

THIS AREA IS PLANNED FOR DEVELOPMENT. FOR MODELING PURPOSES, THIS AREA IS PLANNED AS 90% IMPERVIOUS.

7995 SOUTHTOWN DRIVE
MINNEAPOLIS, MINNESOTA 55431

7901 SOUTHTOWN DRIVE
MINNEAPOLIS, MINNESOTA 55431

7800 SOUTHTOWN DRIVE
MINNEAPOLIS, MINNESOTA 55431

1800 AMERICAN BOULEVARD
MINNEAPOLIS, MINNESOTA 55425

AMERICAN BOULEVARD NORTHWEST

KNOX AVENUE SOUTH

NORTH

GRAPHIC SCALE IN FEET
0 ## ## ###

LEGEND

- PROPERTY LINE
- EXISTING CONTOUR
- PROPOSED CONTOUR
- DRAINAGE AREA DIVIDE

PRELIMINARY - NOT FOR CONSTRUCTION

No.	REVISIONS	DATE	BY

Kimley»Horn

767 EUSTIS STREET, SUITE 100, ST. PAUL, MN 55114
PHONE: 651-645-4197
WWW.KIMLEY-HORN.COM

KHA PROJECT	160551038
DATE	06/18/2024
SCALE	AS SHOWN
DESIGNED BY	MJB
DRAWN BY	AMZ
CHECKED BY	ACL

POST-DEVELOPMENT DRAINAGE AREA MAP

SOUTHTOWN REDEVELOPMENT

PREPARED FOR

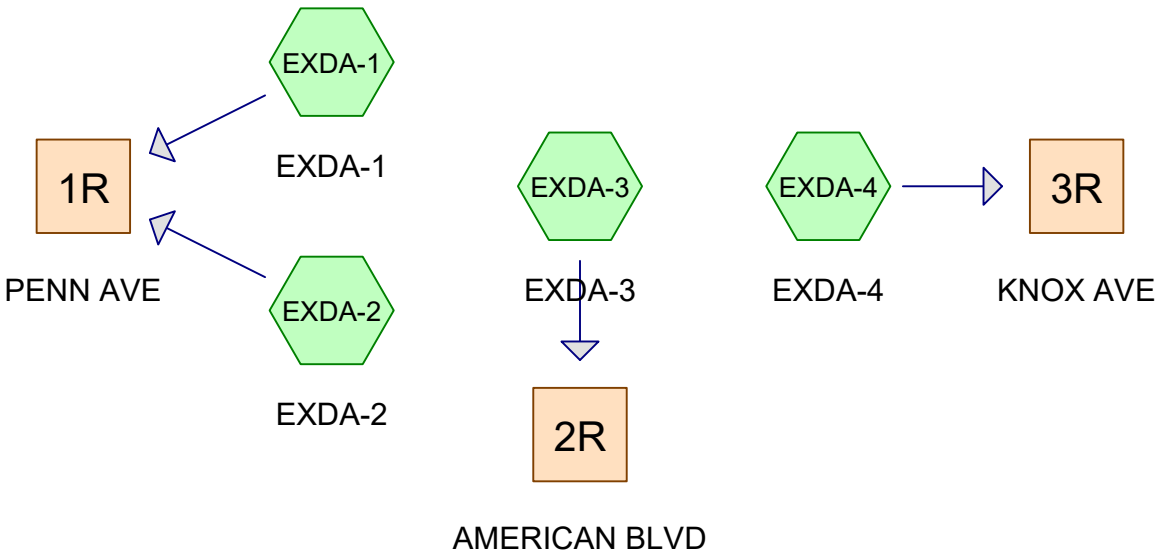
KRAUS ANDERSON

BLOOMINGTON MN

SHEET NUMBER
EX-2

Appendix 2. Pre-Development HydroCAD Model Analysis

EXISTING



Subcat Reach Pond Link

Routing Diagram for Southtown
Prepared by Kimley-Horn & Associates, Printed 6/17/2024

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-yr	MSE 24-hr	3	Default	24.00	1	2.84	2
2	10-yr	MSE 24-hr	3	Default	24.00	1	4.25	2
3	100-yr	MSE 24-hr	3	Default	24.00	1	7.49	2

Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
26,136	74	>75% Grass cover, Good, HSG C (EXDA-1, EXDA-2, EXDA-3, EXDA-4)
605,920	98	Paved parking, HSG C (EXDA-1, EXDA-2, EXDA-3, EXDA-4)
632,056	**97**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
632,056	HSG C	EXDA-1, EXDA-2, EXDA-3, EXDA-4
0	HSG D	
0	Other	
632,056		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
0	0	26,136	0	0	26,136	>75% Grass cover, Good	
0	0	605,920	0	0	605,920	Paved parking	
0	**0**	**632,056**	**0**	**0**	**632,056**	**TOTAL AREA**	

Time span=0.00-52.50 hrs, dt=0.05 hrs, 1051 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment EXDA-1: EXDA-1 Runoff Area=6.040 ac 96.03% Impervious Runoff Depth=2.50"
Tc=10.0 min CN=97 Runoff=20.78 cfs 54,810 cf

Subcatchment EXDA-2: EXDA-2 Runoff Area=0.690 ac 98.55% Impervious Runoff Depth=2.61"
Tc=10.0 min CN=98 Runoff=2.42 cfs 6,535 cf

Subcatchment EXDA-3: EXDA-3 Runoff Area=7.590 ac 96.44% Impervious Runoff Depth=2.50"
Tc=10.0 min CN=97 Runoff=26.12 cfs 68,875 cf

Subcatchment EXDA-4: EXDA-4 Runoff Area=0.190 ac 57.89% Impervious Runoff Depth=1.68"
Tc=10.0 min CN=88 Runoff=0.48 cfs 1,156 cf

Reach 1R: PENN AVE Inflow=23.20 cfs 61,344 cf
Outflow=23.20 cfs 61,344 cf

Reach 2R: AMERICAN BLVD Inflow=26.12 cfs 68,875 cf
Outflow=26.12 cfs 68,875 cf

Reach 3R: KNOX AVE Inflow=0.48 cfs 1,156 cf
Outflow=0.48 cfs 1,156 cf

Total Runoff Area = 632,056 sf Runoff Volume = 131,376 cf Average Runoff Depth = 2.49"
4.14% Pervious = 26,136 sf 95.86% Impervious = 605,920 sf

Summary for Subcatchment EXDA-1: EXDA-1

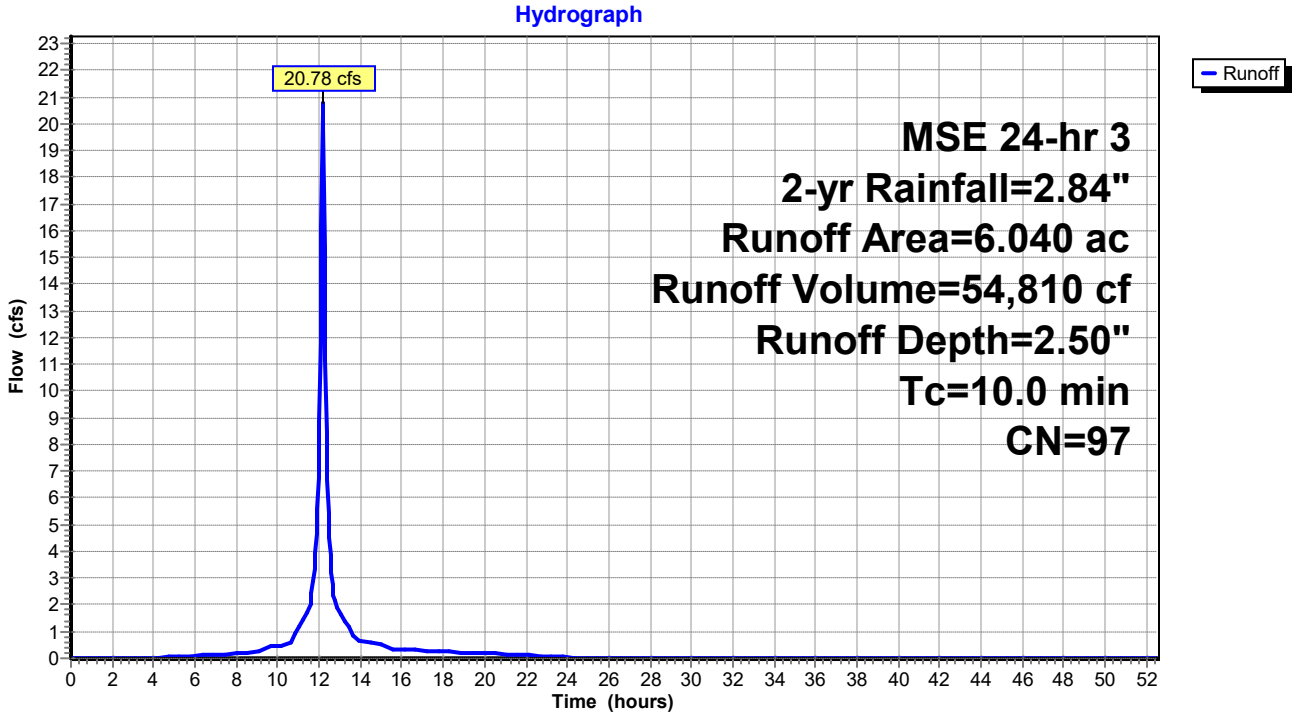
Runoff = 20.78 cfs @ 12.17 hrs, Volume= 54,810 cf, Depth= 2.50"
Routed to Reach 1R : PENN AVE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-yr Rainfall=2.84"

Area (ac)	CN	Description
5.800	98	Paved parking, HSG C
0.240	74	>75% Grass cover, Good, HSG C
6.040	97	Weighted Average
0.240		3.97% Pervious Area
5.800		96.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment EXDA-1: EXDA-1



Summary for Subcatchment EXDA-2: EXDA-2

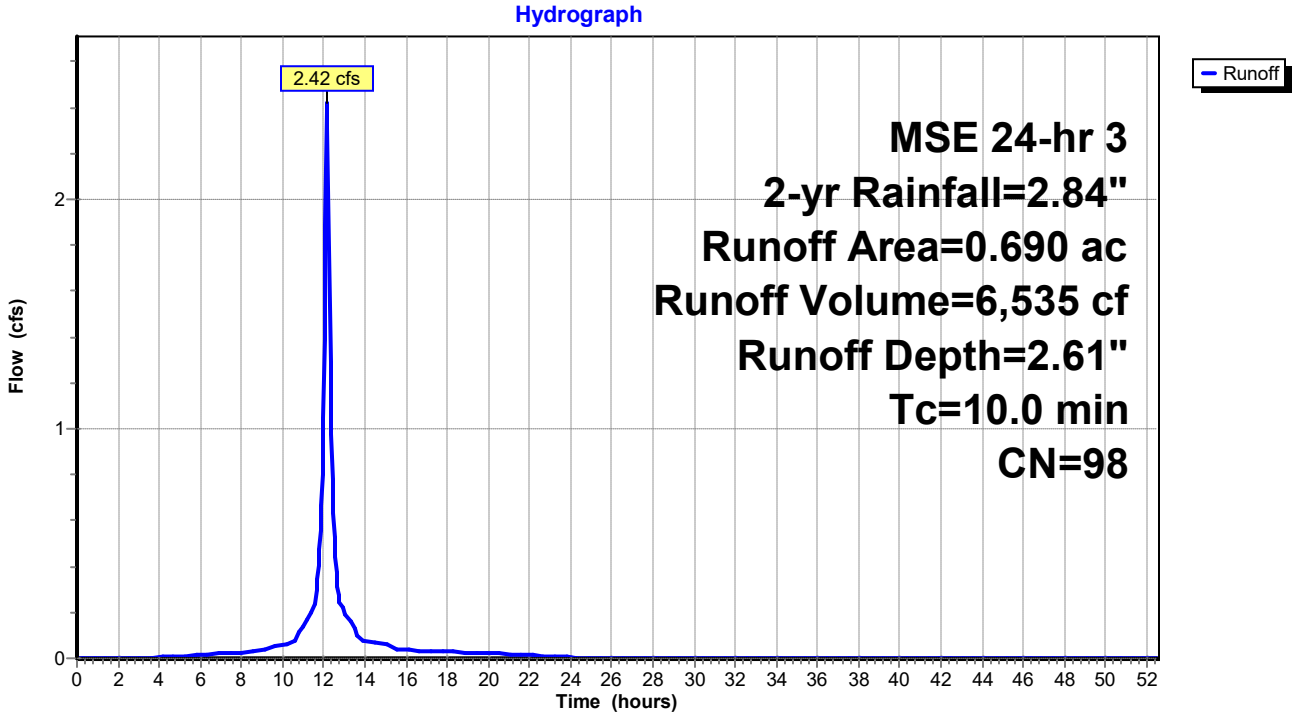
Runoff = 2.42 cfs @ 12.17 hrs, Volume= 6,535 cf, Depth= 2.61"
Routed to Reach 1R : PENN AVE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-yr Rainfall=2.84"

Area (ac)	CN	Description
0.680	98	Paved parking, HSG C
0.010	74	>75% Grass cover, Good, HSG C
0.690	98	Weighted Average
0.010		1.45% Pervious Area
0.680		98.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment EXDA-2: EXDA-2



Summary for Subcatchment EXDA-3: EXDA-3

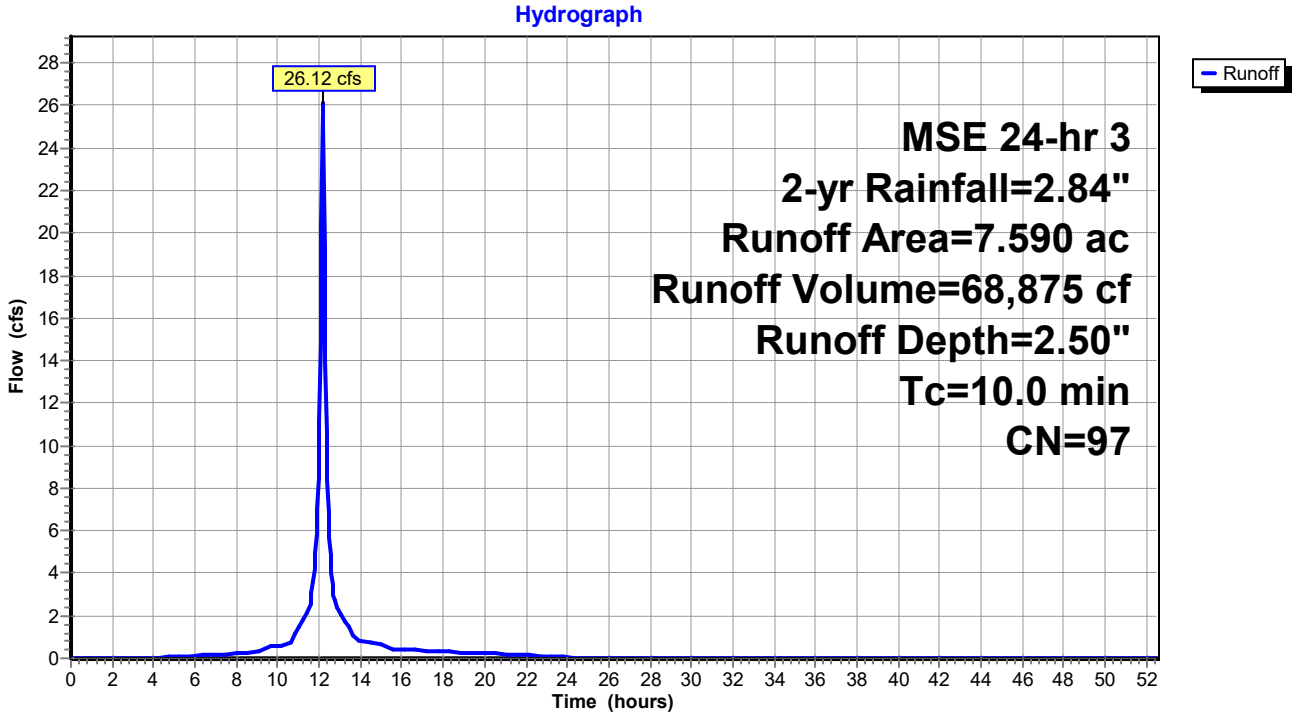
Runoff = 26.12 cfs @ 12.17 hrs, Volume= 68,875 cf, Depth= 2.50"
Routed to Reach 2R : AMERICAN BLVD

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-yr Rainfall=2.84"

Area (ac)	CN	Description
7.320	98	Paved parking, HSG C
0.270	74	>75% Grass cover, Good, HSG C
7.590	97	Weighted Average
0.270		3.56% Pervious Area
7.320		96.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment EXDA-3: EXDA-3



Summary for Subcatchment EXDA-4: EXDA-4

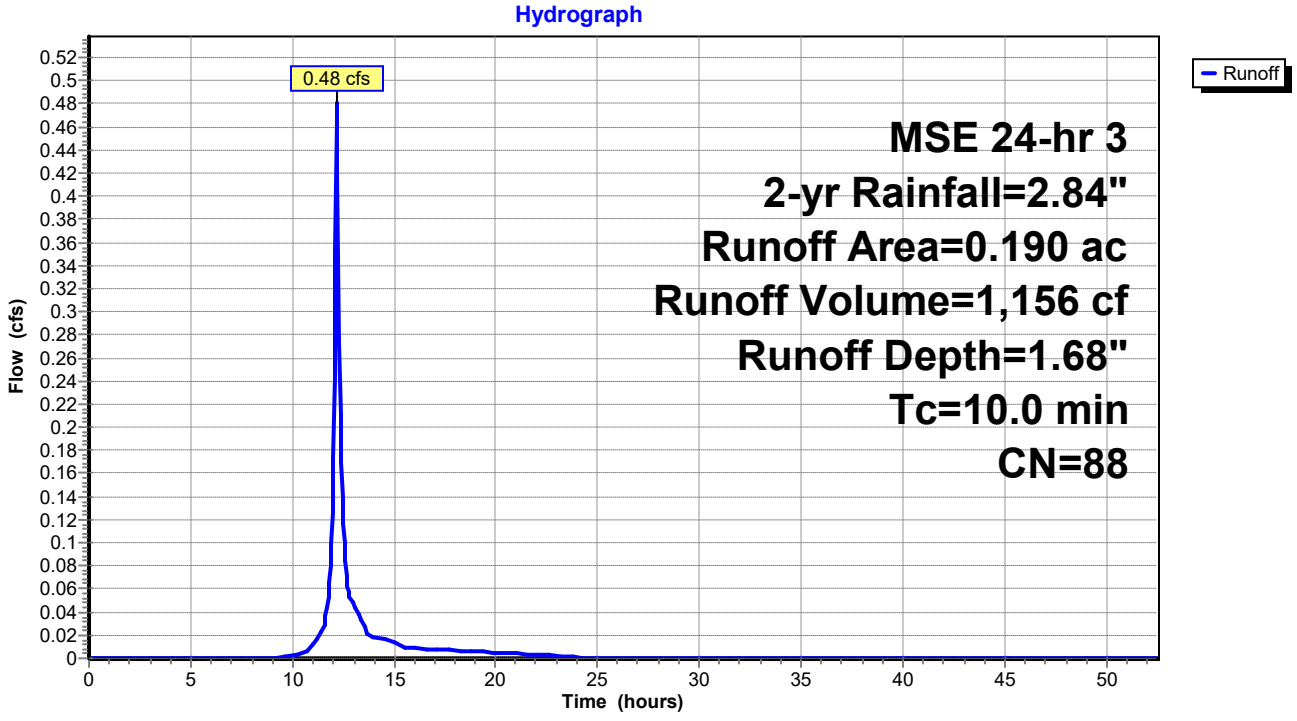
Runoff = 0.48 cfs @ 12.18 hrs, Volume= 1,156 cf, Depth= 1.68"
Routed to Reach 3R : KNOX AVE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-yr Rainfall=2.84"

Area (ac)	CN	Description
0.110	98	Paved parking, HSG C
0.080	74	>75% Grass cover, Good, HSG C
0.190	88	Weighted Average
0.080		42.11% Pervious Area
0.110		57.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment EXDA-4: EXDA-4



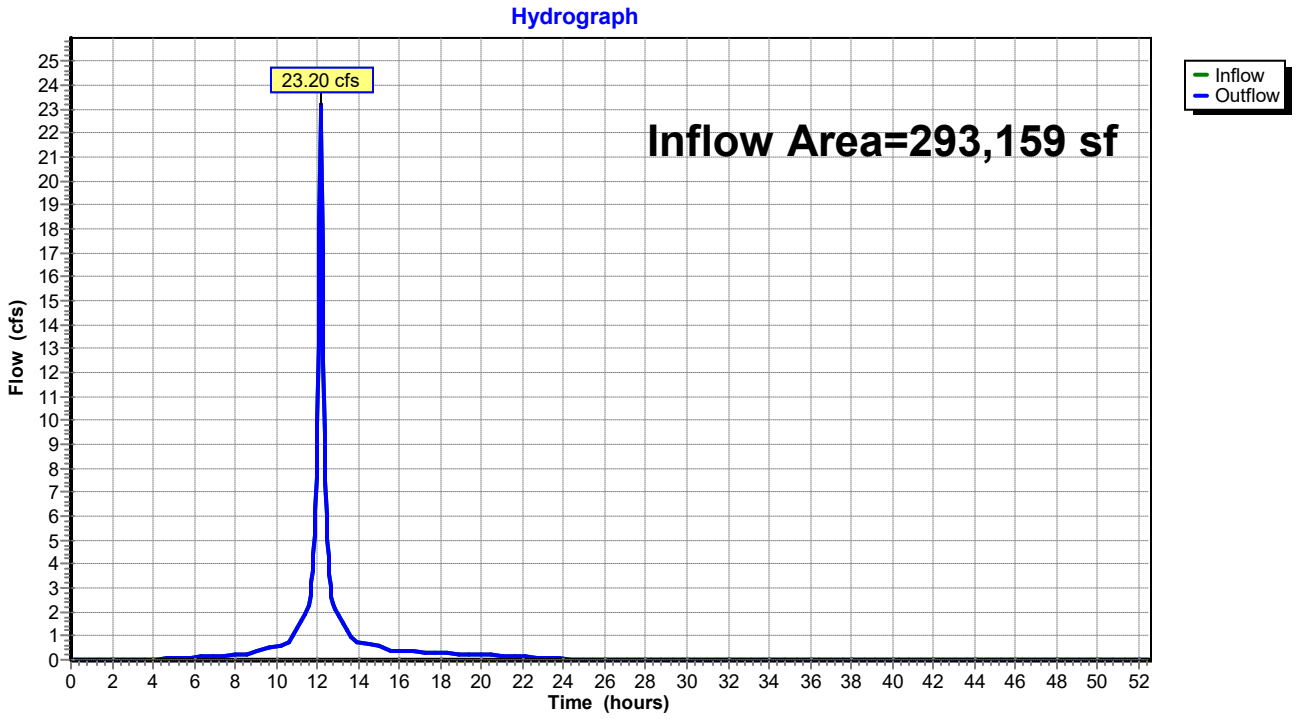
Summary for Reach 1R: PENN AVE

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 293,159 sf, 96.29% Impervious, Inflow Depth = 2.51" for 2-yr event
Inflow = 23.20 cfs @ 12.17 hrs, Volume= 61,344 cf
Outflow = 23.20 cfs @ 12.17 hrs, Volume= 61,344 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node Energy Dr

Routing by Dyn-Stor-Ind method, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs

Reach 1R: PENN AVE



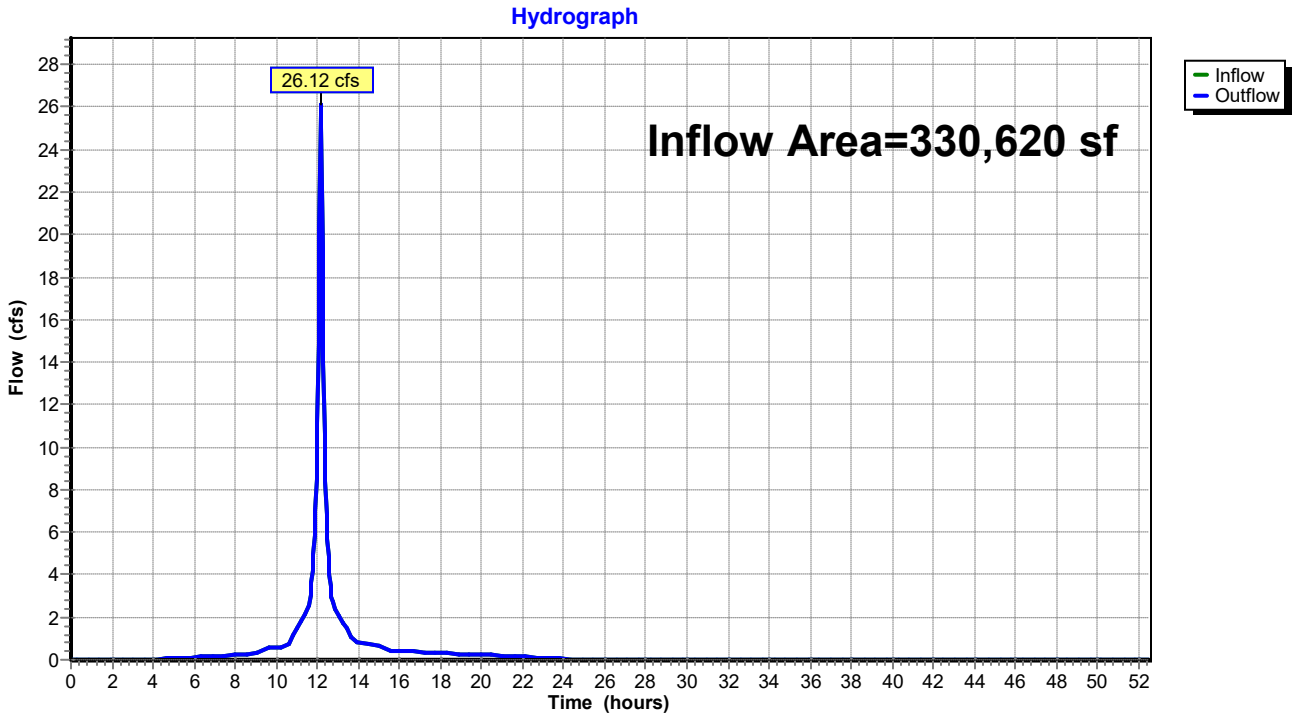
Summary for Reach 2R: AMERICAN BLVD

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 330,620 sf, 96.44% Impervious, Inflow Depth = 2.50" for 2-yr event
Inflow = 26.12 cfs @ 12.17 hrs, Volume= 68,875 cf
Outflow = 26.12 cfs @ 12.17 hrs, Volume= 68,875 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node Energy Dr

Routing by Dyn-Stor-Ind method, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs

Reach 2R: AMERICAN BLVD



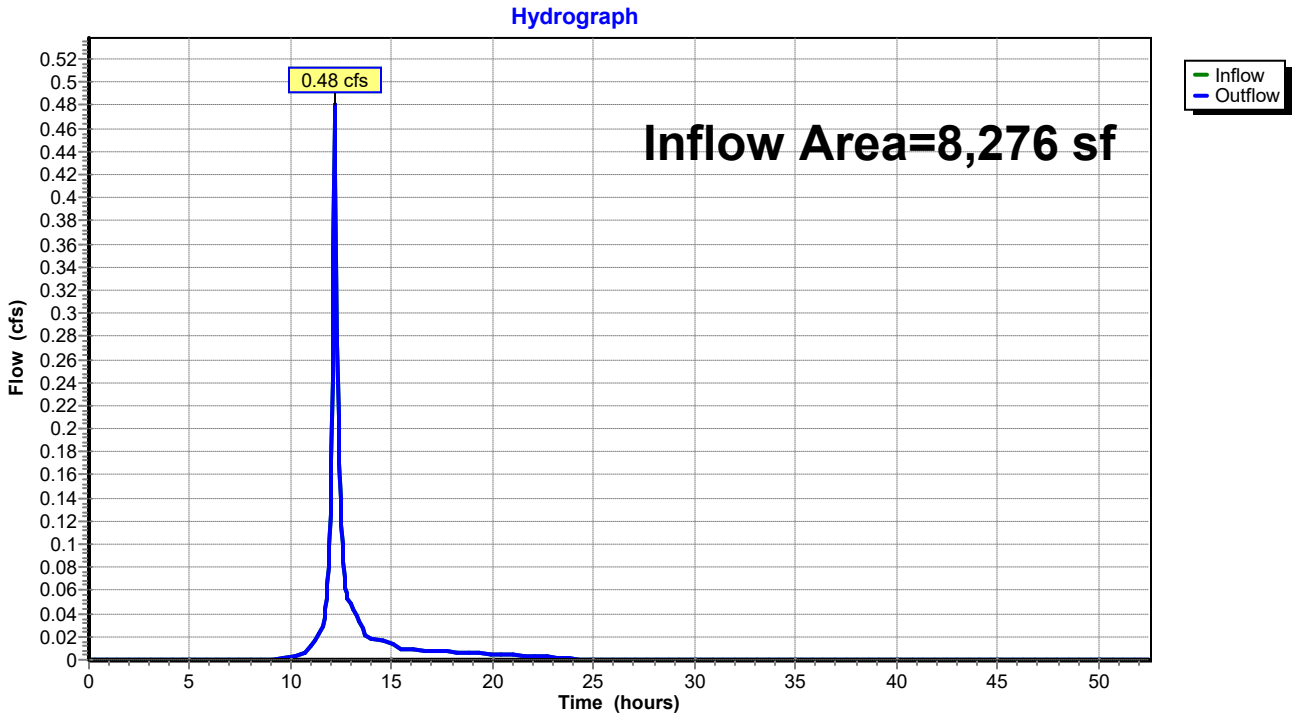
Summary for Reach 3R: KNOX AVE

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 8,276 sf, 57.89% Impervious, Inflow Depth = 1.68" for 2-yr event
Inflow = 0.48 cfs @ 12.18 hrs, Volume= 1,156 cf
Outflow = 0.48 cfs @ 12.18 hrs, Volume= 1,156 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node Energy Dr

Routing by Dyn-Stor-Ind method, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs

Reach 3R: KNOX AVE



Time span=0.00-52.50 hrs, dt=0.05 hrs, 1051 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment EXDA-1: EXDA-1 Runoff Area=6.040 ac 96.03% Impervious Runoff Depth=3.90"
Tc=10.0 min CN=97 Runoff=31.65 cfs 85,511 cf

Subcatchment EXDA-2: EXDA-2 Runoff Area=0.690 ac 98.55% Impervious Runoff Depth=4.01"
Tc=10.0 min CN=98 Runoff=3.65 cfs 10,055 cf

Subcatchment EXDA-3: EXDA-3 Runoff Area=7.590 ac 96.44% Impervious Runoff Depth=3.90"
Tc=10.0 min CN=97 Runoff=39.78 cfs 107,455 cf

Subcatchment EXDA-4: EXDA-4 Runoff Area=0.190 ac 57.89% Impervious Runoff Depth=2.96"
Tc=10.0 min CN=88 Runoff=0.83 cfs 2,043 cf

Reach 1R: PENN AVE Inflow=35.30 cfs 95,566 cf
Outflow=35.30 cfs 95,566 cf

Reach 2R: AMERICAN BLVD Inflow=39.78 cfs 107,455 cf
Outflow=39.78 cfs 107,455 cf

Reach 3R: KNOX AVE Inflow=0.83 cfs 2,043 cf
Outflow=0.83 cfs 2,043 cf

Total Runoff Area = 632,056 sf Runoff Volume = 205,065 cf Average Runoff Depth = 3.89"
4.14% Pervious = 26,136 sf 95.86% Impervious = 605,920 sf

Summary for Subcatchment EXDA-1: EXDA-1

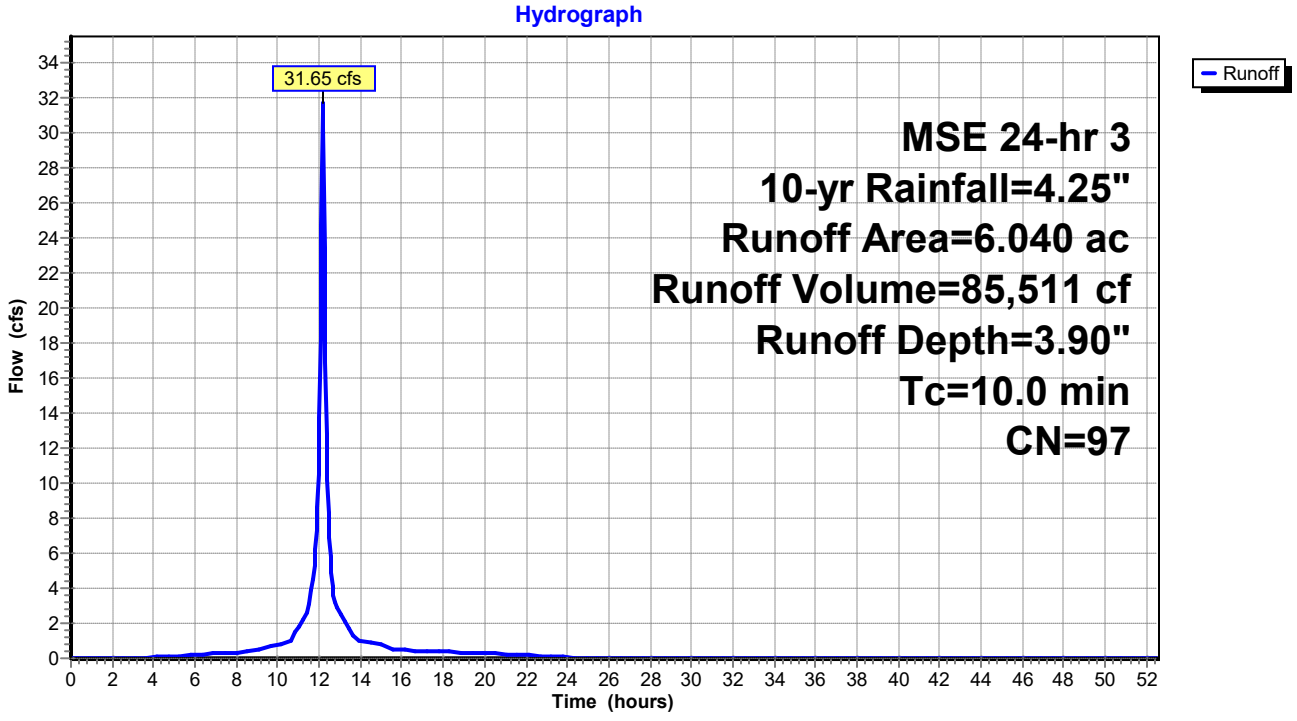
Runoff = 31.65 cfs @ 12.17 hrs, Volume= 85,511 cf, Depth= 3.90"
Routed to Reach 1R : PENN AVE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-yr Rainfall=4.25"

Area (ac)	CN	Description
5.800	98	Paved parking, HSG C
0.240	74	>75% Grass cover, Good, HSG C
6.040	97	Weighted Average
0.240		3.97% Pervious Area
5.800		96.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment EXDA-1: EXDA-1



Summary for Subcatchment EXDA-2: EXDA-2

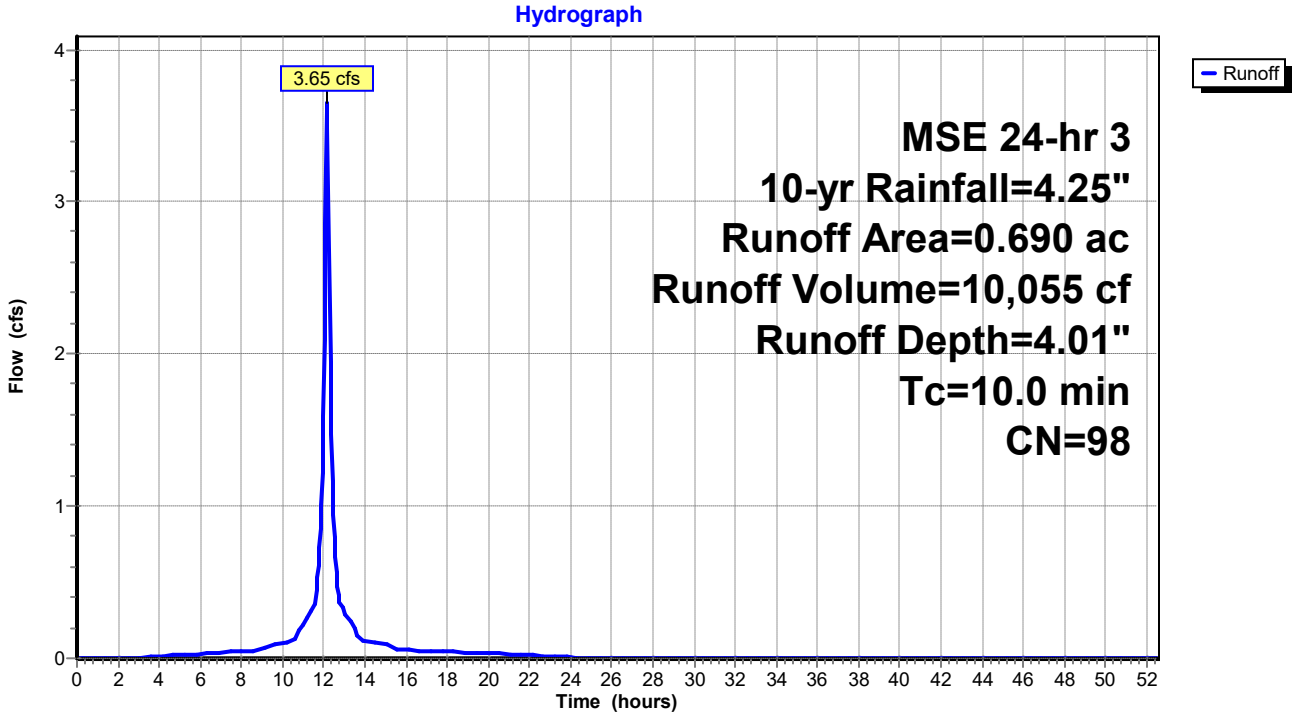
Runoff = 3.65 cfs @ 12.17 hrs, Volume= 10,055 cf, Depth= 4.01"
Routed to Reach 1R : PENN AVE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-yr Rainfall=4.25"

Area (ac)	CN	Description
0.680	98	Paved parking, HSG C
0.010	74	>75% Grass cover, Good, HSG C
0.690	98	Weighted Average
0.010		1.45% Pervious Area
0.680		98.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment EXDA-2: EXDA-2



Summary for Subcatchment EXDA-3: EXDA-3

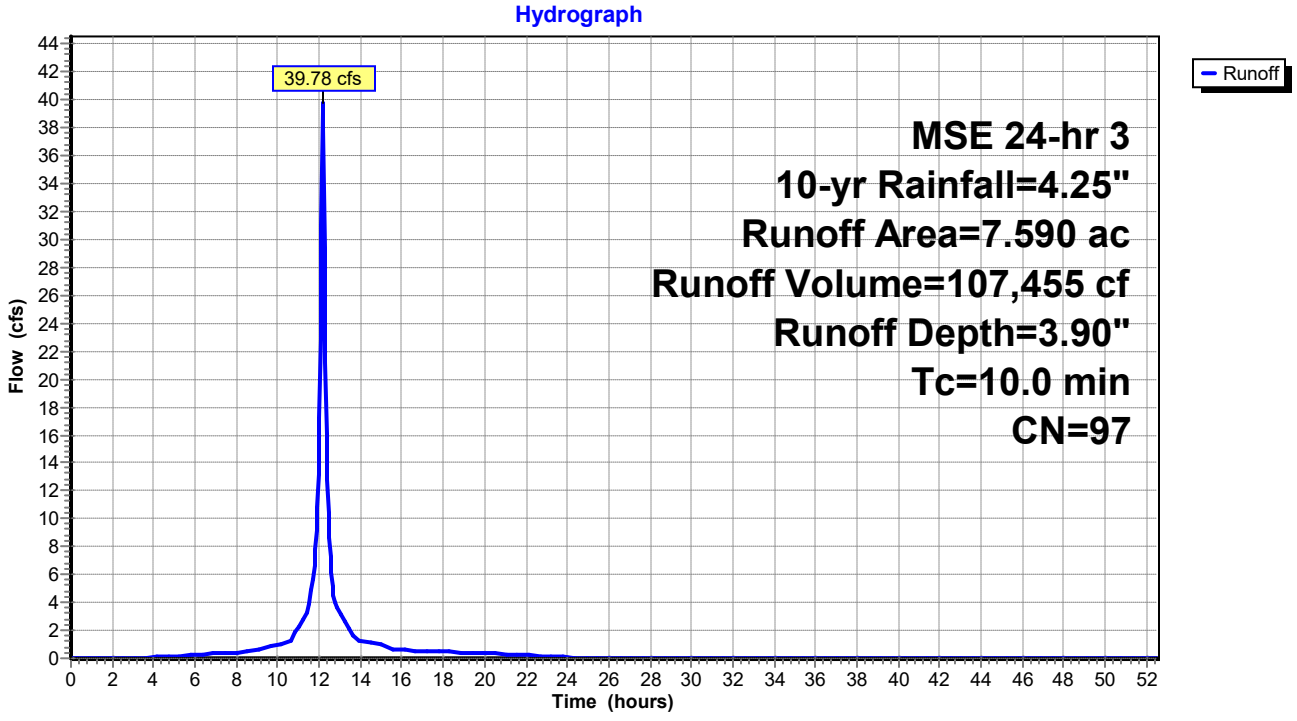
Runoff = 39.78 cfs @ 12.17 hrs, Volume= 107,455 cf, Depth= 3.90"
Routed to Reach 2R : AMERICAN BLVD

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-yr Rainfall=4.25"

Area (ac)	CN	Description
7.320	98	Paved parking, HSG C
0.270	74	>75% Grass cover, Good, HSG C
7.590	97	Weighted Average
0.270		3.56% Pervious Area
7.320		96.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment EXDA-3: EXDA-3



Summary for Subcatchment EXDA-4: EXDA-4

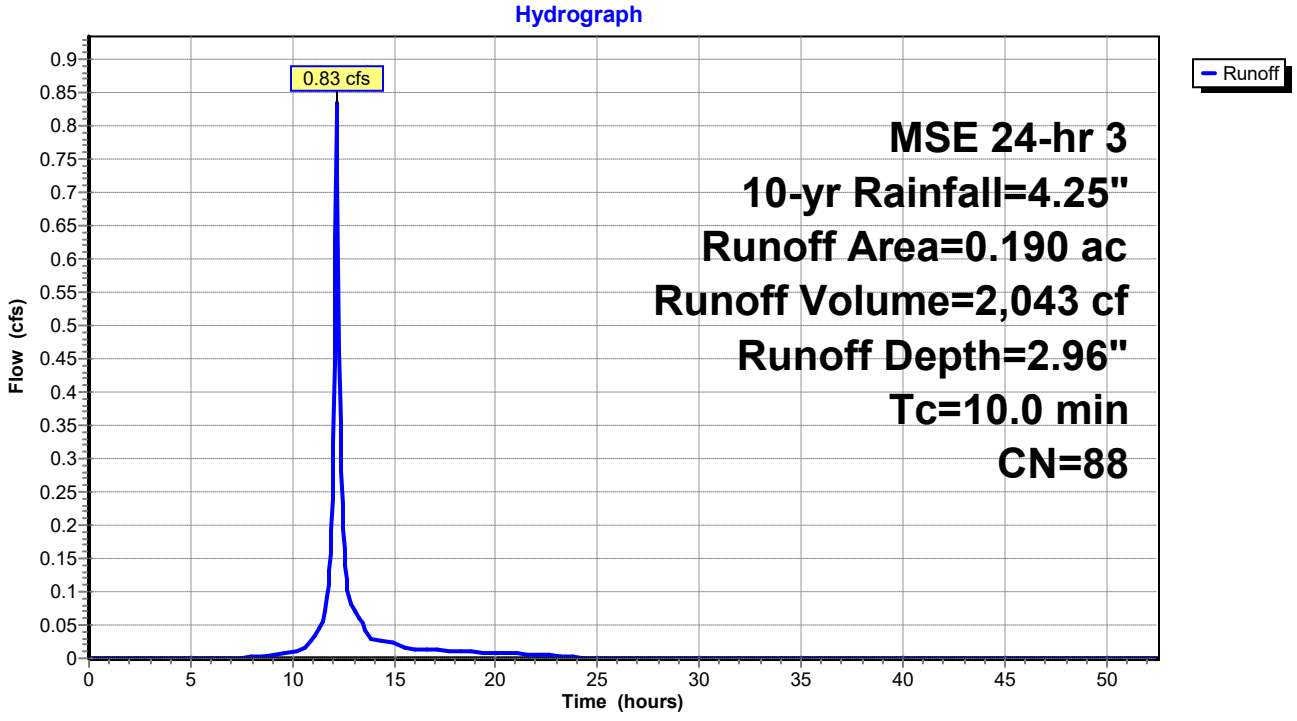
Runoff = 0.83 cfs @ 12.17 hrs, Volume= 2,043 cf, Depth= 2.96"
Routed to Reach 3R : KNOX AVE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-yr Rainfall=4.25"

Area (ac)	CN	Description
0.110	98	Paved parking, HSG C
0.080	74	>75% Grass cover, Good, HSG C
0.190	88	Weighted Average
0.080		42.11% Pervious Area
0.110		57.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment EXDA-4: EXDA-4



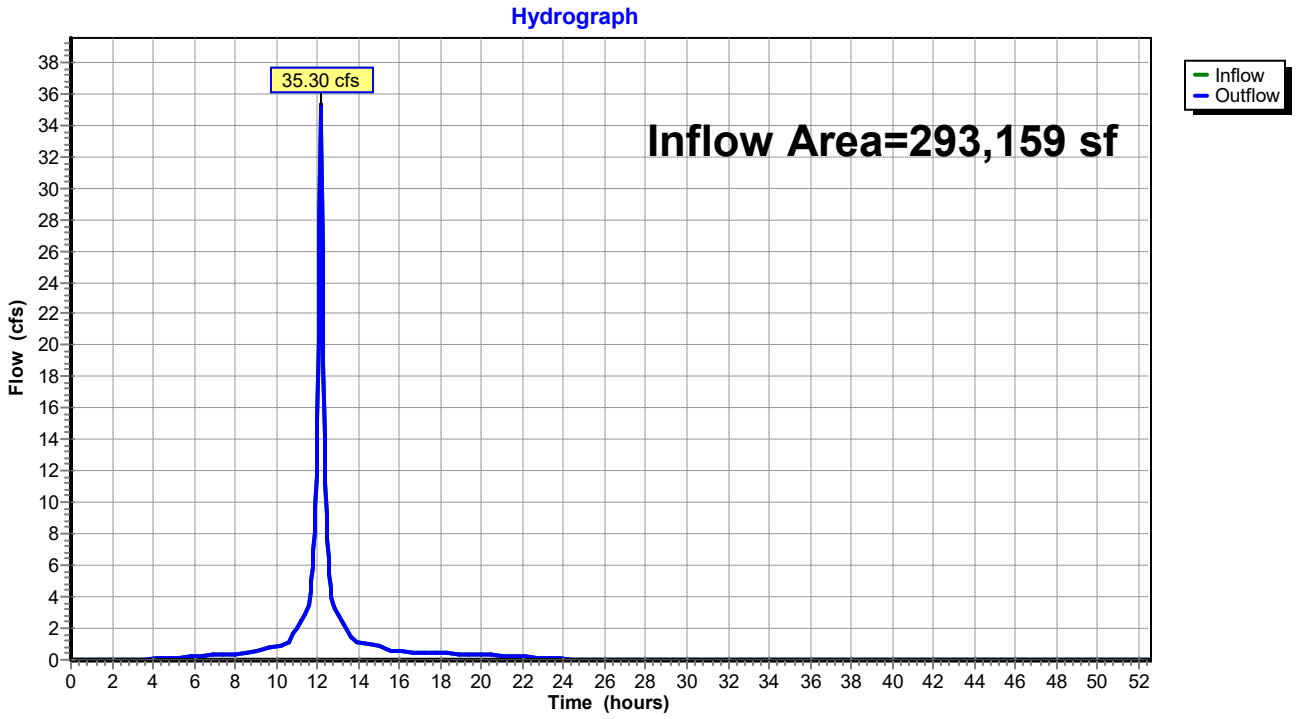
Summary for Reach 1R: PENN AVE

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 293,159 sf, 96.29% Impervious, Inflow Depth = 3.91" for 10-yr event
Inflow = 35.30 cfs @ 12.17 hrs, Volume= 95,566 cf
Outflow = 35.30 cfs @ 12.17 hrs, Volume= 95,566 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node Energy Dr

Routing by Dyn-Stor-Ind method, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs

Reach 1R: PENN AVE



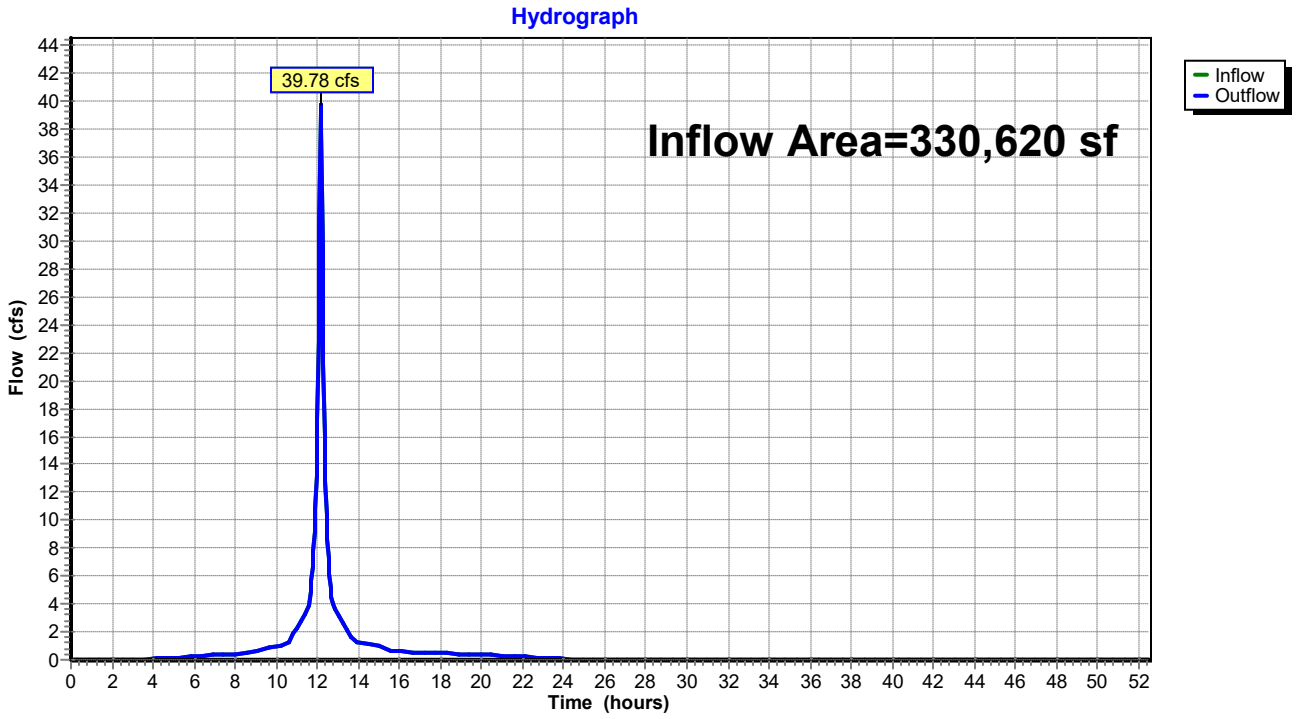
Summary for Reach 2R: AMERICAN BLVD

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 330,620 sf, 96.44% Impervious, Inflow Depth = 3.90" for 10-yr event
Inflow = 39.78 cfs @ 12.17 hrs, Volume= 107,455 cf
Outflow = 39.78 cfs @ 12.17 hrs, Volume= 107,455 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node Energy Dr

Routing by Dyn-Stor-Ind method, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs

Reach 2R: AMERICAN BLVD



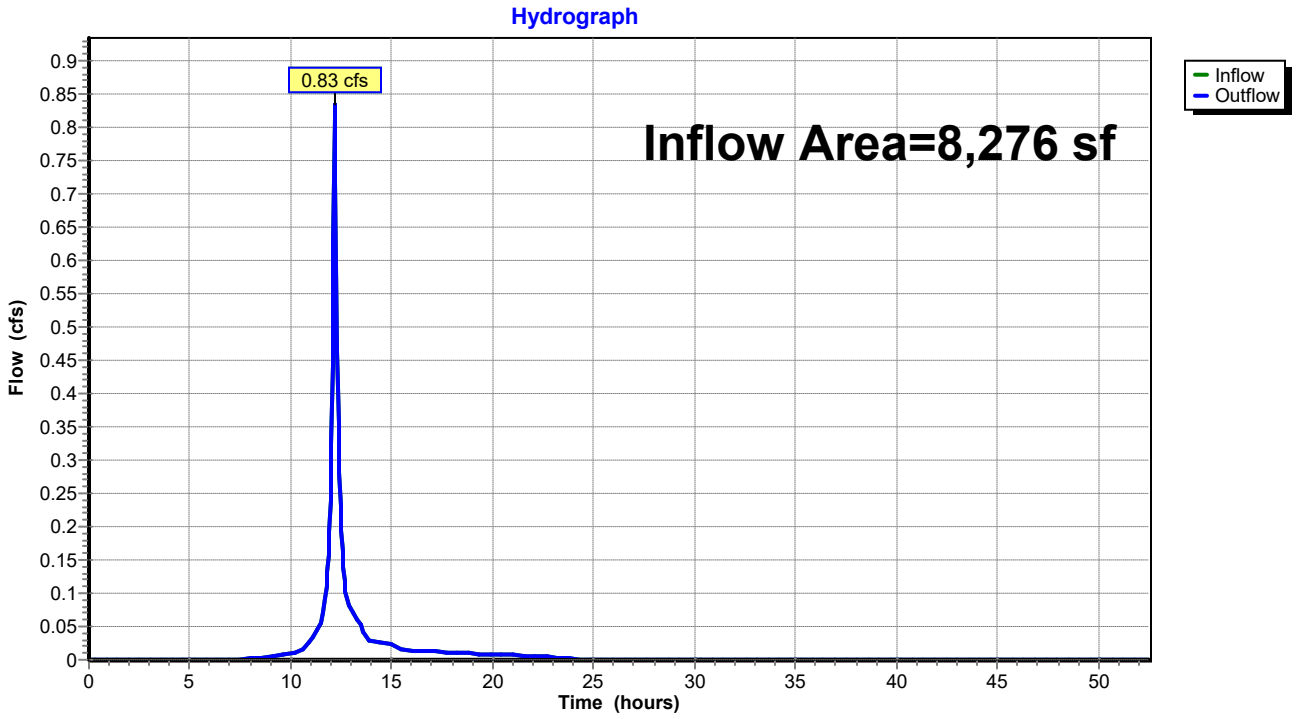
Summary for Reach 3R: KNOX AVE

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 8,276 sf, 57.89% Impervious, Inflow Depth = 2.96" for 10-yr event
Inflow = 0.83 cfs @ 12.17 hrs, Volume= 2,043 cf
Outflow = 0.83 cfs @ 12.17 hrs, Volume= 2,043 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node Energy Dr

Routing by Dyn-Stor-Ind method, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs

Reach 3R: KNOX AVE



Time span=0.00-52.50 hrs, dt=0.05 hrs, 1051 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment EXDA-1: EXDA-1 Runoff Area=6.040 ac 96.03% Impervious Runoff Depth=7.13"
Tc=10.0 min CN=97 Runoff=56.41 cfs 156,354 cf

Subcatchment EXDA-2: EXDA-2 Runoff Area=0.690 ac 98.55% Impervious Runoff Depth=7.25"
Tc=10.0 min CN=98 Runoff=6.46 cfs 18,160 cf

Subcatchment EXDA-3: EXDA-3 Runoff Area=7.590 ac 96.44% Impervious Runoff Depth=7.13"
Tc=10.0 min CN=97 Runoff=70.88 cfs 196,477 cf

Subcatchment EXDA-4: EXDA-4 Runoff Area=0.190 ac 57.89% Impervious Runoff Depth=6.07"
Tc=10.0 min CN=88 Runoff=1.65 cfs 4,187 cf

Reach 1R: PENN AVE Inflow=62.87 cfs 174,514 cf
Outflow=62.87 cfs 174,514 cf

Reach 2R: AMERICAN BLVD Inflow=70.88 cfs 196,477 cf
Outflow=70.88 cfs 196,477 cf

Reach 3R: KNOX AVE Inflow=1.65 cfs 4,187 cf
Outflow=1.65 cfs 4,187 cf

Total Runoff Area = 632,056 sf Runoff Volume = 375,178 cf Average Runoff Depth = 7.12"
4.14% Pervious = 26,136 sf 95.86% Impervious = 605,920 sf

Summary for Subcatchment EXDA-1: EXDA-1

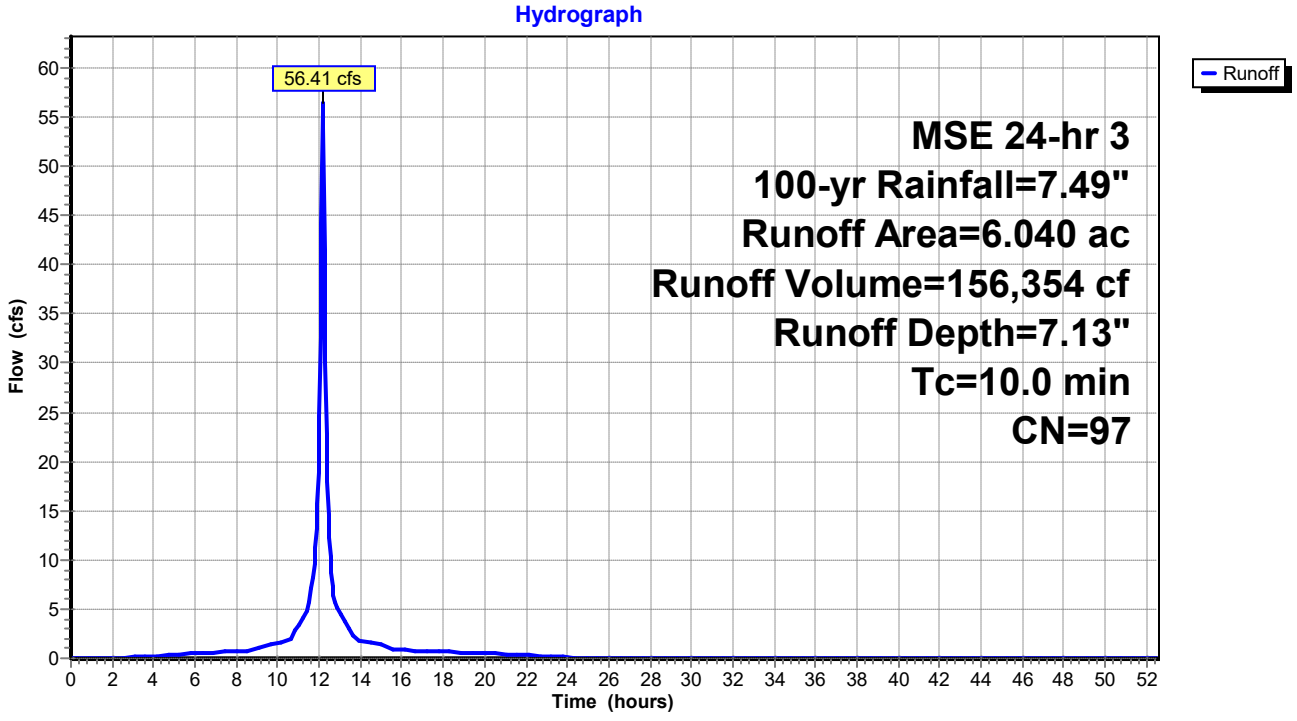
Runoff = 56.41 cfs @ 12.17 hrs, Volume= 156,354 cf, Depth= 7.13"
Routed to Reach 1R : PENN AVE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-yr Rainfall=7.49"

Area (ac)	CN	Description
5.800	98	Paved parking, HSG C
0.240	74	>75% Grass cover, Good, HSG C
6.040	97	Weighted Average
0.240		3.97% Pervious Area
5.800		96.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment EXDA-1: EXDA-1



Summary for Subcatchment EXDA-2: EXDA-2

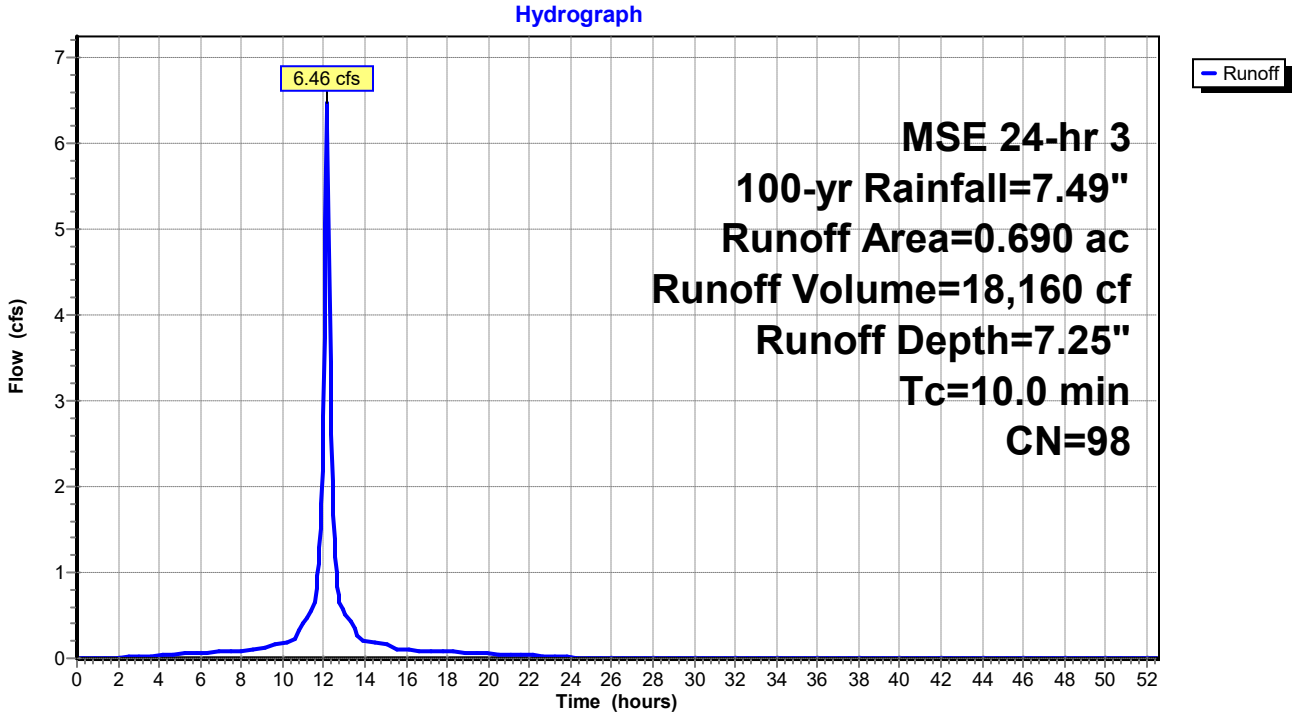
Runoff = 6.46 cfs @ 12.17 hrs, Volume= 18,160 cf, Depth= 7.25"
Routed to Reach 1R : PENN AVE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-yr Rainfall=7.49"

Area (ac)	CN	Description
0.680	98	Paved parking, HSG C
0.010	74	>75% Grass cover, Good, HSG C
0.690	98	Weighted Average
0.010		1.45% Pervious Area
0.680		98.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment EXDA-2: EXDA-2



Summary for Subcatchment EXDA-3: EXDA-3

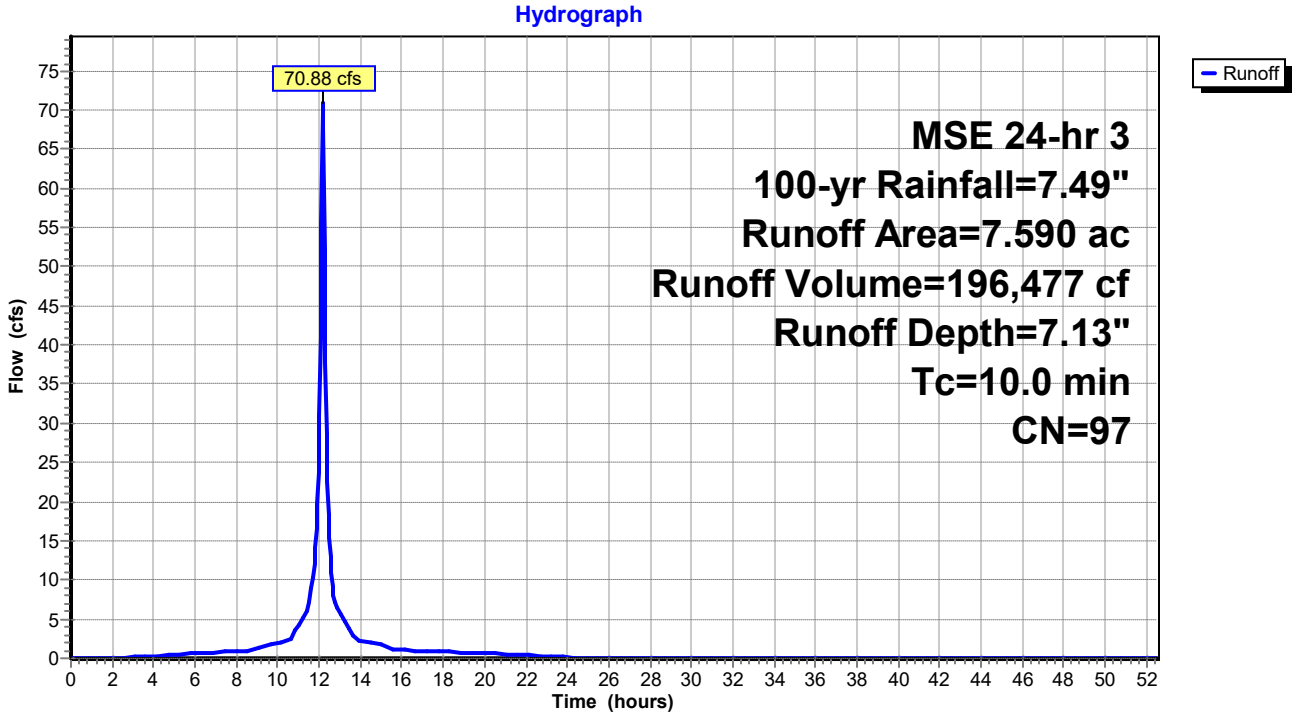
Runoff = 70.88 cfs @ 12.17 hrs, Volume= 196,477 cf, Depth= 7.13"
Routed to Reach 2R : AMERICAN BLVD

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-yr Rainfall=7.49"

Area (ac)	CN	Description
7.320	98	Paved parking, HSG C
0.270	74	>75% Grass cover, Good, HSG C
7.590	97	Weighted Average
0.270		3.56% Pervious Area
7.320		96.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment EXDA-3: EXDA-3



Summary for Subcatchment EXDA-4: EXDA-4

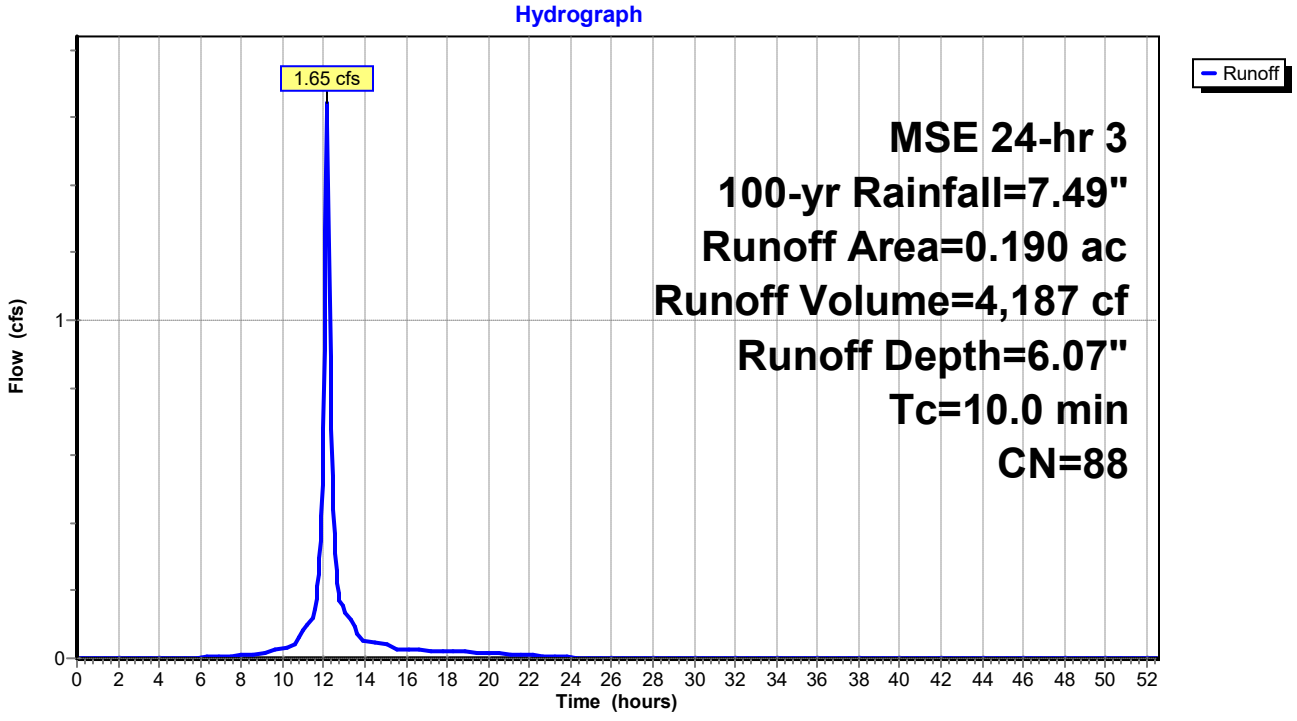
Runoff = 1.65 cfs @ 12.17 hrs, Volume= 4,187 cf, Depth= 6.07"
Routed to Reach 3R : KNOX AVE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-yr Rainfall=7.49"

Area (ac)	CN	Description
0.110	98	Paved parking, HSG C
0.080	74	>75% Grass cover, Good, HSG C
0.190	88	Weighted Average
0.080		42.11% Pervious Area
0.110		57.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment EXDA-4: EXDA-4



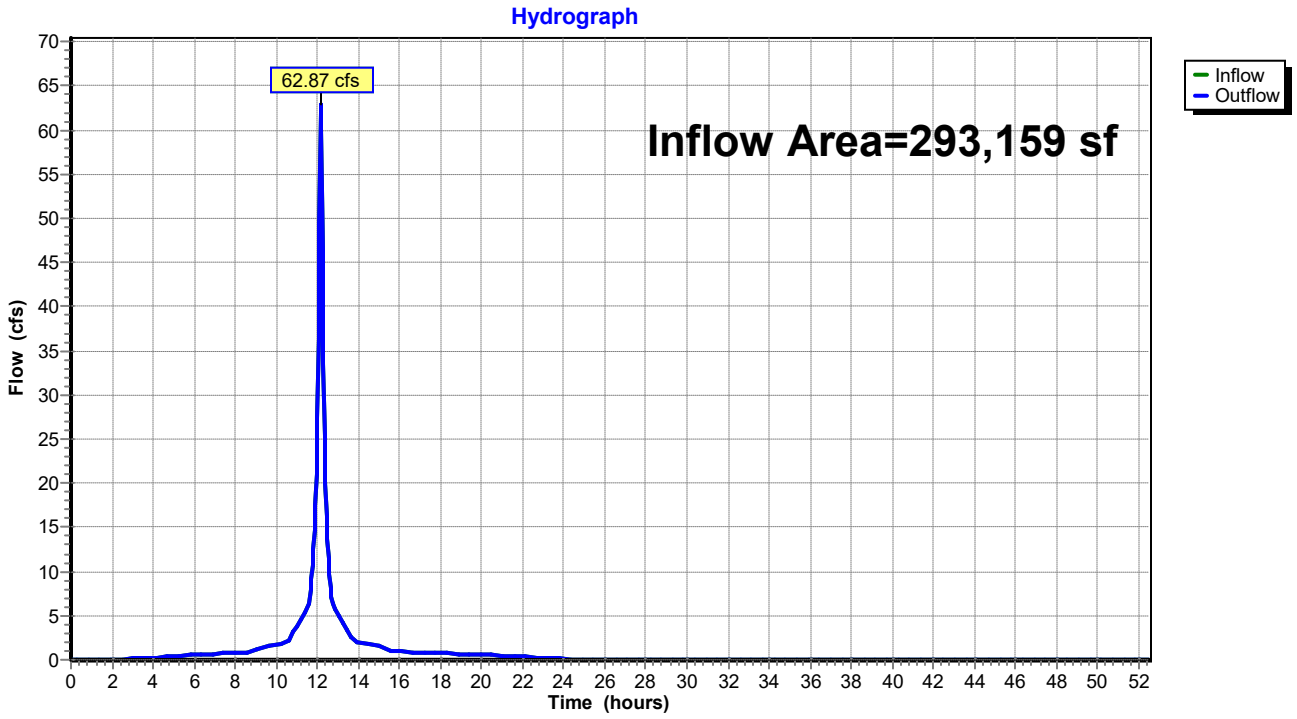
Summary for Reach 1R: PENN AVE

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 293,159 sf, 96.29% Impervious, Inflow Depth = 7.14" for 100-yr event
Inflow = 62.87 cfs @ 12.17 hrs, Volume= 174,514 cf
Outflow = 62.87 cfs @ 12.17 hrs, Volume= 174,514 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node Energy Dr

Routing by Dyn-Stor-Ind method, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs

Reach 1R: PENN AVE



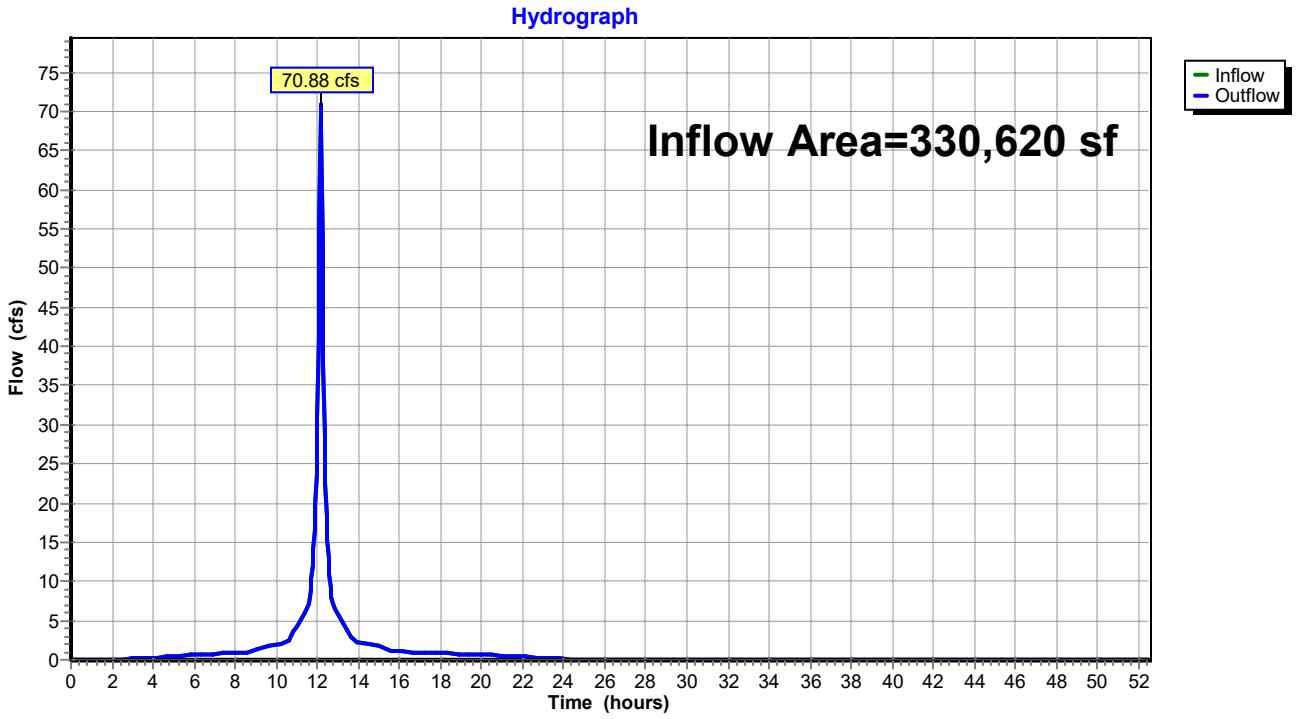
Summary for Reach 2R: AMERICAN BLVD

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 330,620 sf, 96.44% Impervious, Inflow Depth = 7.13" for 100-yr event
Inflow = 70.88 cfs @ 12.17 hrs, Volume= 196,477 cf
Outflow = 70.88 cfs @ 12.17 hrs, Volume= 196,477 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node Energy Dr

Routing by Dyn-Stor-Ind method, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs

Reach 2R: AMERICAN BLVD



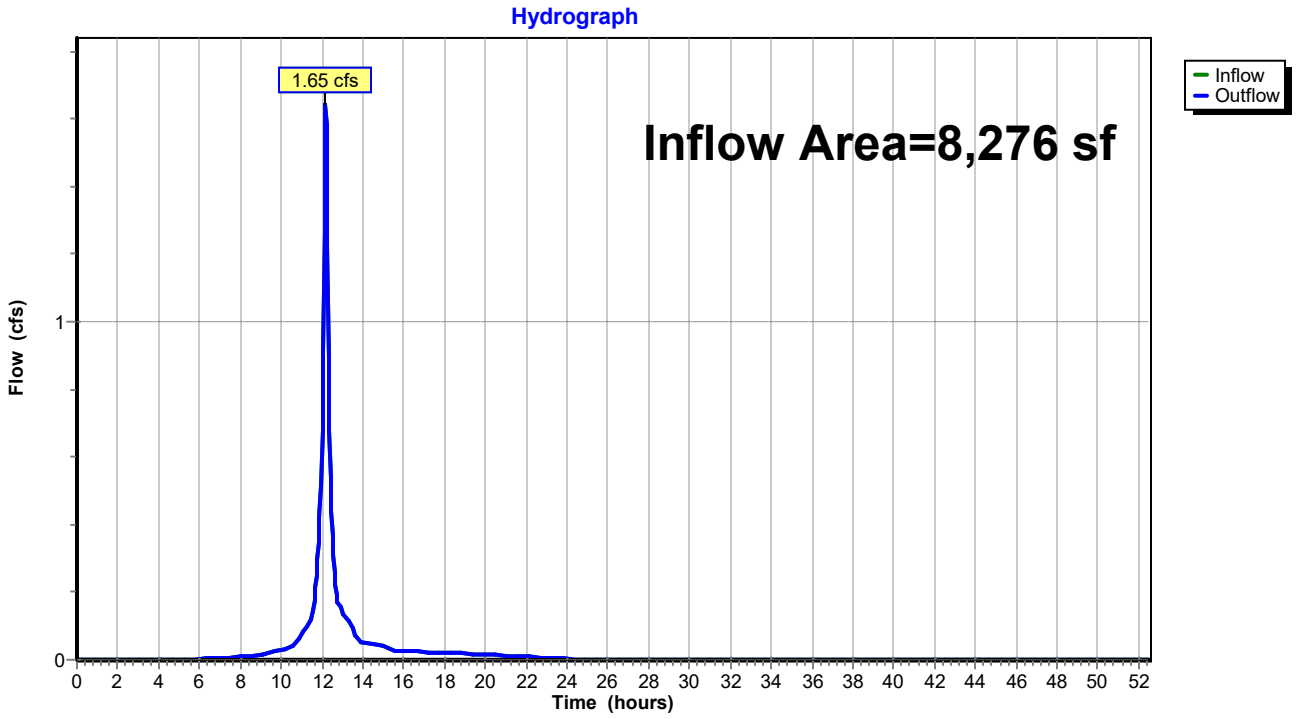
Summary for Reach 3R: KNOX AVE

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 8,276 sf, 57.89% Impervious, Inflow Depth = 6.07" for 100-yr event
Inflow = 1.65 cfs @ 12.17 hrs, Volume= 4,187 cf
Outflow = 1.65 cfs @ 12.17 hrs, Volume= 4,187 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node Energy Dr

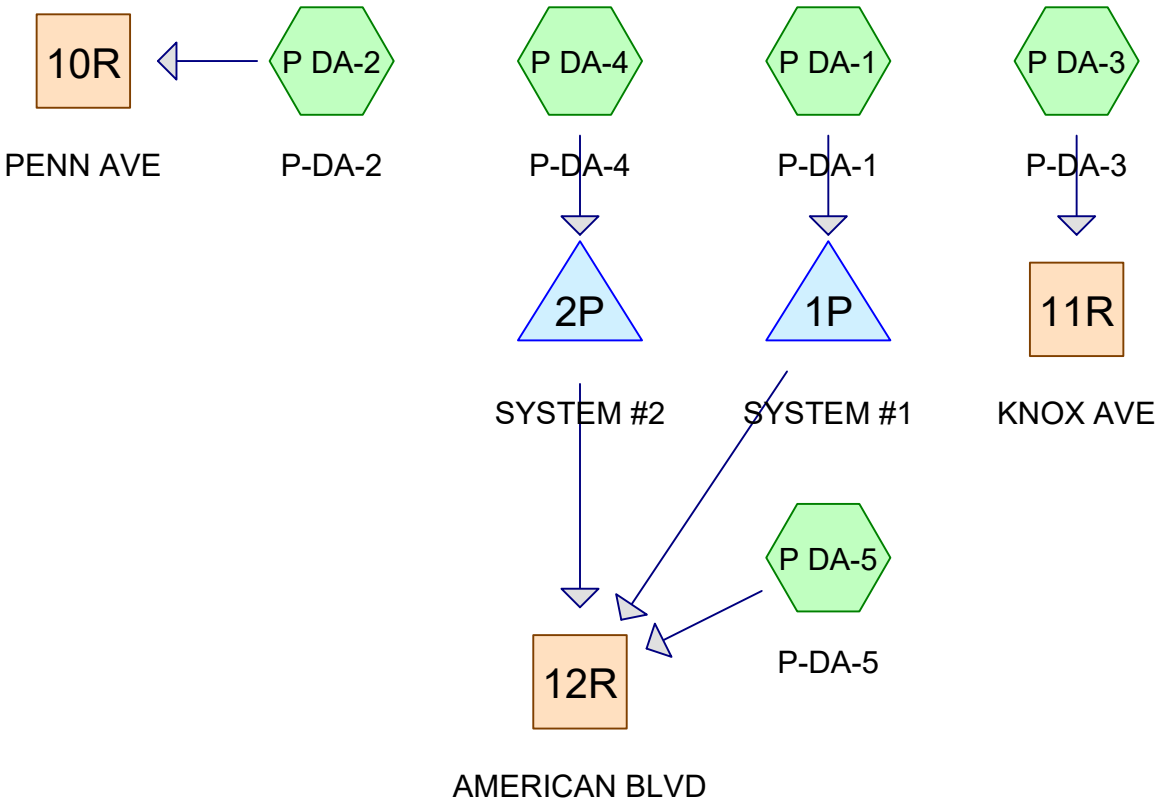
Routing by Dyn-Stor-Ind method, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs

Reach 3R: KNOX AVE



Appendix 3. Post-Development HydroCAD Model Analysis

PROPOSED



Subcat Reach Pond Link

Routing Diagram for Southtown
Prepared by Kimley-Horn & Associates, Printed 6/17/2024

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-yr	MSE 24-hr	3	Default	24.00	1	2.84	2
2	10-yr	MSE 24-hr	3	Default	24.00	1	4.25	2
3	100-yr	MSE 24-hr	3	Default	24.00	1	7.49	2

Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
76,666	74	>75% Grass cover, Good, HSG C (P DA-1, P DA-2, P DA-3, P DA-4, P DA-5)
555,390	98	Paved parking, HSG C (P DA-1, P DA-2, P DA-3, P DA-4, P DA-5)
632,056	**95**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
632,056	HSG C	P DA-1, P DA-2, P DA-3, P DA-4, P DA-5
0	HSG D	
0	Other	
632,056		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
0	0	76,666	0	0	76,666	>75% Grass cover, Good	
0	0	555,390	0	0	555,390	Paved parking	
0	**0**	**632,056**	**0**	**0**	**632,056**	**TOTAL AREA**	

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	1P	820.00	817.50	500.0	0.0050	0.011	0.0	24.0	0.0	
2	2P	821.00	817.50	600.0	0.0058	0.011	0.0	24.0	0.0	

Time span=0.00-52.50 hrs, dt=0.05 hrs, 1051 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment P DA-1: P-DA-1 Runoff Area=7.360 ac 89.13% Impervious Runoff Depth=2.29"
Tc=10.0 min CN=95 Runoff=24.11 cfs 61,271 cf

Subcatchment P DA-2: P-DA-2 Runoff Area=0.380 ac 50.00% Impervious Runoff Depth=1.53"
Tc=10.0 min CN=86 Runoff=0.88 cfs 2,105 cf

Subcatchment P DA-3: P-DA-3 Runoff Area=0.100 ac 60.00% Impervious Runoff Depth=1.68"
Tc=10.0 min CN=88 Runoff=0.25 cfs 609 cf

Subcatchment P DA-4: P-DA-4 Runoff Area=5.860 ac 89.42% Impervious Runoff Depth=2.29"
Tc=10.0 min CN=95 Runoff=19.19 cfs 48,784 cf

Subcatchment P DA-5: P-DA-5 Runoff Area=0.810 ac 86.42% Impervious Runoff Depth=2.29"
Tc=7.0 min CN=95 Runoff=2.99 cfs 6,743 cf

Reach 10R: PENN AVE Inflow=0.88 cfs 2,105 cf
Outflow=0.88 cfs 2,105 cf

Reach 11R: KNOX AVE Inflow=0.25 cfs 609 cf
Outflow=0.25 cfs 609 cf

Reach 12R: AMERICAN BLVD Inflow=9.28 cfs 64,994 cf
Outflow=9.28 cfs 64,994 cf

Pond 1P: SYSTEM #1 Peak Elev=824.11' Storage=36,890 cf Inflow=24.11 cfs 61,271 cf
Outflow=5.41 cfs 32,022 cf

Pond 2P: SYSTEM #2 Peak Elev=825.37' Storage=29,837 cf Inflow=19.19 cfs 48,784 cf
Outflow=3.42 cfs 26,228 cf

Total Runoff Area = 632,056 sf Runoff Volume = 119,513 cf Average Runoff Depth = 2.27"
12.13% Pervious = 76,666 sf 87.87% Impervious = 555,390 sf

Summary for Subcatchment P DA-1: P-DA-1

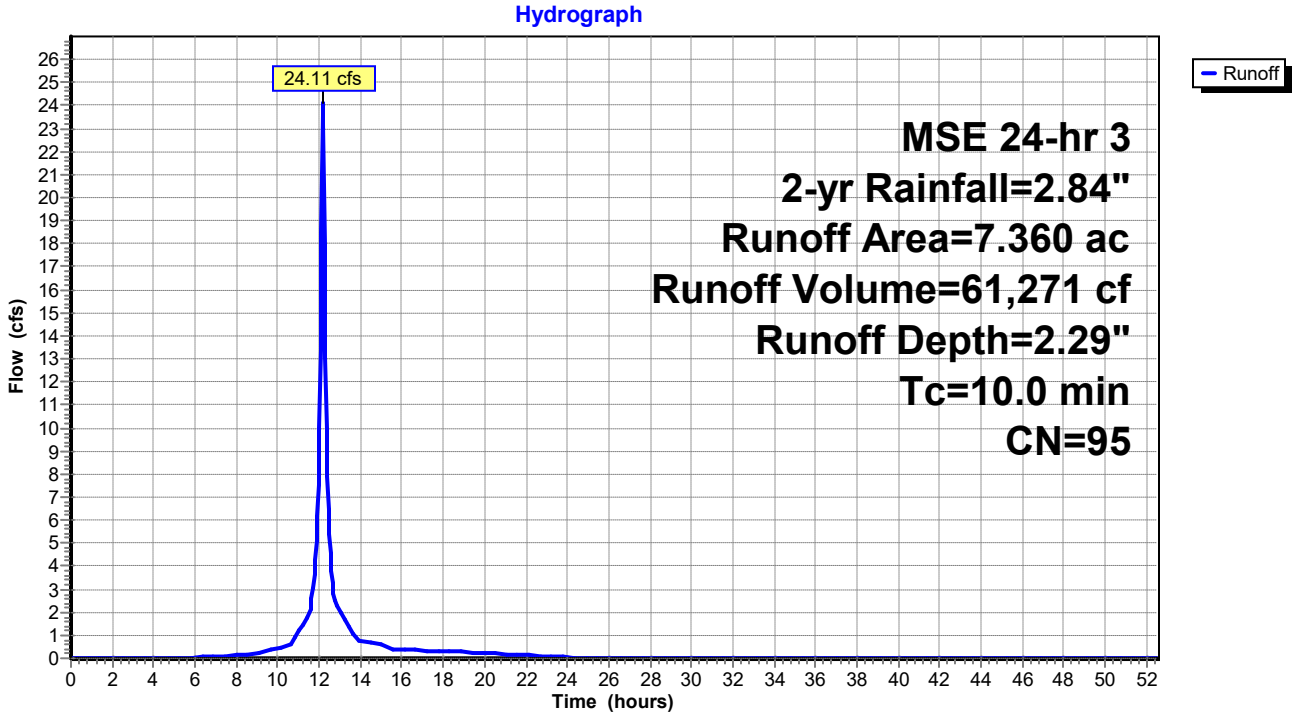
Runoff = 24.11 cfs @ 12.17 hrs, Volume= 61,271 cf, Depth= 2.29"
Routed to Pond 1P : SYSTEM #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-yr Rainfall=2.84"

Area (ac)	CN	Description
6.560	98	Paved parking, HSG C
0.800	74	>75% Grass cover, Good, HSG C
7.360	95	Weighted Average
0.800		10.87% Pervious Area
6.560		89.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment P DA-1: P-DA-1



Summary for Subcatchment P DA-2: P-DA-2

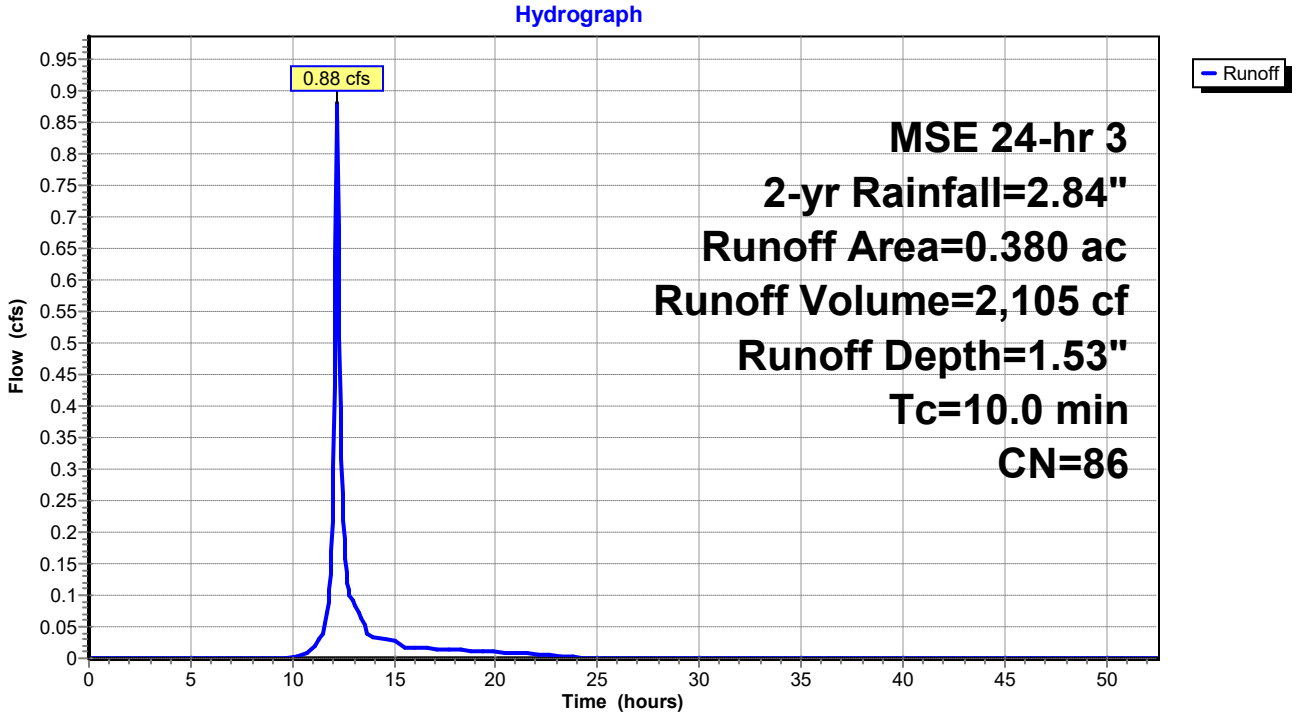
Runoff = 0.88 cfs @ 12.18 hrs, Volume= 2,105 cf, Depth= 1.53"
Routed to Reach 10R : PENN AVE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-yr Rainfall=2.84"

Area (ac)	CN	Description
0.190	98	Paved parking, HSG C
0.190	74	>75% Grass cover, Good, HSG C
0.380	86	Weighted Average
0.190		50.00% Pervious Area
0.190		50.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment P DA-2: P-DA-2



Summary for Subcatchment P DA-3: P-DA-3

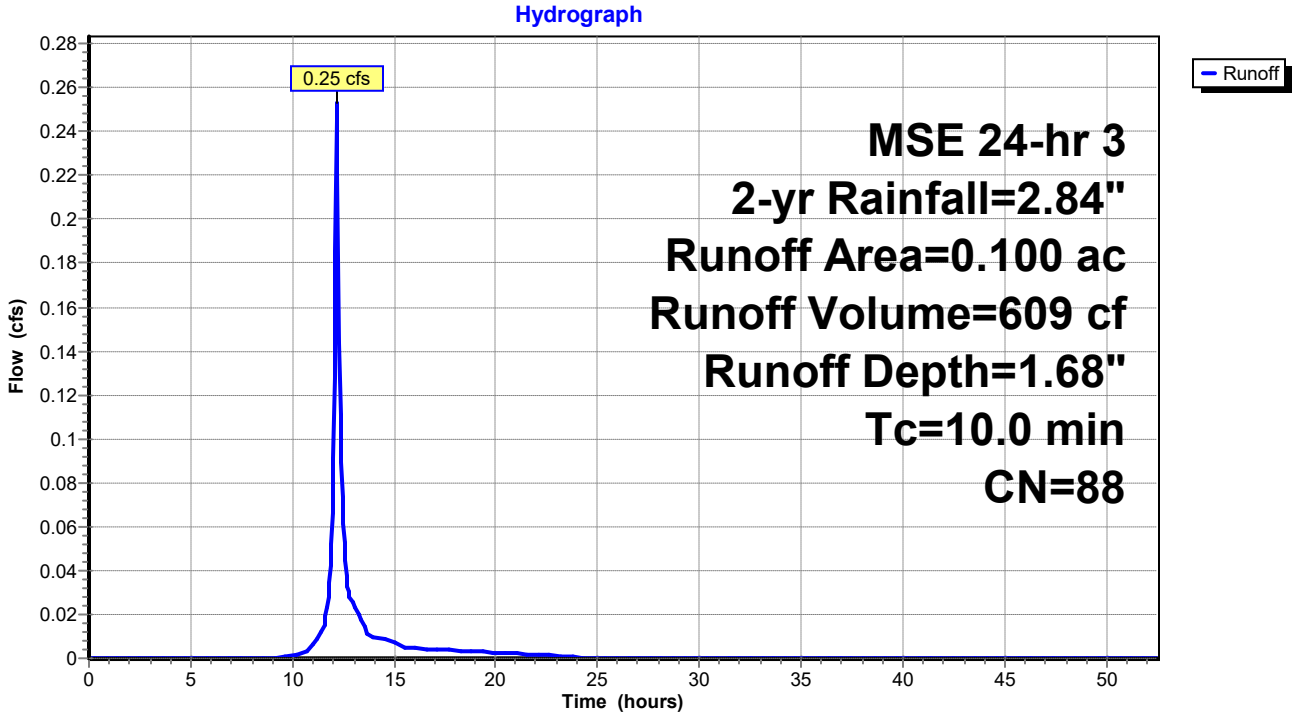
Runoff = 0.25 cfs @ 12.18 hrs, Volume= 609 cf, Depth= 1.68"
Routed to Reach 11R : KNOX AVE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-yr Rainfall=2.84"

Area (ac)	CN	Description
0.060	98	Paved parking, HSG C
0.040	74	>75% Grass cover, Good, HSG C
0.100	88	Weighted Average
0.040		40.00% Pervious Area
0.060		60.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment P DA-3: P-DA-3



Summary for Subcatchment P DA-4: P-DA-4

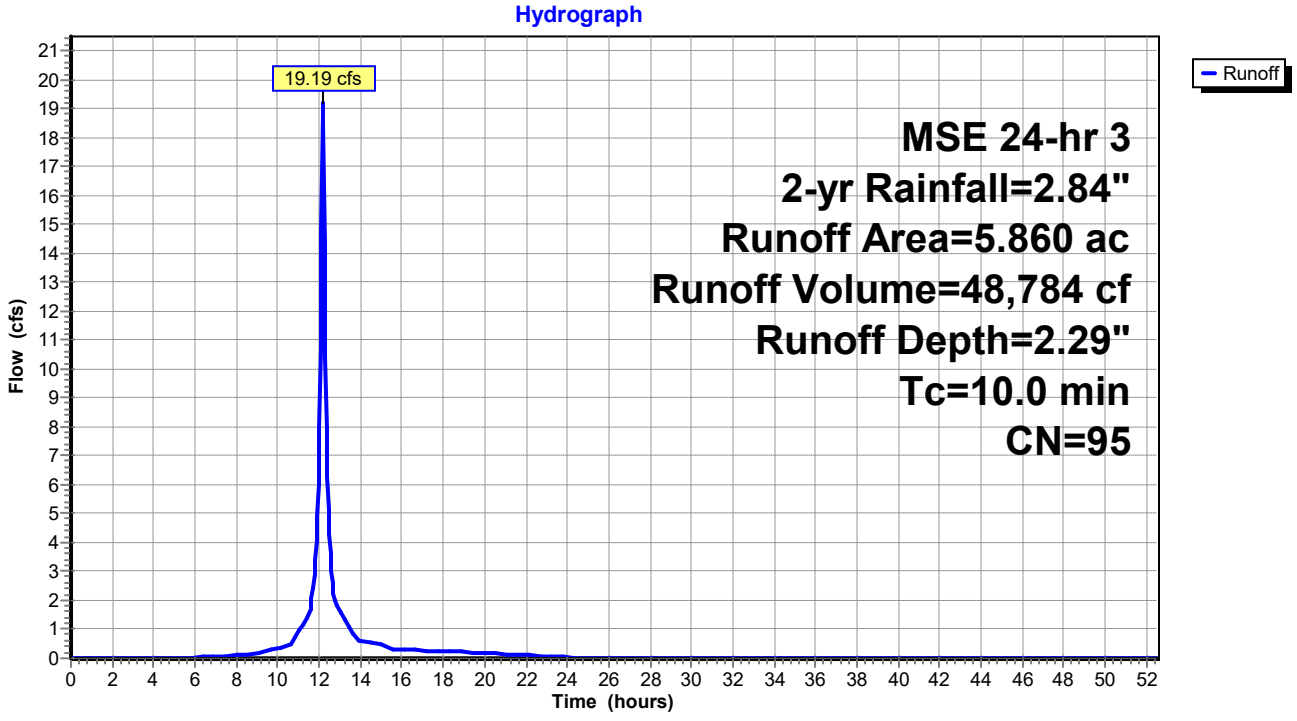
Runoff = 19.19 cfs @ 12.17 hrs, Volume= 48,784 cf, Depth= 2.29"
Routed to Pond 2P : SYSTEM #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-yr Rainfall=2.84"

Area (ac)	CN	Description
5.240	98	Paved parking, HSG C
0.620	74	>75% Grass cover, Good, HSG C
5.860	95	Weighted Average
0.620		10.58% Pervious Area
5.240		89.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment P DA-4: P-DA-4



Summary for Subcatchment P DA-5: P-DA-5

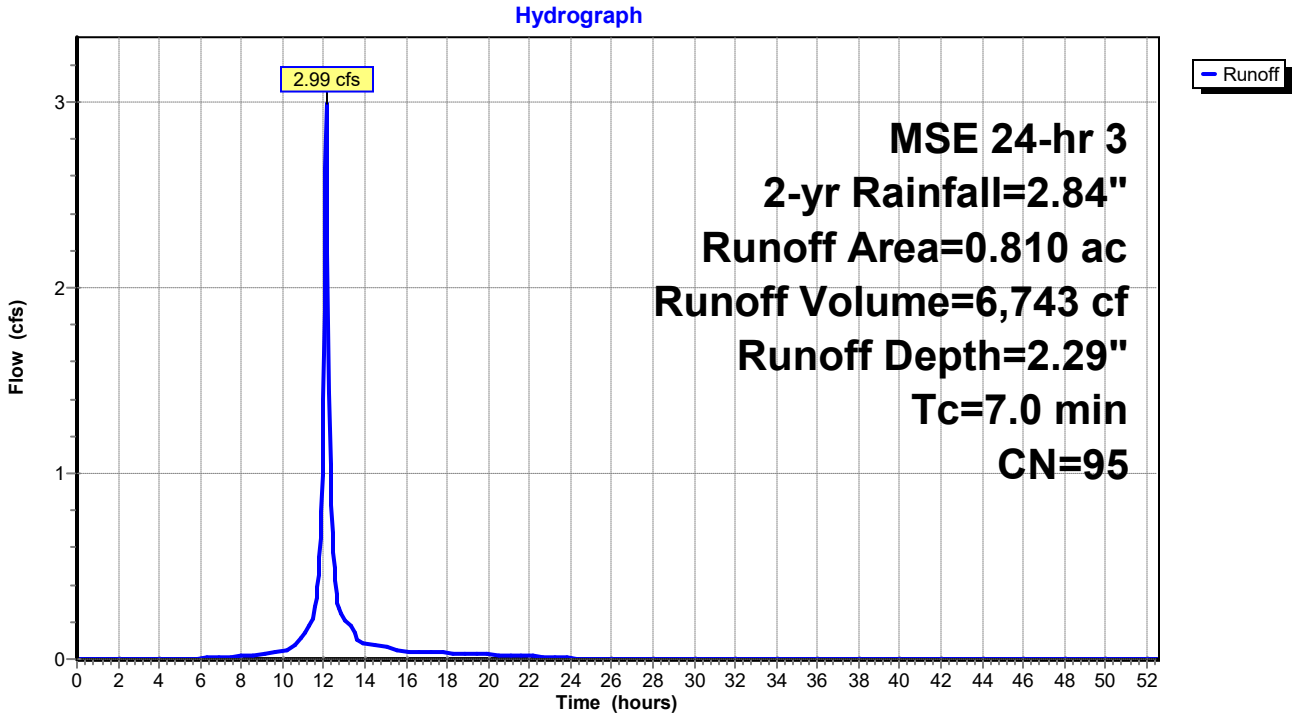
Runoff = 2.99 cfs @ 12.14 hrs, Volume= 6,743 cf, Depth= 2.29"
Routed to Reach 12R : AMERICAN BLVD

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-yr Rainfall=2.84"

Area (ac)	CN	Description
0.700	98	Paved parking, HSG C
0.110	74	>75% Grass cover, Good, HSG C
0.810	95	Weighted Average
0.110		13.58% Pervious Area
0.700		86.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**
6.0	0	Total, Increased to minimum Tc = 7.0 min			

Subcatchment P DA-5: P-DA-5



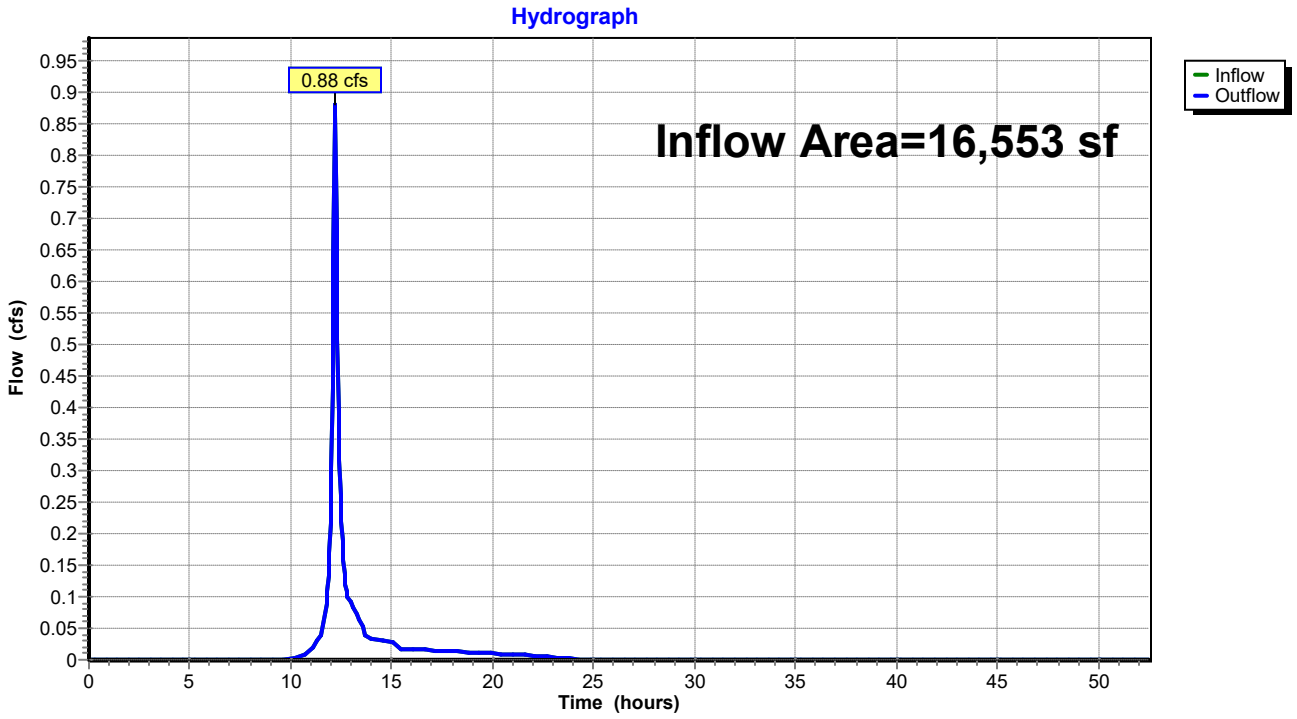
Summary for Reach 10R: PENN AVE

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 16,553 sf, 50.00% Impervious, Inflow Depth = 1.53" for 2-yr event
Inflow = 0.88 cfs @ 12.18 hrs, Volume= 2,105 cf
Outflow = 0.88 cfs @ 12.18 hrs, Volume= 2,105 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node Energy Dr

Routing by Dyn-Stor-Ind method, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs

Reach 10R: PENN AVE



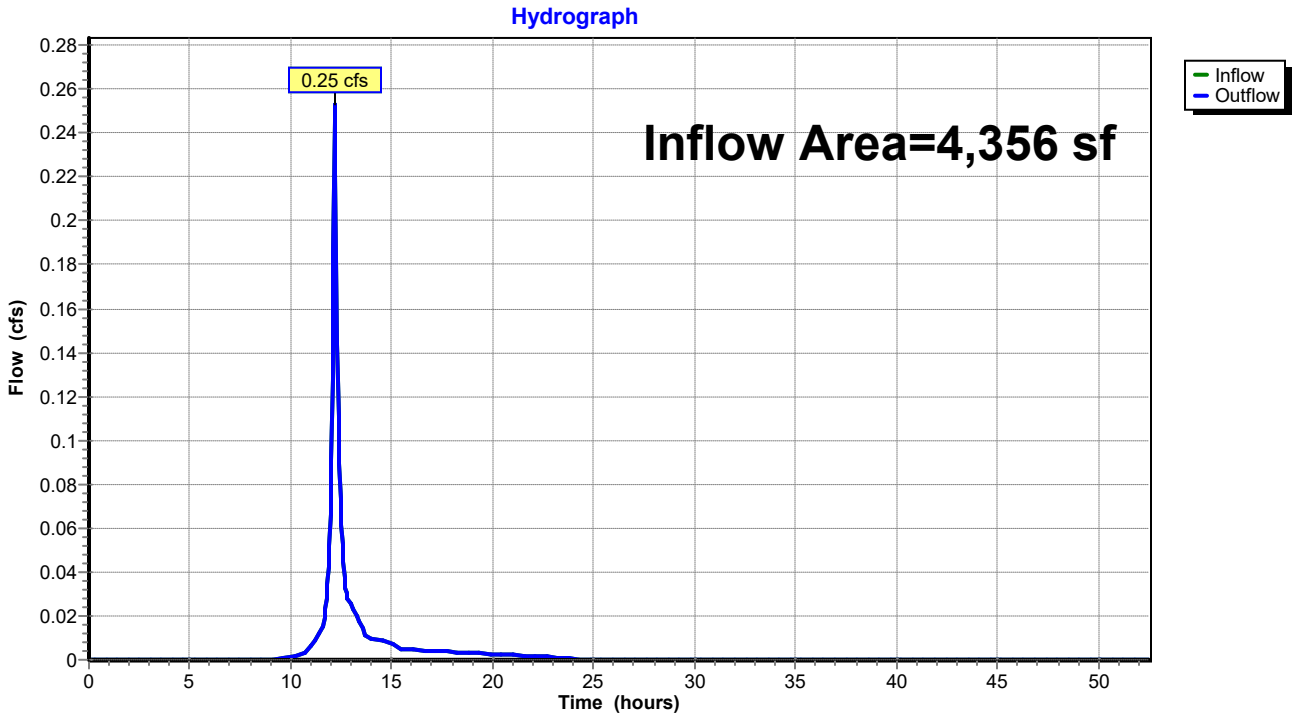
Summary for Reach 11R: KNOX AVE

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 4,356 sf, 60.00% Impervious, Inflow Depth = 1.68" for 2-yr event
Inflow = 0.25 cfs @ 12.18 hrs, Volume= 609 cf
Outflow = 0.25 cfs @ 12.18 hrs, Volume= 609 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node Energy Dr

Routing by Dyn-Stor-Ind method, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs

Reach 11R: KNOX AVE



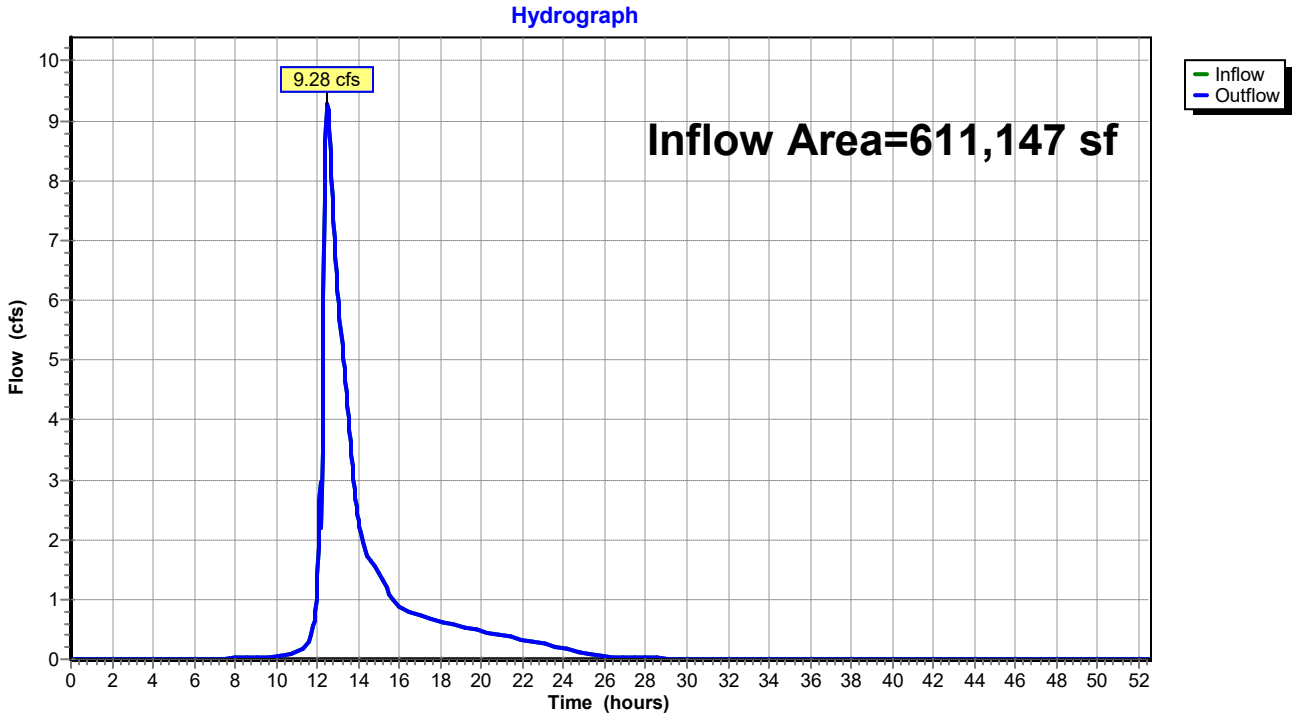
Summary for Reach 12R: AMERICAN BLVD

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 611,147 sf, 89.09% Impervious, Inflow Depth = 1.28" for 2-yr event
Inflow = 9.28 cfs @ 12.50 hrs, Volume= 64,994 cf
Outflow = 9.28 cfs @ 12.50 hrs, Volume= 64,994 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs

Reach 12R: AMERICAN BLVD



Summary for Pond 1P: SYSTEM #1

Inflow Area = 320,602 sf, 89.13% Impervious, Inflow Depth = 2.29" for 2-yr event
Inflow = 24.11 cfs @ 12.17 hrs, Volume= 61,271 cf
Outflow = 5.41 cfs @ 12.50 hrs, Volume= 32,022 cf, Atten= 78%, Lag= 20.0 min
Primary = 5.41 cfs @ 12.50 hrs, Volume= 32,022 cf
Routed to Reach 12R : AMERICAN BLVD

Routing by Dyn-Stor-Ind method, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs
Peak Elev= 824.11' @ 12.50 hrs Surf.Area= 16,214 sf Storage= 36,890 cf

Plug-Flow detention time= 197.8 min calculated for 32,022 cf (52% of inflow)
Center-of-Mass det. time= 117.7 min (894.7 - 776.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	820.00'	31,677 cf	**67.00'W x 242.00'L x 7.50'H Field A** 121,605 cf Overall - 42,412 cf Embedded = 79,193 cf x 40.0% Voids
#2A	822.00'	42,412 cf	**CMP Round 60** x 108 Inside #1 Effective Size= 60.0"W x 60.0"H => 19.63 sf x 20.00'L = 392.7 cf Overall Size= 60.0"W x 60.0"H x 20.00'L 108 Chambers in 9 Rows
		74,089 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	820.00'	**24.0" Round Outlet to American Blvd** L= 500.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 820.00' / 817.50' S= 0.0050 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 3.14 sf
#2	Device 1	820.00'	**6.0" Vert. Draintile X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Device 2	820.00'	**0.800 in/hr Filtration Through Sand over Surface area above 820.00'** Excluded Surface area = 16,214 sf
#4	Device 1	823.51'	**42.0" W x 6.0" H Vert. Orifice in Weir** C= 0.600 Limited to weir flow at low heads
#5	Device 1	824.01'	**5.0' long Weir** 2 End Contraction(s)

Primary OutFlow Max=5.41 cfs @ 12.50 hrs HW=824.11' TW=0.00' (Dynamic Tailwater)
- **1=Outlet to American Blvd** (Passes 5.41 cfs of 21.07 cfs potential flow)
  - **2=Draintile** (Passes 0.00 cfs of 3.72 cfs potential flow)
    - **3=Filtration Through Sand** (Exfiltration Controls 0.00 cfs)
  - **4=Orifice in Weir** (Orifice Controls 4.88 cfs @ 2.79 fps)
  - **5=Weir** (Weir Controls 0.53 cfs @ 1.04 fps)

Pond 1P: SYSTEM #1 - Chamber Wizard Field A

Chamber Model = CMP Round 60 (Round Corrugated Metal Pipe)
Effective Size= 60.0"W x 60.0"H => 19.63 sf x 20.00'L = 392.7 cf
Overall Size= 60.0"W x 60.0"H x 20.00'L

60.0" Wide + 30.0" Spacing = 90.0" C-C Row Spacing

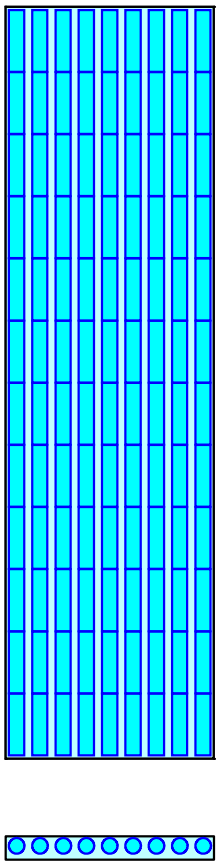
12 Chambers/Row x 20.00' Long = 240.00' Row Length +12.0" End Stone x 2 = 242.00' Base Length
9 Rows x 60.0" Wide + 30.0" Spacing x 8 + 12.0" Side Stone x 2 = 67.00' Base Width
24.0" Stone Base + 60.0" Chamber Height + 6.0" Stone Cover = 7.50' Field Height

108 Chambers x 392.7 cf = 42,411.5 cf Chamber Storage

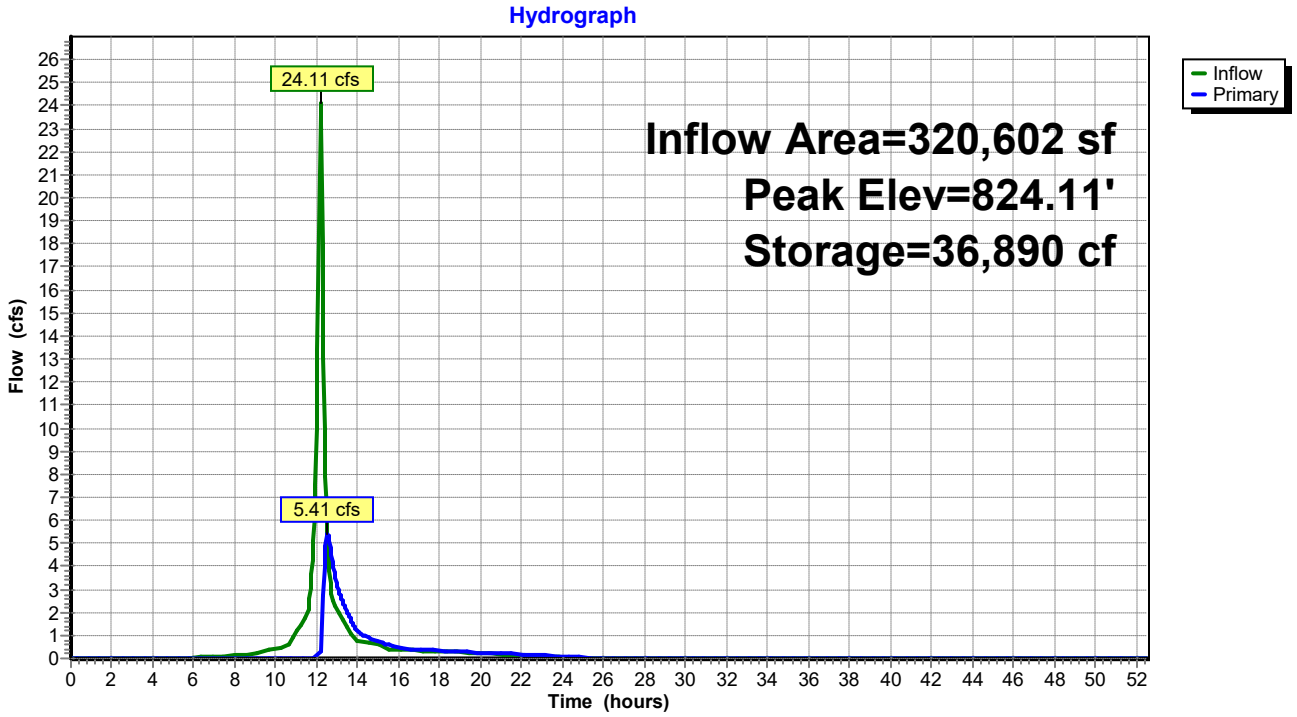
121,605.0 cf Field - 42,411.5 cf Chambers = 79,193.5 cf Stone x 40.0% Voids = 31,677.4 cf Stone Storage

Chamber Storage + Stone Storage = 74,088.9 cf = 1.701 af
Overall Storage Efficiency = 60.9%
Overall System Size = 242.00' x 67.00' x 7.50'

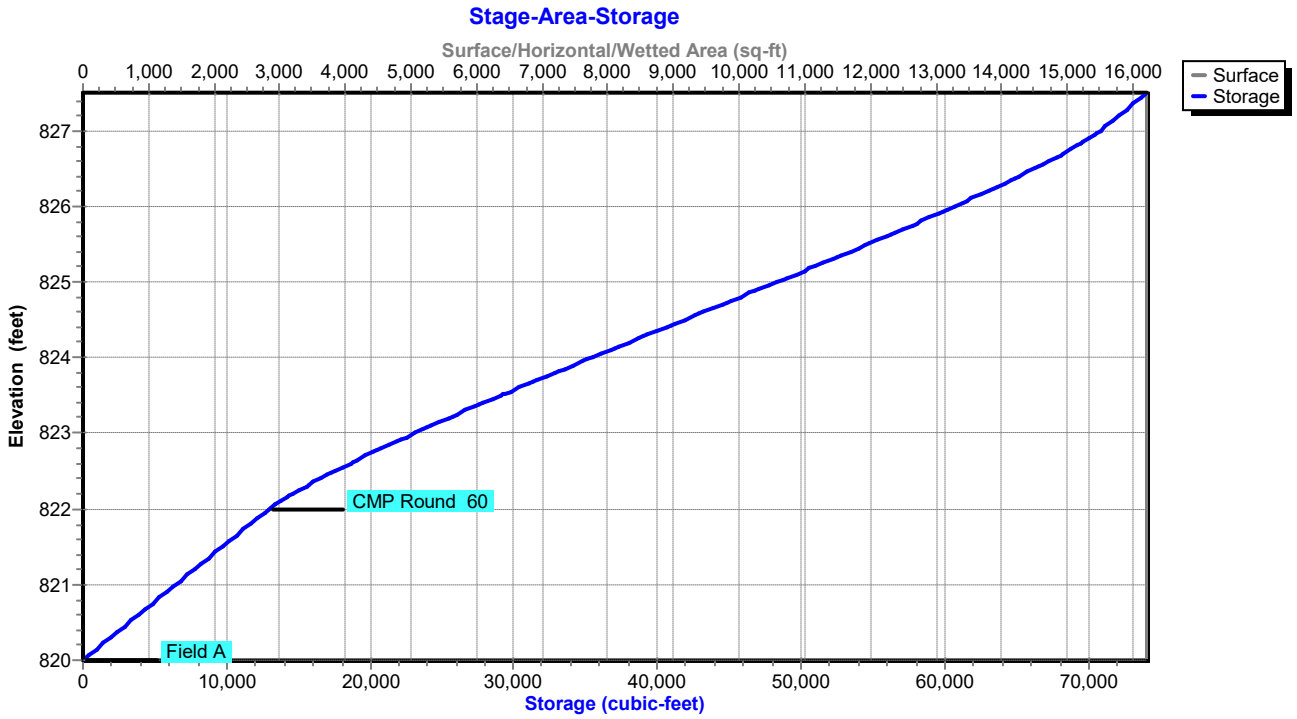
108 Chambers
4,503.9 cy Field
2,933.1 cy Stone



Pond 1P: SYSTEM #1



Pond 1P: SYSTEM #1



Summary for Pond 2P: SYSTEM #2

Inflow Area = 255,262 sf, 89.42% Impervious, Inflow Depth = 2.29" for 2-yr event
Inflow = 19.19 cfs @ 12.17 hrs, Volume= 48,784 cf
Outflow = 3.42 cfs @ 12.57 hrs, Volume= 26,228 cf, Atten= 82%, Lag= 23.9 min
Primary = 3.42 cfs @ 12.57 hrs, Volume= 26,228 cf
Routed to Reach 12R : AMERICAN BLVD

Routing by Dyn-Stor-Ind method, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs
Peak Elev= 825.37' @ 12.57 hrs Surf.Area= 12,019 sf Storage= 29,837 cf

Plug-Flow detention time= 203.6 min calculated for 26,203 cf (54% of inflow)
Center-of-Mass det. time= 126.7 min (903.6 - 776.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	821.00'	23,491 cf	**59.50'W x 202.00'L x 7.50'H Field A** 90,143 cf Overall - 31,416 cf Embedded = 58,727 cf x 40.0% Voids
#2A	823.00'	31,416 cf	**CMP Round 60** x 80 Inside #1 Effective Size= 60.0"W x 60.0"H => 19.63 sf x 20.00'L = 392.7 cf Overall Size= 60.0"W x 60.0"H x 20.00'L 80 Chambers in 8 Rows
		54,907 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	821.00'	**24.0" Round Outlet to American Boulevard** L= 600.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 821.00' / 817.50' S= 0.0058 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 3.14 sf
#2	Device 1	821.00'	**6.0" Vert. Draintile X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Device 2	821.00'	**0.800 in/hr Filtration over Surface area above 821.00'** Excluded Surface area = 12,019 sf
#4	Device 1	824.60'	**6.0" Vert. Orifice in Weir X 5.00** C= 0.600 Limited to weir flow at low heads
#5	Device 1	825.48'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=3.41 cfs @ 12.57 hrs HW=825.37' TW=0.00' (Dynamic Tailwater)
- **1=Outlet to American Boulevard** (Passes 3.41 cfs of 21.93 cfs potential flow)
  - **2=Draintile** (Passes 0.00 cfs of 3.84 cfs potential flow)
    - **3=Filtration** (Exfiltration Controls 0.00 cfs)
  - **4=Orifice in Weir** (Orifice Controls 3.41 cfs @ 3.48 fps)
  - **5=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: SYSTEM #2 - Chamber Wizard Field A

Chamber Model = CMP Round 60 (Round Corrugated Metal Pipe)
Effective Size= 60.0"W x 60.0"H => 19.63 sf x 20.00'L = 392.7 cf
Overall Size= 60.0"W x 60.0"H x 20.00'L

60.0" Wide + 30.0" Spacing = 90.0" C-C Row Spacing

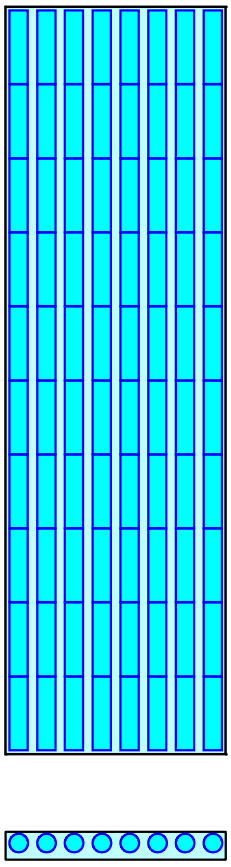
10 Chambers/Row x 20.00' Long = 200.00' Row Length +12.0" End Stone x 2 = 202.00' Base Length
8 Rows x 60.0" Wide + 30.0" Spacing x 7 + 12.0" Side Stone x 2 = 59.50' Base Width
24.0" Stone Base + 60.0" Chamber Height + 6.0" Stone Cover = 7.50' Field Height

80 Chambers x 392.7 cf = 31,415.9 cf Chamber Storage

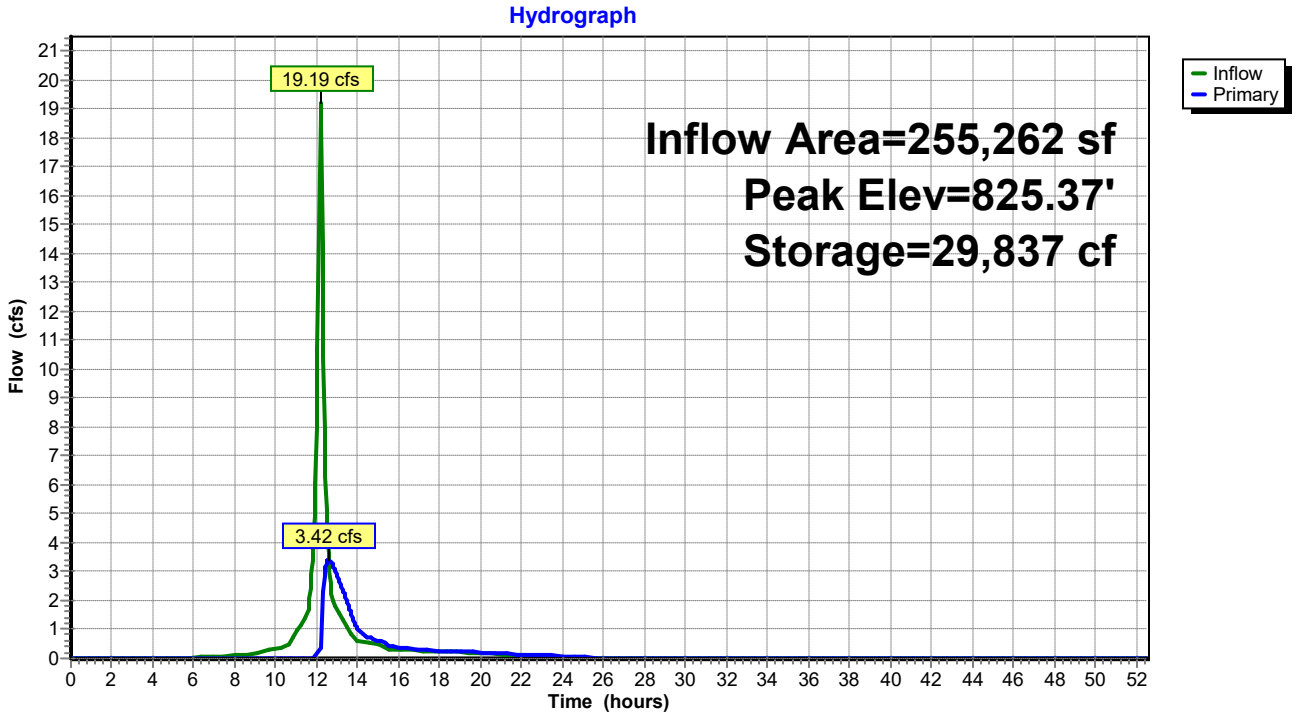
90,142.5 cf Field - 31,415.9 cf Chambers = 58,726.6 cf Stone x 40.0% Voids = 23,490.6 cf Stone Storage

Chamber Storage + Stone Storage = 54,906.6 cf = 1.260 af
Overall Storage Efficiency = 60.9%
Overall System Size = 202.00' x 59.50' x 7.50'

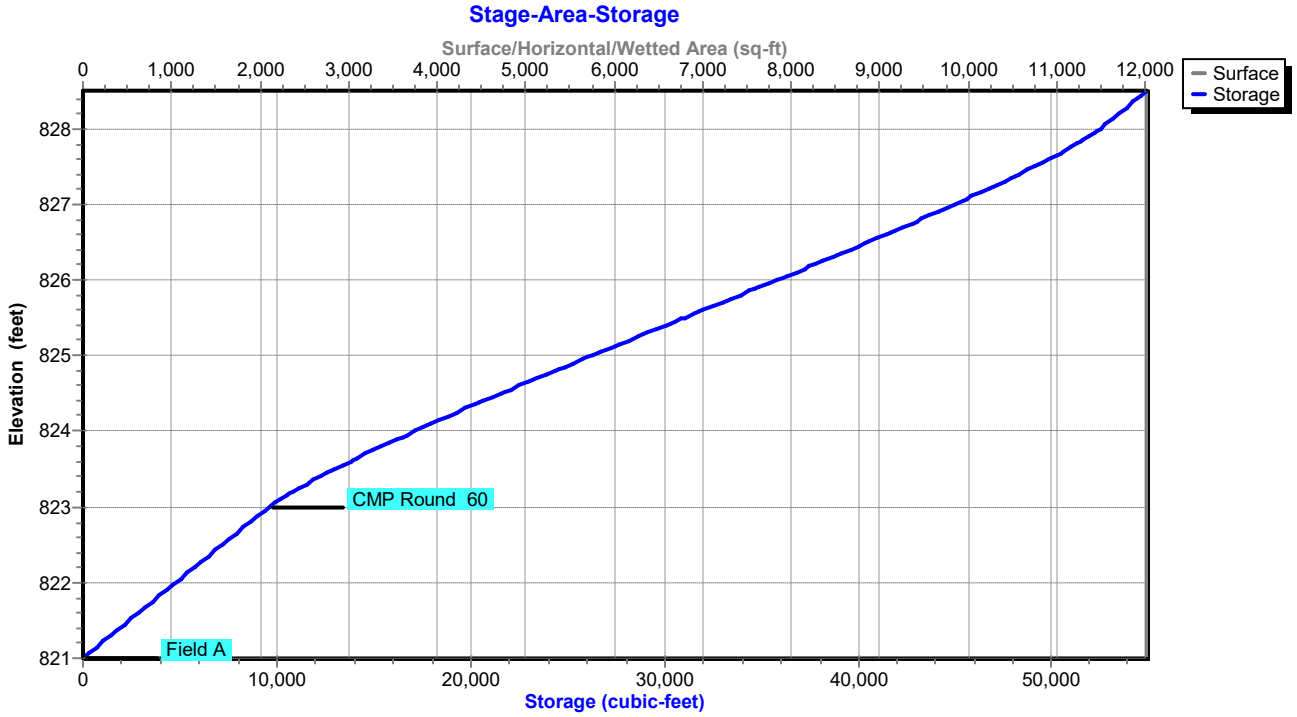
80 Chambers
3,338.6 cy Field
2,175.1 cy Stone



Pond 2P: SYSTEM #2



Pond 2P: SYSTEM #2



Time span=0.00-52.50 hrs, dt=0.05 hrs, 1051 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment P DA-1: P-DA-1 Runoff Area=7.360 ac 89.13% Impervious Runoff Depth=3.68"
Tc=10.0 min CN=95 Runoff=37.58 cfs 98,257 cf

Subcatchment P DA-2: P-DA-2 Runoff Area=0.380 ac 50.00% Impervious Runoff Depth=2.77"
Tc=10.0 min CN=86 Runoff=1.58 cfs 3,826 cf

Subcatchment P DA-3: P-DA-3 Runoff Area=0.100 ac 60.00% Impervious Runoff Depth=2.96"
Tc=10.0 min CN=88 Runoff=0.44 cfs 1,075 cf

Subcatchment P DA-4: P-DA-4 Runoff Area=5.860 ac 89.42% Impervious Runoff Depth=3.68"
Tc=10.0 min CN=95 Runoff=29.92 cfs 78,232 cf

Subcatchment P DA-5: P-DA-5 Runoff Area=0.810 ac 86.42% Impervious Runoff Depth=3.68"
Tc=7.0 min CN=95 Runoff=4.66 cfs 10,814 cf

Reach 10R: PENN AVE Inflow=1.58 cfs 3,826 cf
Outflow=1.58 cfs 3,826 cf

Reach 11R: KNOX AVE Inflow=0.44 cfs 1,075 cf
Outflow=0.44 cfs 1,075 cf

Reach 12R: AMERICAN BLVD Inflow=39.78 cfs 135,497 cf
Outflow=39.78 cfs 135,497 cf

Pond 1P: SYSTEM #1 Peak Elev=824.87' Storage=46,757 cf Inflow=37.58 cfs 98,257 cf
Outflow=21.57 cfs 69,008 cf

Pond 2P: SYSTEM #2 Peak Elev=826.26' Storage=38,341 cf Inflow=29.92 cfs 78,232 cf
Outflow=16.61 cfs 55,675 cf

Total Runoff Area = 632,056 sf Runoff Volume = 192,204 cf Average Runoff Depth = 3.65"
12.13% Pervious = 76,666 sf 87.87% Impervious = 555,390 sf

Summary for Subcatchment P DA-1: P-DA-1

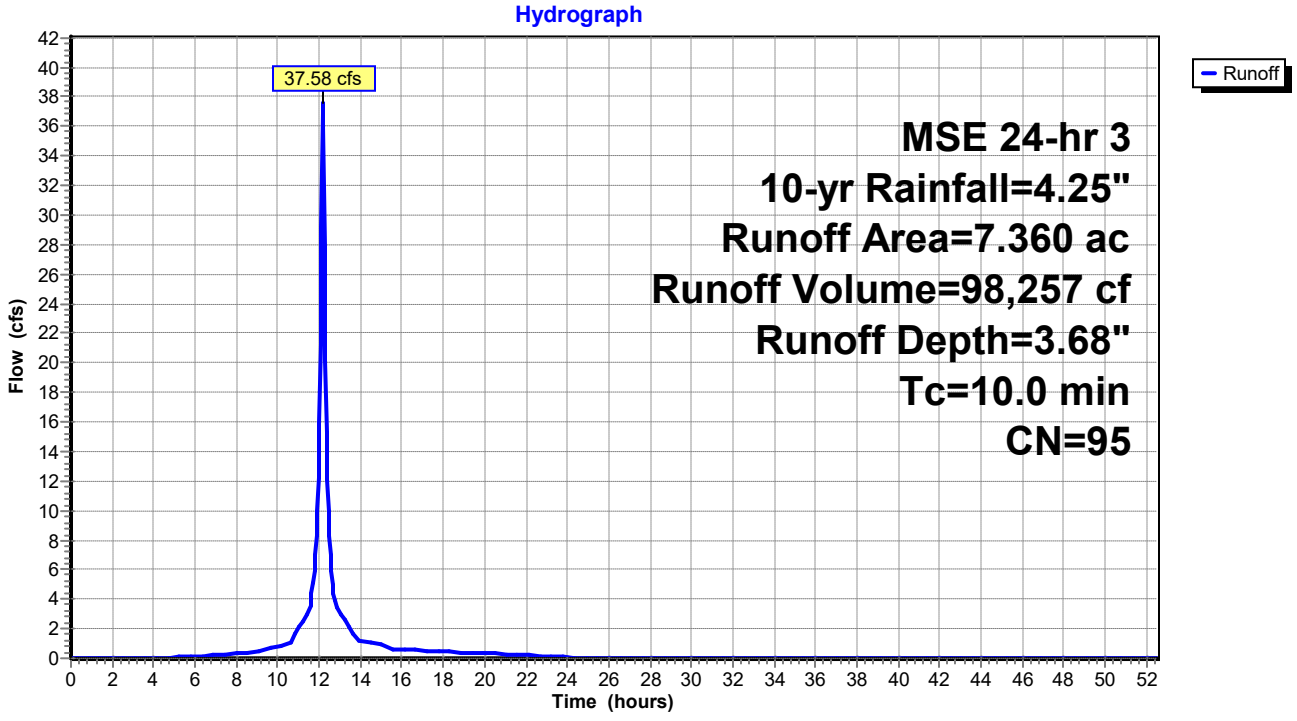
Runoff = 37.58 cfs @ 12.17 hrs, Volume= 98,257 cf, Depth= 3.68"
Routed to Pond 1P : SYSTEM #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-yr Rainfall=4.25"

Area (ac)	CN	Description
6.560	98	Paved parking, HSG C
0.800	74	>75% Grass cover, Good, HSG C
7.360	95	Weighted Average
0.800		10.87% Pervious Area
6.560		89.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment P DA-1: P-DA-1



Summary for Subcatchment P DA-2: P-DA-2

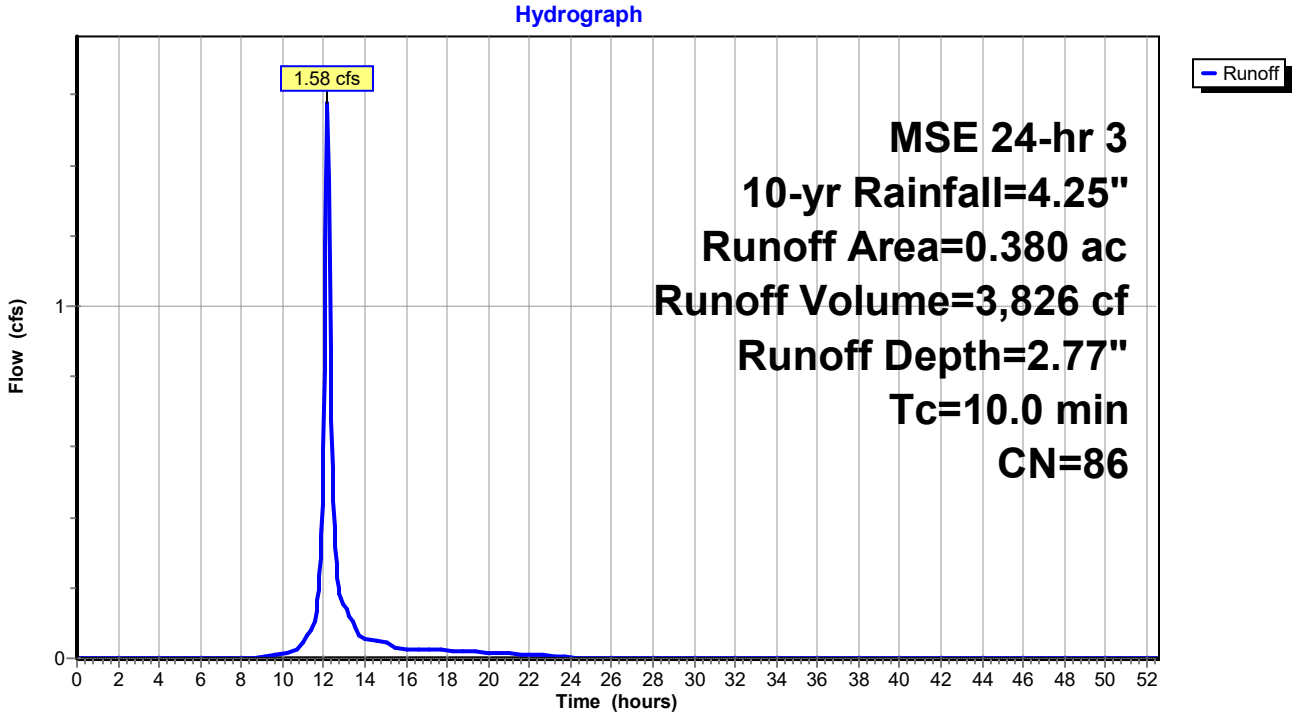
Runoff = 1.58 cfs @ 12.17 hrs, Volume= 3,826 cf, Depth= 2.77"
Routed to Reach 10R : PENN AVE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-yr Rainfall=4.25"

Area (ac)	CN	Description
0.190	98	Paved parking, HSG C
0.190	74	>75% Grass cover, Good, HSG C
0.380	86	Weighted Average
0.190		50.00% Pervious Area
0.190		50.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment P DA-2: P-DA-2



Summary for Subcatchment P DA-3: P-DA-3

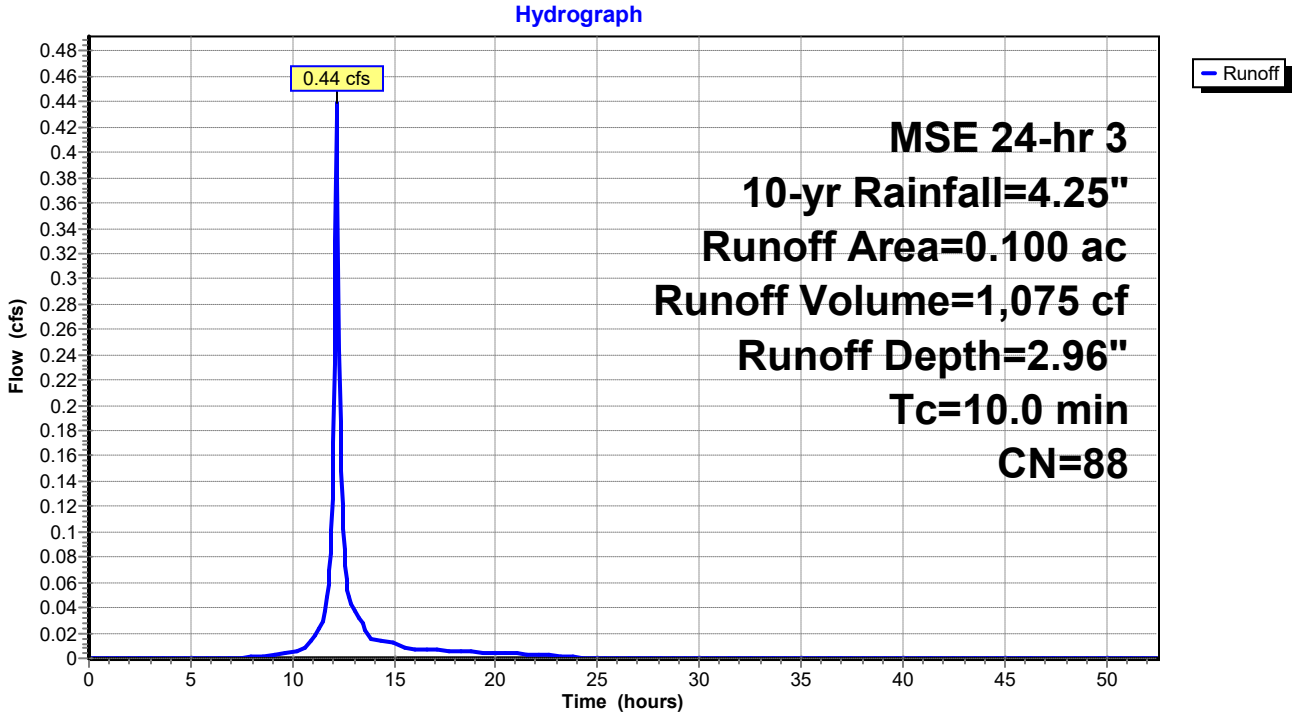
Runoff = 0.44 cfs @ 12.17 hrs, Volume= 1,075 cf, Depth= 2.96"
Routed to Reach 11R : KNOX AVE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-yr Rainfall=4.25"

Area (ac)	CN	Description
0.060	98	Paved parking, HSG C
0.040	74	>75% Grass cover, Good, HSG C
0.100	88	Weighted Average
0.040		40.00% Pervious Area
0.060		60.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment P DA-3: P-DA-3



Summary for Subcatchment P DA-4: P-DA-4

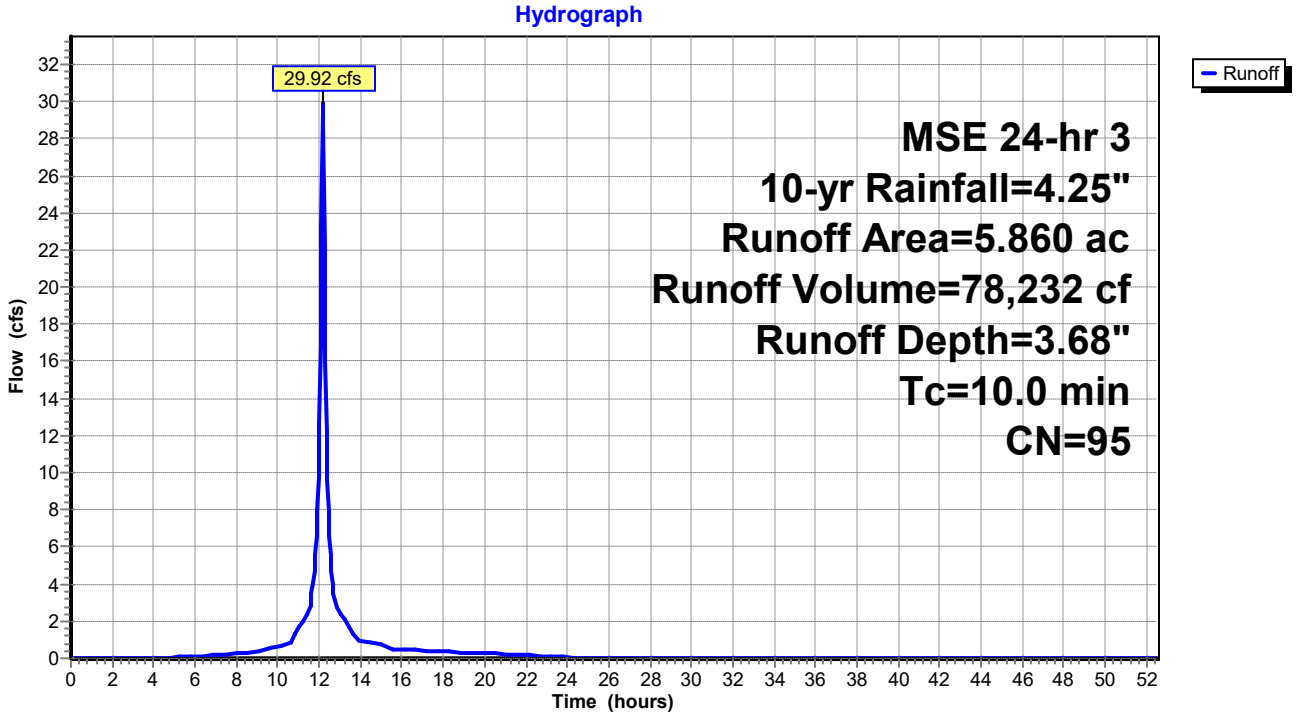
Runoff = 29.92 cfs @ 12.17 hrs, Volume= 78,232 cf, Depth= 3.68"
Routed to Pond 2P : SYSTEM #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-yr Rainfall=4.25"

Area (ac)	CN	Description
5.240	98	Paved parking, HSG C
0.620	74	>75% Grass cover, Good, HSG C
5.860	95	Weighted Average
0.620		10.58% Pervious Area
5.240		89.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment P DA-4: P-DA-4



Summary for Subcatchment P DA-5: P-DA-5

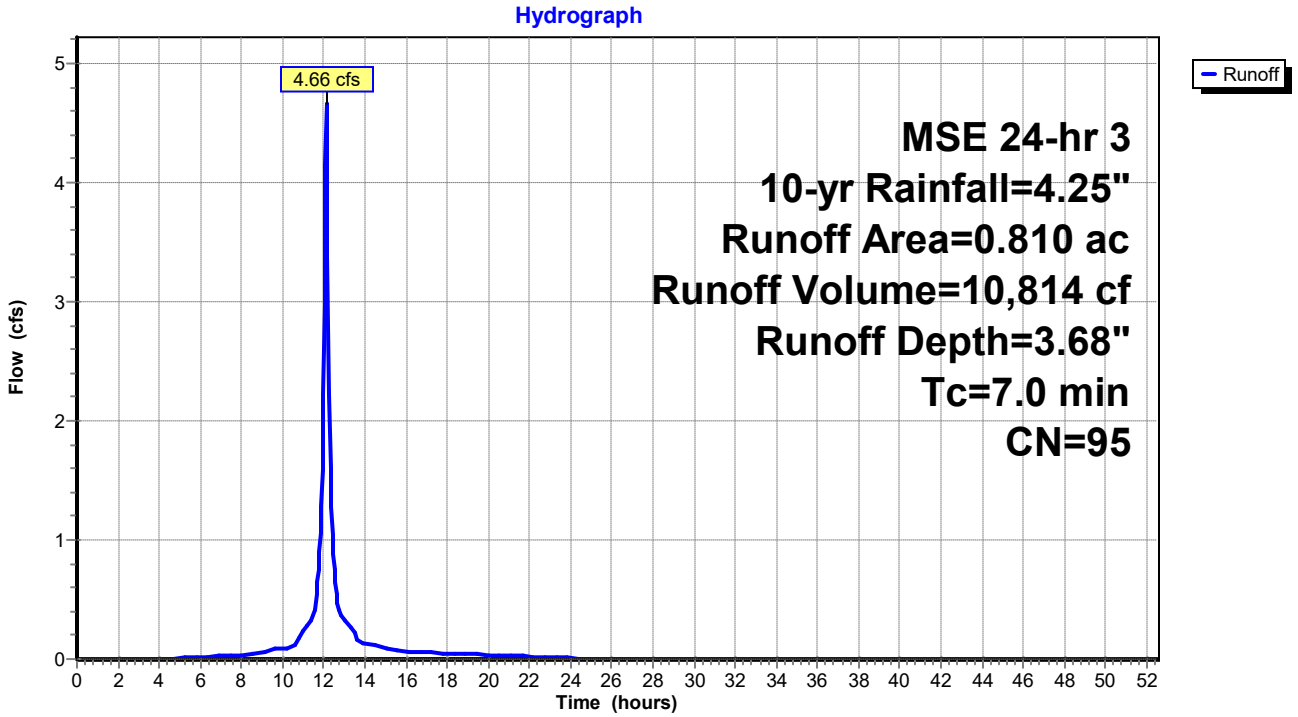
Runoff = 4.66 cfs @ 12.14 hrs, Volume= 10,814 cf, Depth= 3.68"
Routed to Reach 12R : AMERICAN BLVD

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-yr Rainfall=4.25"

Area (ac)	CN	Description
0.700	98	Paved parking, HSG C
0.110	74	>75% Grass cover, Good, HSG C
0.810	95	Weighted Average
0.110		13.58% Pervious Area
0.700		86.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**
6.0	0	Total, Increased to minimum Tc = 7.0 min			

Subcatchment P DA-5: P-DA-5



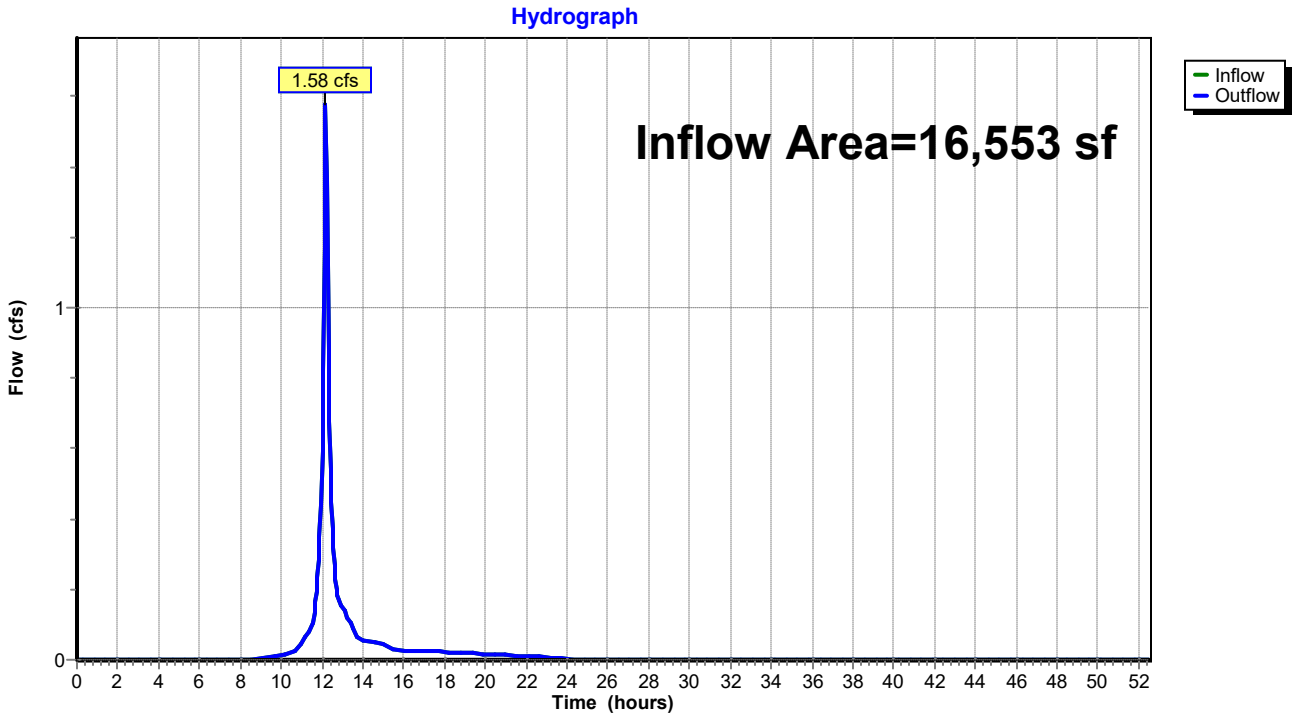
Summary for Reach 10R: PENN AVE

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 16,553 sf, 50.00% Impervious, Inflow Depth = 2.77" for 10-yr event
Inflow = 1.58 cfs @ 12.17 hrs, Volume= 3,826 cf
Outflow = 1.58 cfs @ 12.17 hrs, Volume= 3,826 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node Energy Dr

Routing by Dyn-Stor-Ind method, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs

Reach 10R: PENN AVE



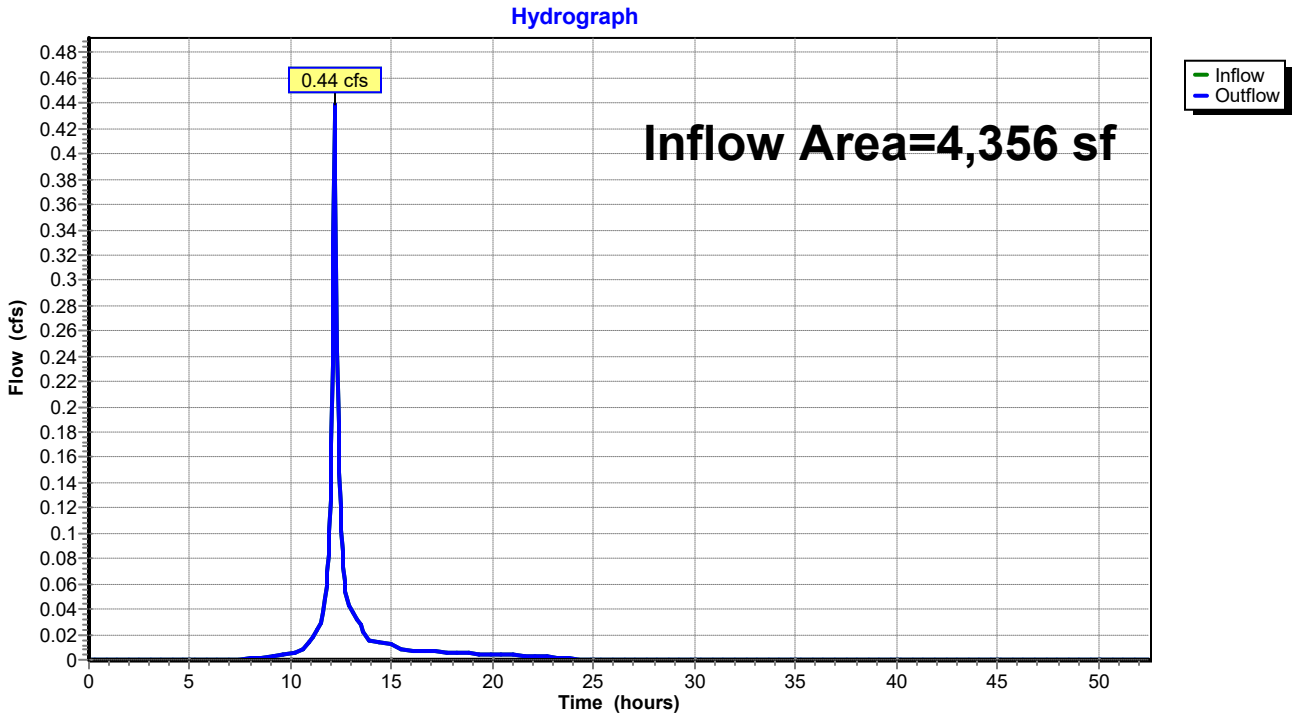
Summary for Reach 11R: KNOX AVE

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 4,356 sf, 60.00% Impervious, Inflow Depth = 2.96" for 10-yr event
Inflow = 0.44 cfs @ 12.17 hrs, Volume= 1,075 cf
Outflow = 0.44 cfs @ 12.17 hrs, Volume= 1,075 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node Energy Dr

Routing by Dyn-Stor-Ind method, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs

Reach 11R: KNOX AVE



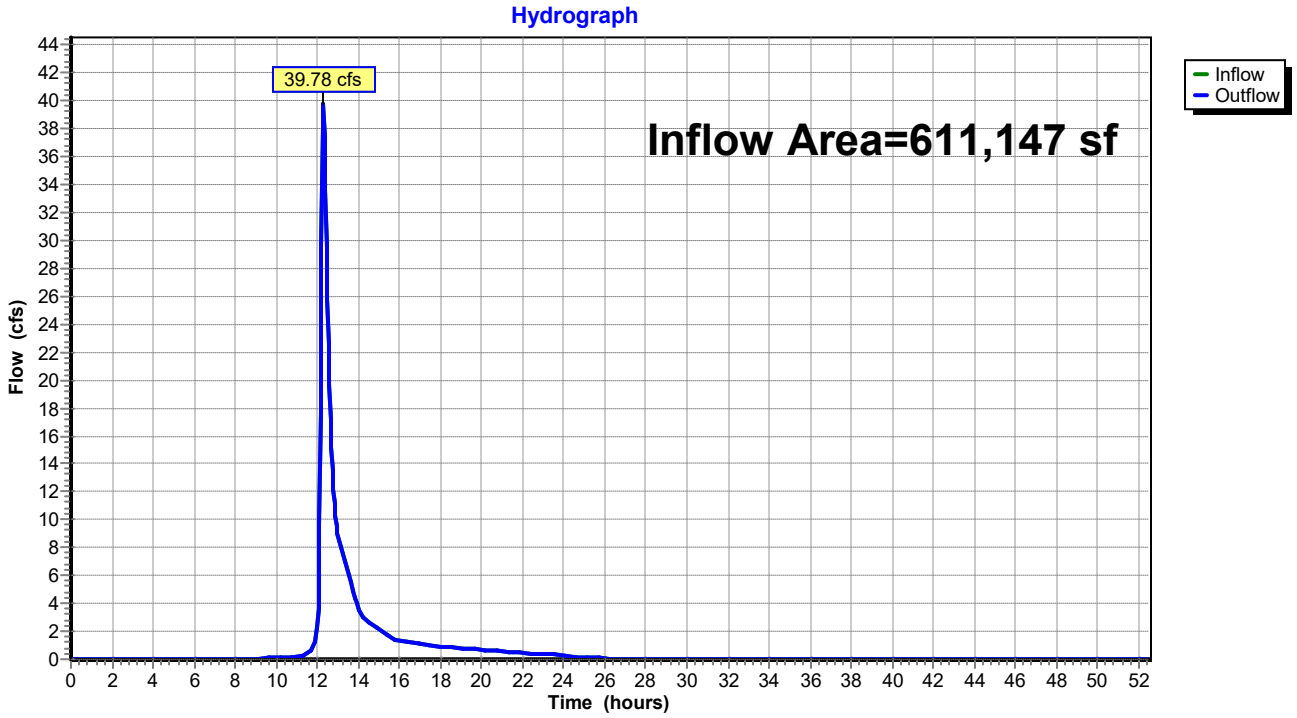
Summary for Reach 12R: AMERICAN BLVD

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 611,147 sf, 89.09% Impervious, Inflow Depth = 2.66" for 10-yr event
Inflow = 39.78 cfs @ 12.30 hrs, Volume= 135,497 cf
Outflow = 39.78 cfs @ 12.30 hrs, Volume= 135,497 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs

Reach 12R: AMERICAN BLVD



Summary for Pond 1P: SYSTEM #1

Inflow Area = 320,602 sf, 89.13% Impervious, Inflow Depth = 3.68" for 10-yr event
Inflow = 37.58 cfs @ 12.17 hrs, Volume= 98,257 cf
Outflow = 21.57 cfs @ 12.30 hrs, Volume= 69,008 cf, Atten= 43%, Lag= 7.7 min
Primary = 21.57 cfs @ 12.30 hrs, Volume= 69,008 cf
Routed to Reach 12R : AMERICAN BLVD

Routing by Dyn-Stor-Ind method, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs
Peak Elev= 824.87' @ 12.30 hrs Surf.Area= 16,214 sf Storage= 46,757 cf

Plug-Flow detention time= 144.9 min calculated for 69,008 cf (70% of inflow)
Center-of-Mass det. time= 77.1 min (845.1 - 768.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	820.00'	31,677 cf	**67.00'W x 242.00'L x 7.50'H Field A** 121,605 cf Overall - 42,412 cf Embedded = 79,193 cf x 40.0% Voids
#2A	822.00'	42,412 cf	**CMP Round 60** x 108 Inside #1 Effective Size= 60.0"W x 60.0"H => 19.63 sf x 20.00'L = 392.7 cf Overall Size= 60.0"W x 60.0"H x 20.00'L 108 Chambers in 9 Rows
		74,089 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	820.00'	**24.0" Round Outlet to American Blvd** L= 500.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 820.00' / 817.50' S= 0.0050 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 3.14 sf
#2	Device 1	820.00'	**6.0" Vert. Draintile X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Device 2	820.00'	**0.800 in/hr Filtration Through Sand over Surface area above 820.00'** Excluded Surface area = 16,214 sf
#4	Device 1	823.51'	**42.0" W x 6.0" H Vert. Orifice in Weir** C= 0.600 Limited to weir flow at low heads
#5	Device 1	824.01'	**5.0' long Weir** 2 End Contraction(s)

Primary OutFlow Max=21.55 cfs @ 12.30 hrs HW=824.87' TW=0.00' (Dynamic Tailwater)
- **1=Outlet to American Blvd** (Passes 21.55 cfs of 23.17 cfs potential flow)
  - **2=Draintile** (Passes 0.00 cfs of 4.07 cfs potential flow)
    - **3=Filtration Through Sand** (Exfiltration Controls 0.00 cfs)
  - **4=Orifice in Weir** (Orifice Controls 8.87 cfs @ 5.07 fps)
  - **5=Weir** (Weir Controls 12.67 cfs @ 3.04 fps)

Pond 1P: SYSTEM #1 - Chamber Wizard Field A

Chamber Model = CMP Round 60 (Round Corrugated Metal Pipe)
Effective Size= 60.0"W x 60.0"H => 19.63 sf x 20.00'L = 392.7 cf
Overall Size= 60.0"W x 60.0"H x 20.00'L

60.0" Wide + 30.0" Spacing = 90.0" C-C Row Spacing

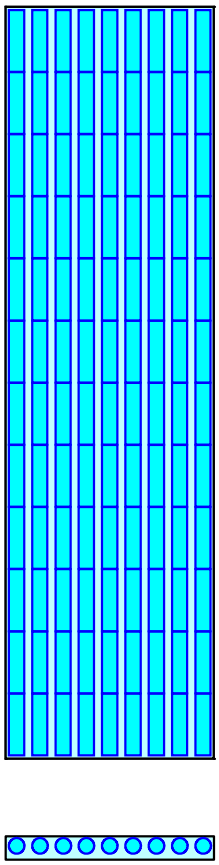
12 Chambers/Row x 20.00' Long = 240.00' Row Length +12.0" End Stone x 2 = 242.00' Base Length
9 Rows x 60.0" Wide + 30.0" Spacing x 8 + 12.0" Side Stone x 2 = 67.00' Base Width
24.0" Stone Base + 60.0" Chamber Height + 6.0" Stone Cover = 7.50' Field Height

108 Chambers x 392.7 cf = 42,411.5 cf Chamber Storage

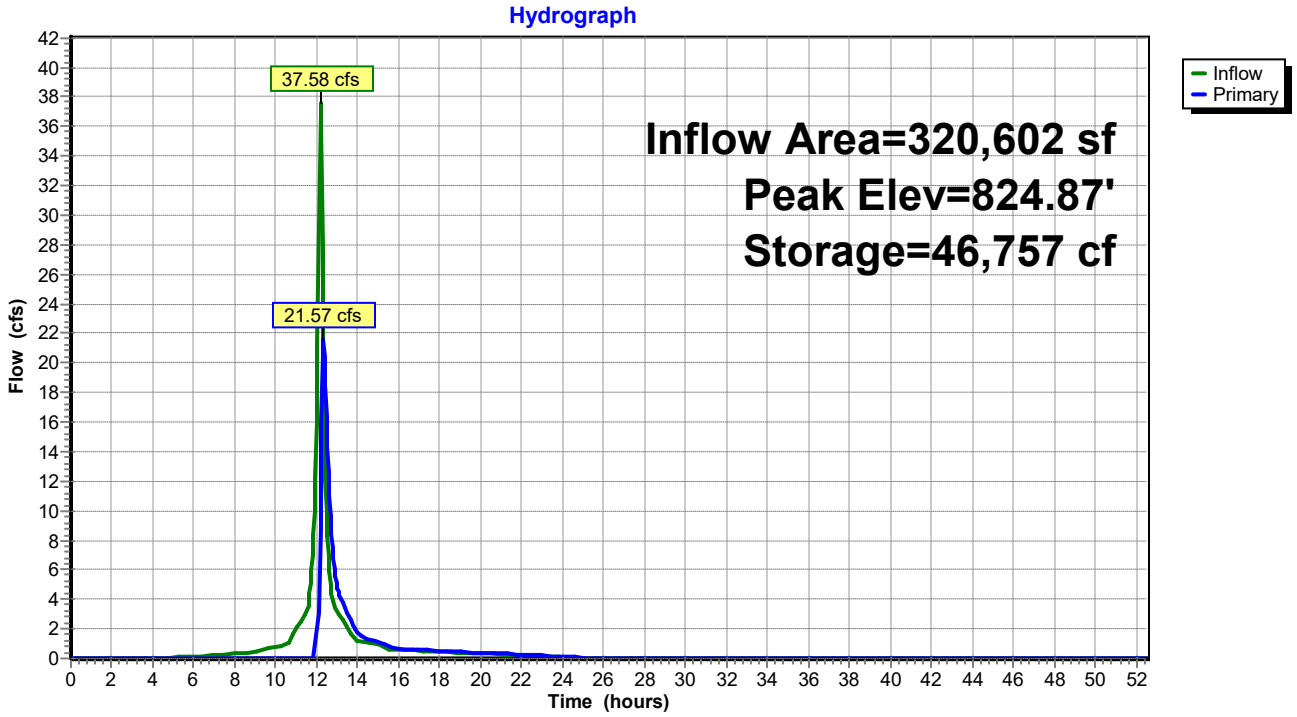
121,605.0 cf Field - 42,411.5 cf Chambers = 79,193.5 cf Stone x 40.0% Voids = 31,677.4 cf Stone Storage

Chamber Storage + Stone Storage = 74,088.9 cf = 1.701 af
Overall Storage Efficiency = 60.9%
Overall System Size = 242.00' x 67.00' x 7.50'

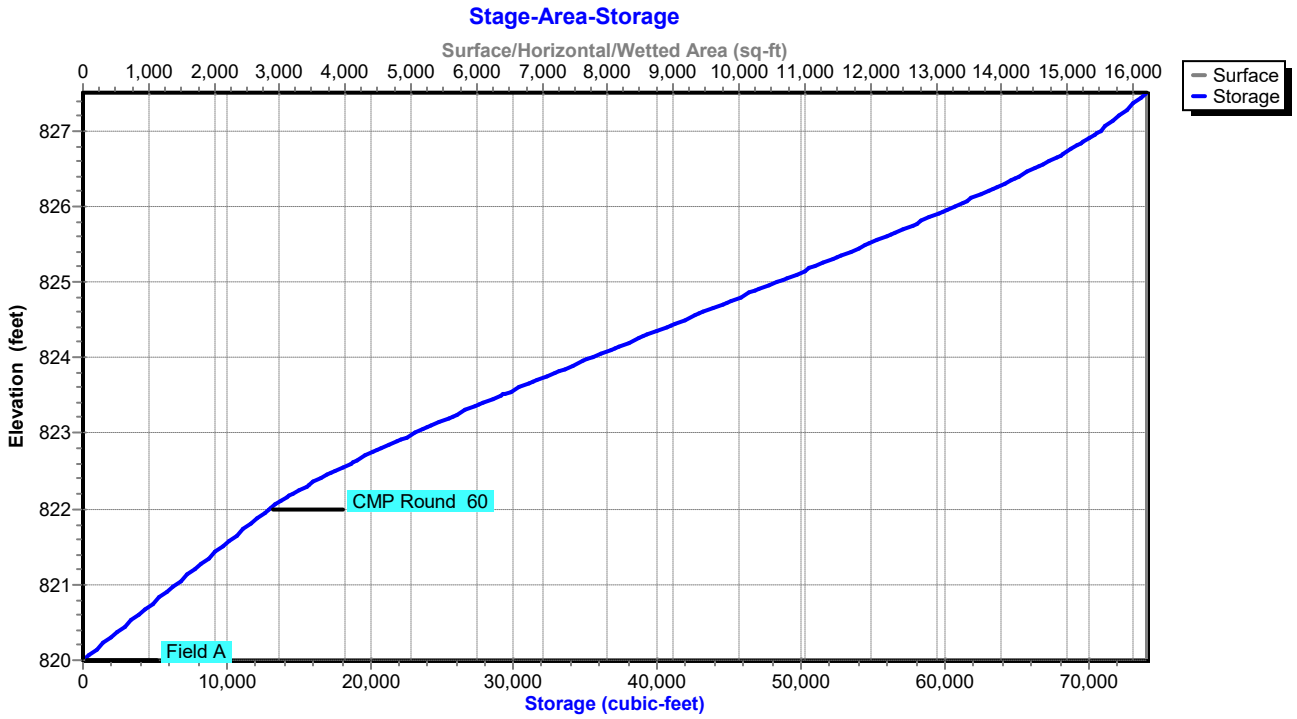
108 Chambers
4,503.9 cy Field
2,933.1 cy Stone



Pond 1P: SYSTEM #1



Pond 1P: SYSTEM #1



Summary for Pond 2P: SYSTEM #2

Inflow Area = 255,262 sf, 89.42% Impervious, Inflow Depth = 3.68" for 10-yr event
Inflow = 29.92 cfs @ 12.17 hrs, Volume= 78,232 cf
Outflow = 16.61 cfs @ 12.31 hrs, Volume= 55,675 cf, Atten= 44%, Lag= 8.1 min
Primary = 16.61 cfs @ 12.31 hrs, Volume= 55,675 cf
Routed to Reach 12R : AMERICAN BLVD

Routing by Dyn-Stor-Ind method, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs
Peak Elev= 826.26' @ 12.31 hrs Surf.Area= 12,019 sf Storage= 38,341 cf

Plug-Flow detention time= 149.8 min calculated for 55,623 cf (71% of inflow)
Center-of-Mass det. time= 84.7 min (852.6 - 768.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	821.00'	23,491 cf	**59.50'W x 202.00'L x 7.50'H Field A** 90,143 cf Overall - 31,416 cf Embedded = 58,727 cf x 40.0% Voids
#2A	823.00'	31,416 cf	**CMP Round 60** x 80 Inside #1 Effective Size= 60.0"W x 60.0"H => 19.63 sf x 20.00'L = 392.7 cf Overall Size= 60.0"W x 60.0"H x 20.00'L 80 Chambers in 8 Rows
		54,907 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	821.00'	**24.0" Round Outlet to American Boulevard** L= 600.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 821.00' / 817.50' S= 0.0058 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 3.14 sf
#2	Device 1	821.00'	**6.0" Vert. Draintile X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Device 2	821.00'	**0.800 in/hr Filtration over Surface area above 821.00'** Excluded Surface area = 12,019 sf
#4	Device 1	824.60'	**6.0" Vert. Orifice in Weir X 5.00** C= 0.600 Limited to weir flow at low heads
#5	Device 1	825.48'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=16.50 cfs @ 12.31 hrs HW=826.26' TW=0.00' (Dynamic Tailwater)
- **1=Outlet to American Boulevard** (Passes 16.50 cfs of 24.34 cfs potential flow)
  - **2=Draintile** (Passes 0.00 cfs of 4.23 cfs potential flow)
    - **3=Filtration** (Exfiltration Controls 0.00 cfs)
  - **4=Orifice in Weir** (Orifice Controls 5.61 cfs @ 5.72 fps)
  - **5=Sharp-Crested Rectangular Weir** (Weir Controls 10.89 cfs @ 2.89 fps)

Pond 2P: SYSTEM #2 - Chamber Wizard Field A

Chamber Model = CMP Round 60 (Round Corrugated Metal Pipe)
Effective Size= 60.0"W x 60.0"H => 19.63 sf x 20.00'L = 392.7 cf
Overall Size= 60.0"W x 60.0"H x 20.00'L

60.0" Wide + 30.0" Spacing = 90.0" C-C Row Spacing

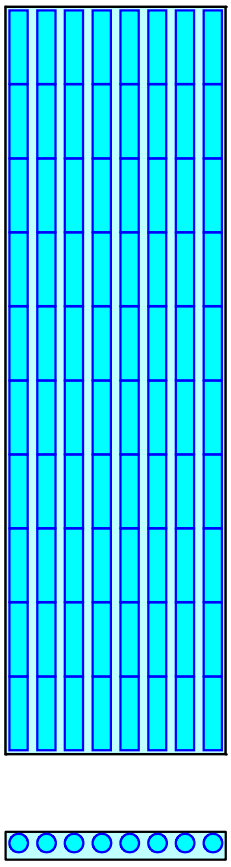
10 Chambers/Row x 20.00' Long = 200.00' Row Length +12.0" End Stone x 2 = 202.00' Base Length
8 Rows x 60.0" Wide + 30.0" Spacing x 7 + 12.0" Side Stone x 2 = 59.50' Base Width
24.0" Stone Base + 60.0" Chamber Height + 6.0" Stone Cover = 7.50' Field Height

80 Chambers x 392.7 cf = 31,415.9 cf Chamber Storage

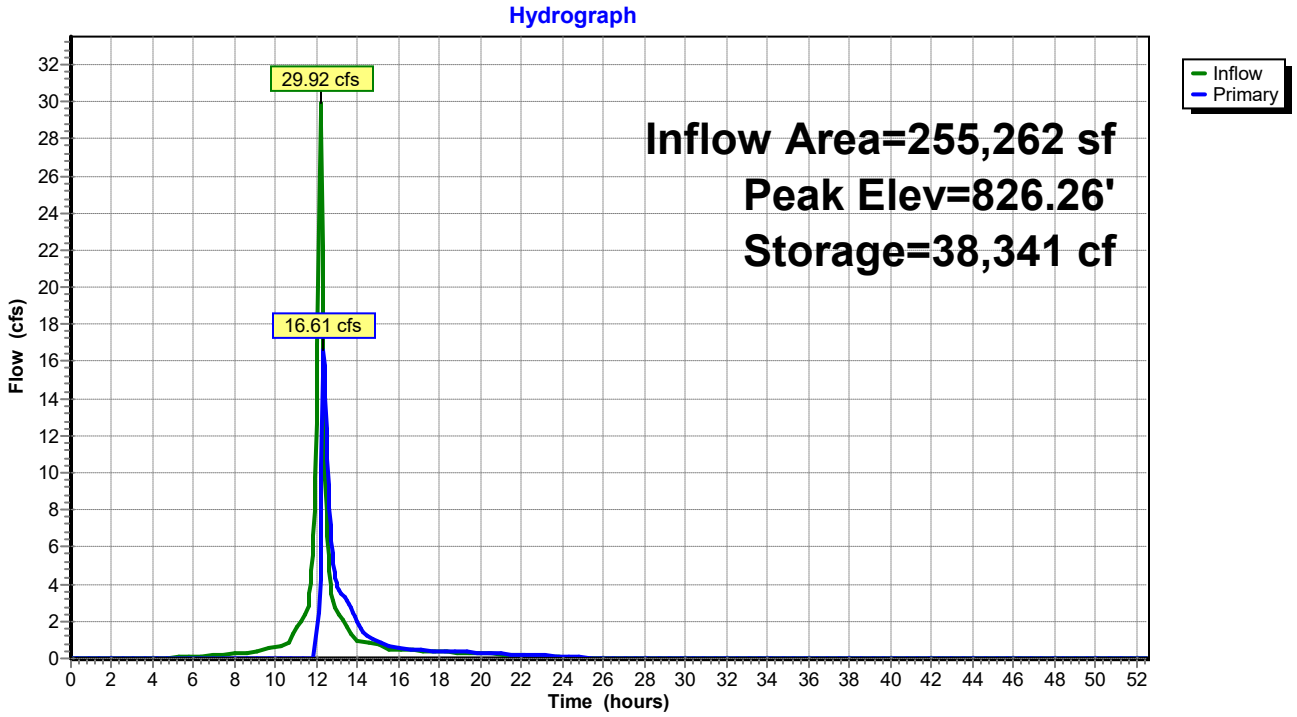
90,142.5 cf Field - 31,415.9 cf Chambers = 58,726.6 cf Stone x 40.0% Voids = 23,490.6 cf Stone Storage

Chamber Storage + Stone Storage = 54,906.6 cf = 1.260 af
Overall Storage Efficiency = 60.9%
Overall System Size = 202.00' x 59.50' x 7.50'

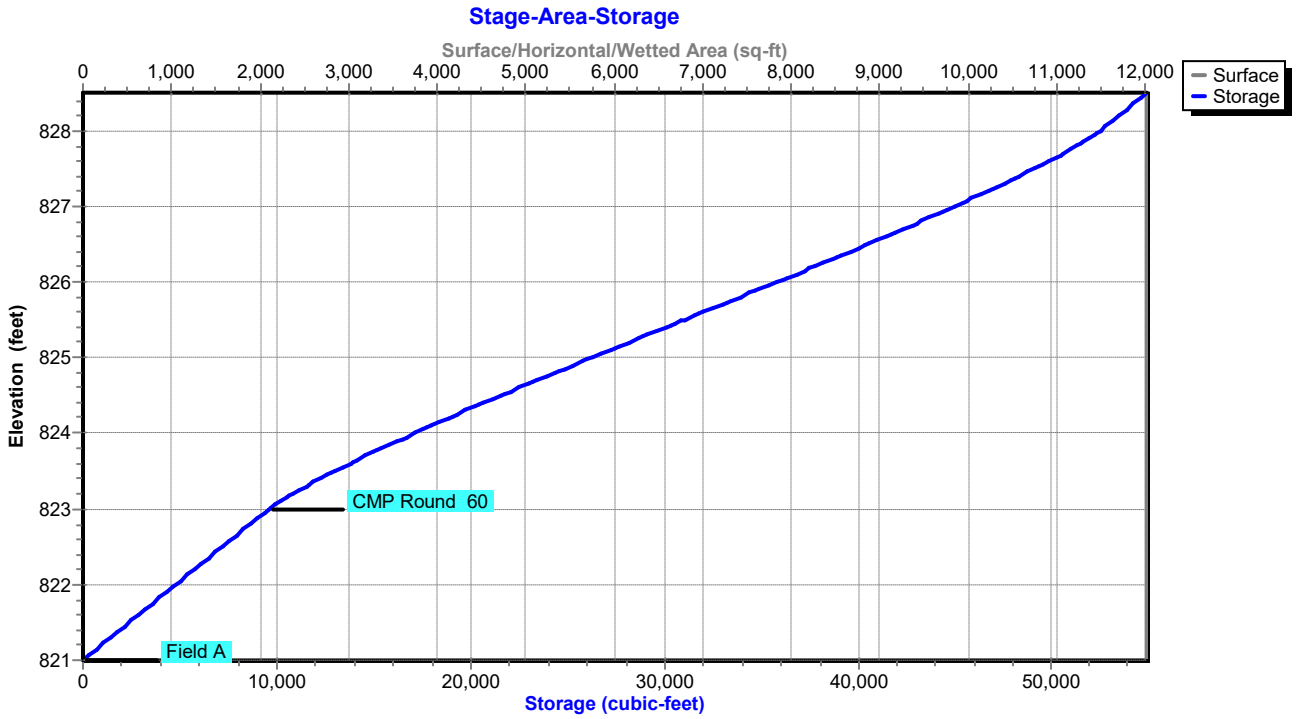
80 Chambers
3,338.6 cy Field
2,175.1 cy Stone



Pond 2P: SYSTEM #2



Pond 2P: SYSTEM #2



Time span=0.00-52.50 hrs, dt=0.05 hrs, 1051 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment P DA-1: P-DA-1 Runoff Area=7.360 ac 89.13% Impervious Runoff Depth=6.89"
Tc=10.0 min CN=95 Runoff=68.05 cfs 184,171 cf

Subcatchment P DA-2: P-DA-2 Runoff Area=0.380 ac 50.00% Impervious Runoff Depth=5.84"
Tc=10.0 min CN=86 Runoff=3.20 cfs 8,053 cf

Subcatchment P DA-3: P-DA-3 Runoff Area=0.100 ac 60.00% Impervious Runoff Depth=6.07"
Tc=10.0 min CN=88 Runoff=0.87 cfs 2,204 cf

Subcatchment P DA-4: P-DA-4 Runoff Area=5.860 ac 89.42% Impervious Runoff Depth=6.89"
Tc=10.0 min CN=95 Runoff=54.18 cfs 146,636 cf

Subcatchment P DA-5: P-DA-5 Runoff Area=0.810 ac 86.42% Impervious Runoff Depth=6.89"
Tc=7.0 min CN=95 Runoff=8.42 cfs 20,269 cf

Reach 10R: PENN AVE Inflow=3.20 cfs 8,053 cf
Outflow=3.20 cfs 8,053 cf

Reach 11R: KNOX AVE Inflow=0.87 cfs 2,204 cf
Outflow=0.87 cfs 2,204 cf

Reach 12R: AMERICAN BLVD Inflow=59.01 cfs 299,269 cf
Outflow=59.01 cfs 299,269 cf

Pond 1P: SYSTEM #1 Peak Elev=827.45' Storage=73,789 cf Inflow=68.05 cfs 184,171 cf
Outflow=28.19 cfs 154,921 cf

Pond 2P: SYSTEM #2 Peak Elev=828.49' Storage=54,880 cf Inflow=54.18 cfs 146,636 cf
Outflow=28.07 cfs 124,079 cf

Total Runoff Area = 632,056 sf Runoff Volume = 361,331 cf Average Runoff Depth = 6.86"
12.13% Pervious = 76,666 sf 87.87% Impervious = 555,390 sf

Summary for Subcatchment P DA-1: P-DA-1

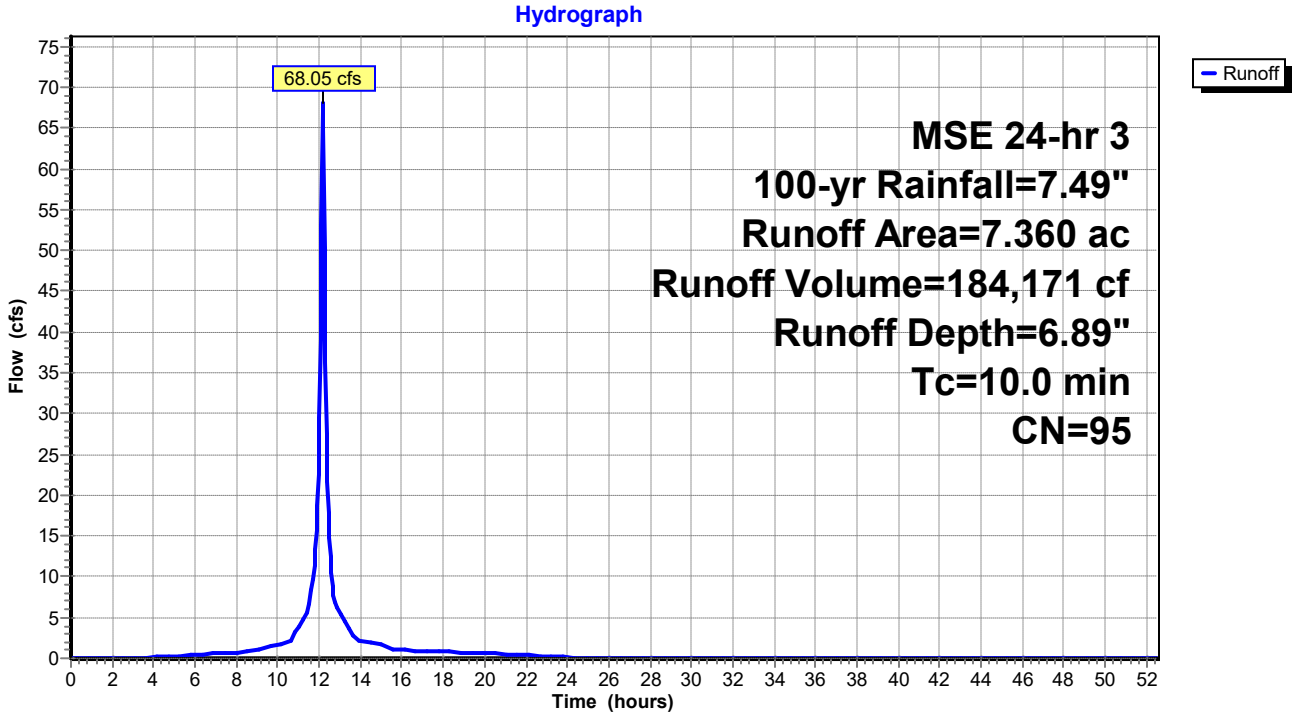
Runoff = 68.05 cfs @ 12.17 hrs, Volume= 184,171 cf, Depth= 6.89"
Routed to Pond 1P : SYSTEM #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-yr Rainfall=7.49"

Area (ac)	CN	Description
6.560	98	Paved parking, HSG C
0.800	74	>75% Grass cover, Good, HSG C
7.360	95	Weighted Average
0.800		10.87% Pervious Area
6.560		89.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment P DA-1: P-DA-1



Summary for Subcatchment P DA-2: P-DA-2

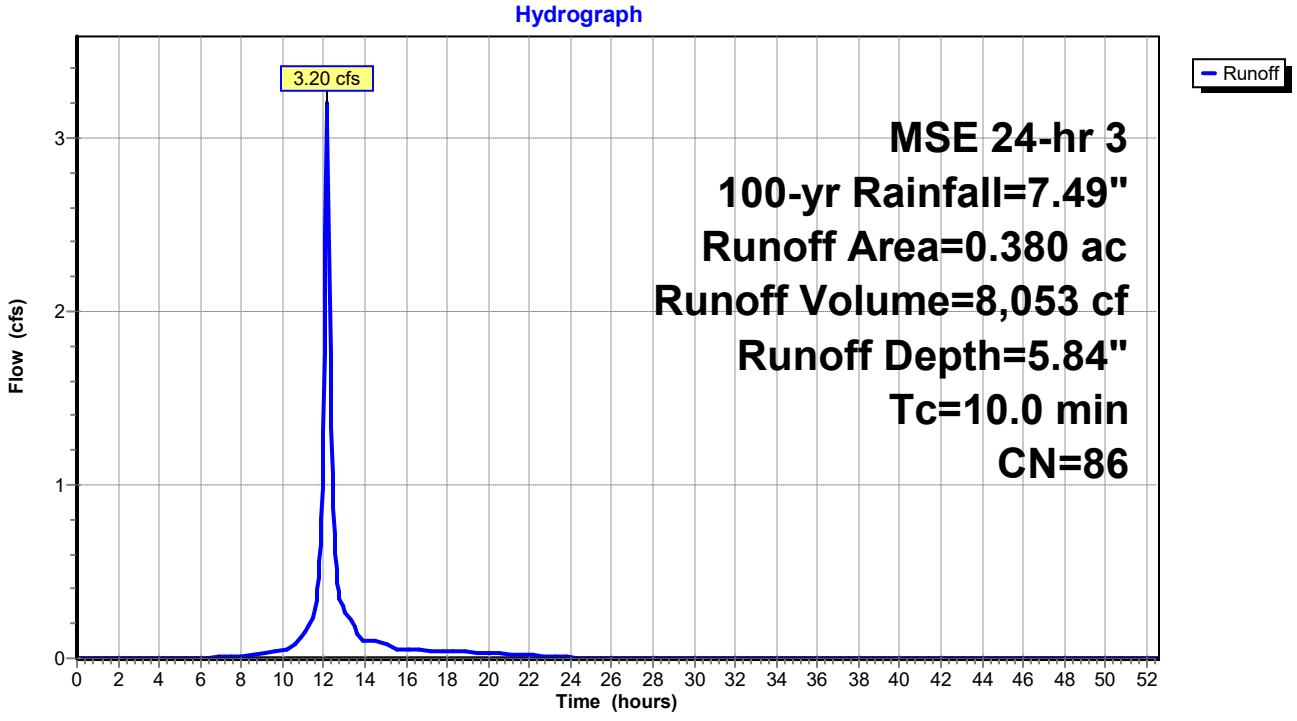
Runoff = 3.20 cfs @ 12.17 hrs, Volume= 8,053 cf, Depth= 5.84"
Routed to Reach 10R : PENN AVE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-yr Rainfall=7.49"

Area (ac)	CN	Description
0.190	98	Paved parking, HSG C
0.190	74	>75% Grass cover, Good, HSG C
0.380	86	Weighted Average
0.190		50.00% Pervious Area
0.190		50.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment P DA-2: P-DA-2



Summary for Subcatchment P DA-3: P-DA-3

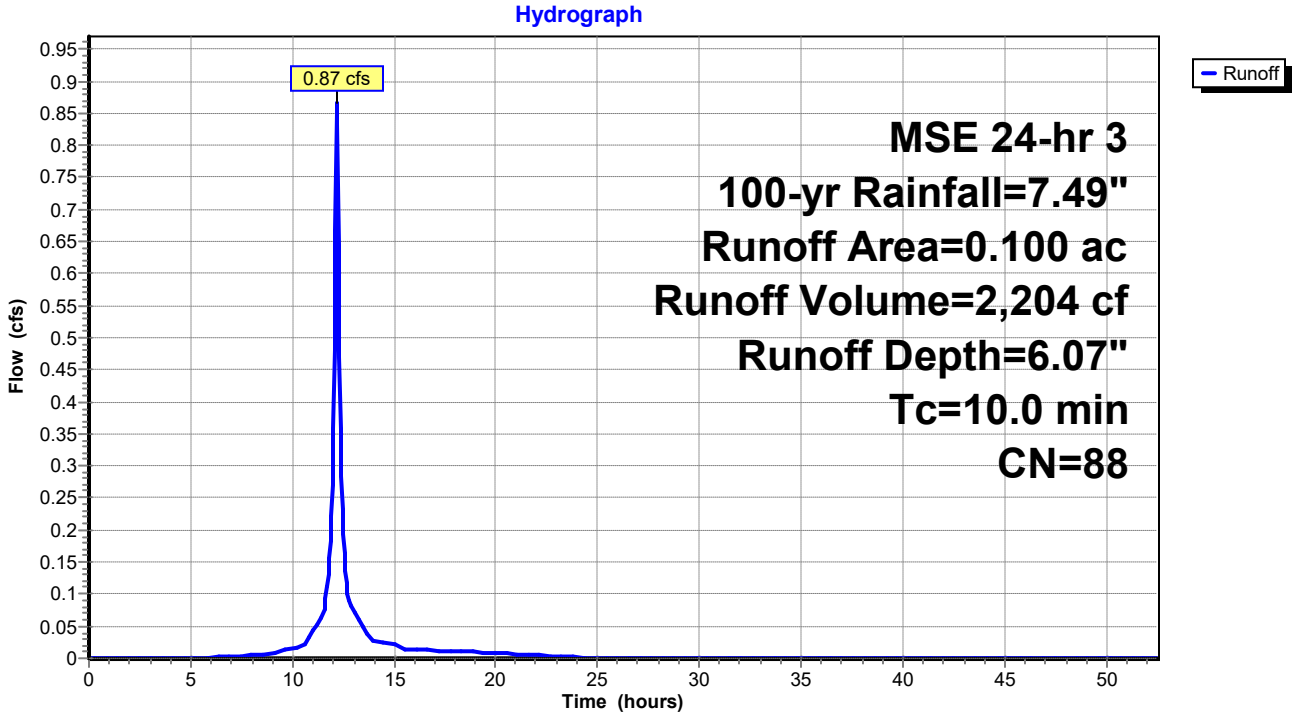
Runoff = 0.87 cfs @ 12.17 hrs, Volume= 2,204 cf, Depth= 6.07"
Routed to Reach 11R : KNOX AVE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-yr Rainfall=7.49"

Area (ac)	CN	Description
0.060	98	Paved parking, HSG C
0.040	74	>75% Grass cover, Good, HSG C
0.100	88	Weighted Average
0.040		40.00% Pervious Area
0.060		60.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment P DA-3: P-DA-3



Summary for Subcatchment P DA-4: P-DA-4

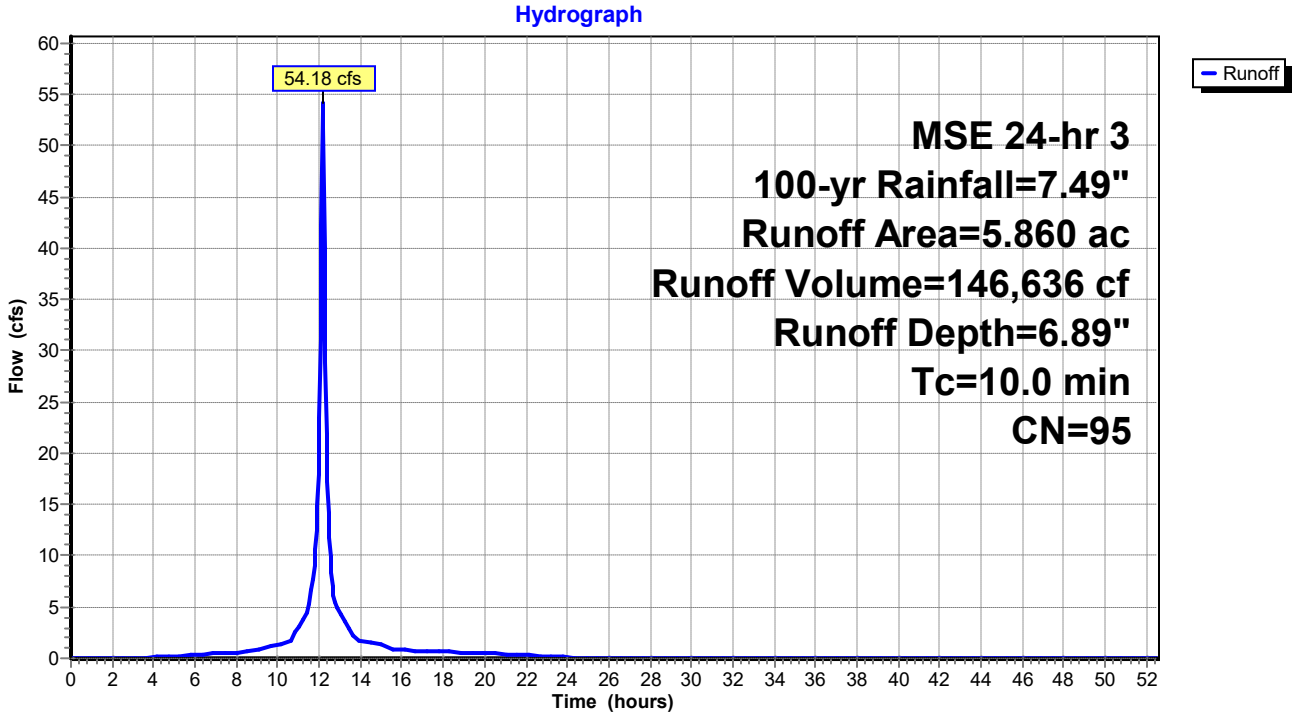
Runoff = 54.18 cfs @ 12.17 hrs, Volume= 146,636 cf, Depth= 6.89"
Routed to Pond 2P : SYSTEM #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-yr Rainfall=7.49"

Area (ac)	CN	Description
5.240	98	Paved parking, HSG C
0.620	74	>75% Grass cover, Good, HSG C
5.860	95	Weighted Average
0.620		10.58% Pervious Area
5.240		89.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment P DA-4: P-DA-4



Summary for Subcatchment P DA-5: P-DA-5

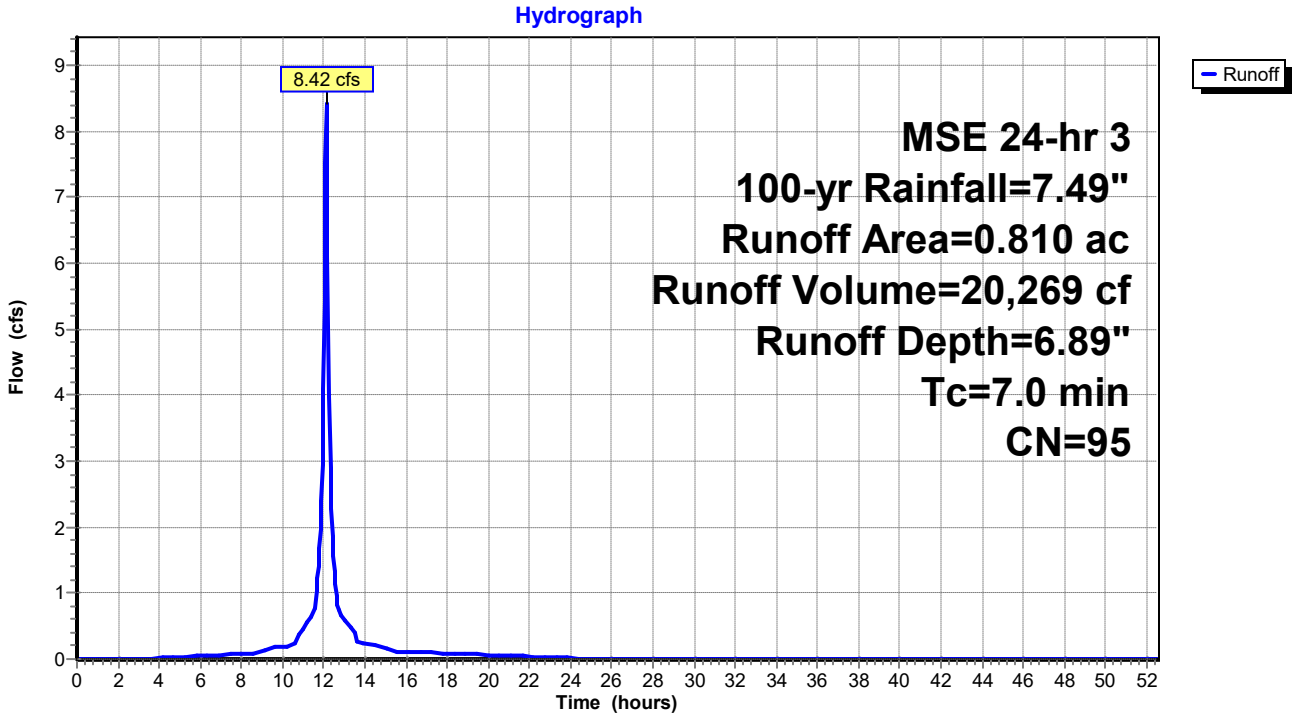
Runoff = 8.42 cfs @ 12.14 hrs, Volume= 20,269 cf, Depth= 6.89"
Routed to Reach 12R : AMERICAN BLVD

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-yr Rainfall=7.49"

Area (ac)	CN	Description
0.700	98	Paved parking, HSG C
0.110	74	>75% Grass cover, Good, HSG C
0.810	95	Weighted Average
0.110		13.58% Pervious Area
0.700		86.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**
6.0	0	Total, Increased to minimum Tc = 7.0 min			

Subcatchment P DA-5: P-DA-5



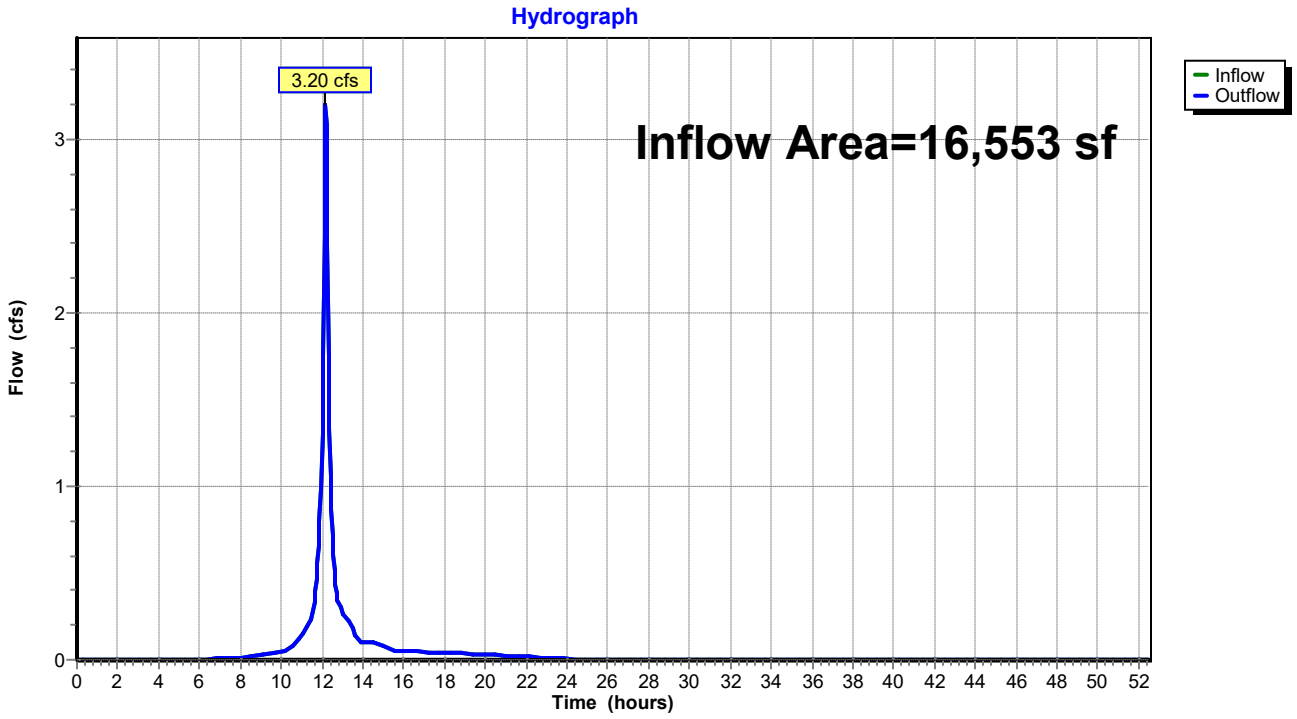
Summary for Reach 10R: PENN AVE

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 16,553 sf, 50.00% Impervious, Inflow Depth = 5.84" for 100-yr event
Inflow = 3.20 cfs @ 12.17 hrs, Volume= 8,053 cf
Outflow = 3.20 cfs @ 12.17 hrs, Volume= 8,053 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node Energy Dr

Routing by Dyn-Stor-Ind method, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs

Reach 10R: PENN AVE



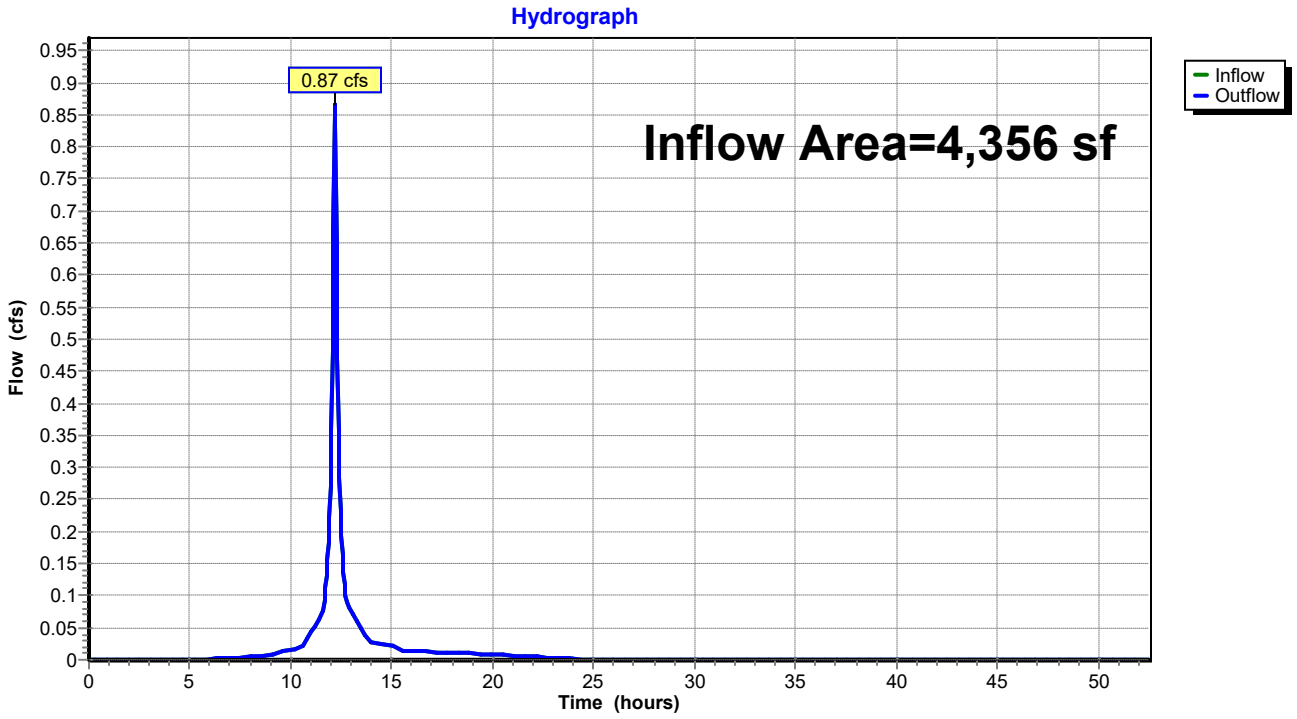
Summary for Reach 11R: KNOX AVE

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 4,356 sf, 60.00% Impervious, Inflow Depth = 6.07" for 100-yr event
Inflow = 0.87 cfs @ 12.17 hrs, Volume= 2,204 cf
Outflow = 0.87 cfs @ 12.17 hrs, Volume= 2,204 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node Energy Dr

Routing by Dyn-Stor-Ind method, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs

Reach 11R: KNOX AVE



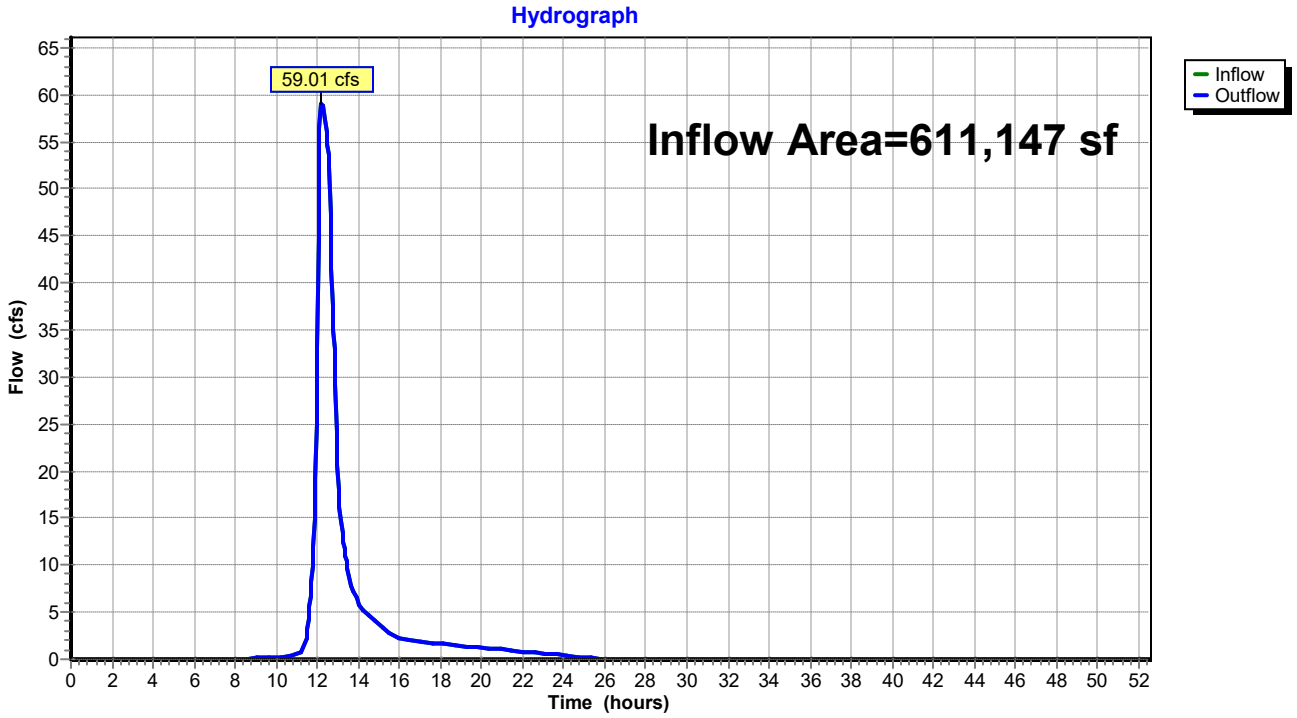
Summary for Reach 12R: AMERICAN BLVD

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 611,147 sf, 89.09% Impervious, Inflow Depth = 5.88" for 100-yr event
Inflow = 59.01 cfs @ 12.15 hrs, Volume= 299,269 cf
Outflow = 59.01 cfs @ 12.15 hrs, Volume= 299,269 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs

Reach 12R: AMERICAN BLVD



Summary for Pond 1P: SYSTEM #1

Inflow Area = 320,602 sf, 89.13% Impervious, Inflow Depth = 6.89" for 100-yr event
Inflow = 68.05 cfs @ 12.17 hrs, Volume= 184,171 cf
Outflow = 28.19 cfs @ 12.35 hrs, Volume= 154,921 cf, Atten= 59%, Lag= 10.9 min
Primary = 28.19 cfs @ 12.35 hrs, Volume= 154,921 cf
Routed to Reach 12R : AMERICAN BLVD

Routing by Dyn-Stor-Ind method, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs
Peak Elev= 827.45' @ 12.35 hrs Surf.Area= 16,214 sf Storage= 73,789 cf

Plug-Flow detention time= 114.7 min calculated for 154,774 cf (84% of inflow)
Center-of-Mass det. time= 62.8 min (819.9 - 757.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	820.00'	31,677 cf	**67.00'W x 242.00'L x 7.50'H Field A** 121,605 cf Overall - 42,412 cf Embedded = 79,193 cf x 40.0% Voids
#2A	822.00'	42,412 cf	**CMP Round 60** x 108 Inside #1 Effective Size= 60.0"W x 60.0"H => 19.63 sf x 20.00'L = 392.7 cf Overall Size= 60.0"W x 60.0"H x 20.00'L 108 Chambers in 9 Rows
		74,089 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	820.00'	**24.0" Round Outlet to American Blvd** L= 500.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 820.00' / 817.50' S= 0.0050 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 3.14 sf
#2	Device 1	820.00'	**6.0" Vert. Draintile X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Device 2	820.00'	**0.800 in/hr Filtration Through Sand over Surface area above 820.00'** Excluded Surface area = 16,214 sf
#4	Device 1	823.51'	**42.0" W x 6.0" H Vert. Orifice in Weir** C= 0.600 Limited to weir flow at low heads
#5	Device 1	824.01'	**5.0' long Weir** 2 End Contraction(s)

Primary OutFlow Max=28.18 cfs @ 12.35 hrs HW=827.45' TW=0.00' (Dynamic Tailwater)
- **1=Outlet to American Blvd** (Barrel Controls 28.18 cfs @ 8.97 fps)
- **2=Draintile** (Passes 0.00 cfs of 5.07 cfs potential flow)
  - **3=Filtration Through Sand** (Exfiltration Controls 0.00 cfs)
- **4=Orifice in Weir** (Passes < 16.18 cfs potential flow)
- **5=Weir** (Passes < 89.99 cfs potential flow)

Pond 1P: SYSTEM #1 - Chamber Wizard Field A

Chamber Model = CMP Round 60 (Round Corrugated Metal Pipe)
Effective Size= 60.0"W x 60.0"H => 19.63 sf x 20.00'L = 392.7 cf
Overall Size= 60.0"W x 60.0"H x 20.00'L

60.0" Wide + 30.0" Spacing = 90.0" C-C Row Spacing

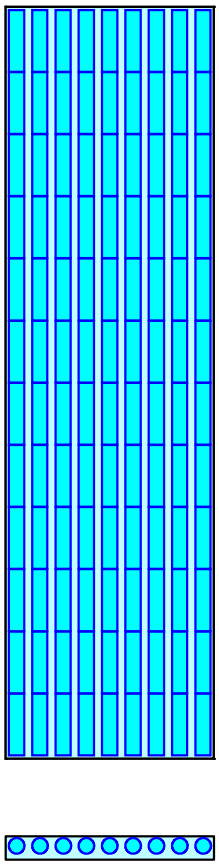
12 Chambers/Row x 20.00' Long = 240.00' Row Length +12.0" End Stone x 2 = 242.00' Base Length
9 Rows x 60.0" Wide + 30.0" Spacing x 8 + 12.0" Side Stone x 2 = 67.00' Base Width
24.0" Stone Base + 60.0" Chamber Height + 6.0" Stone Cover = 7.50' Field Height

108 Chambers x 392.7 cf = 42,411.5 cf Chamber Storage

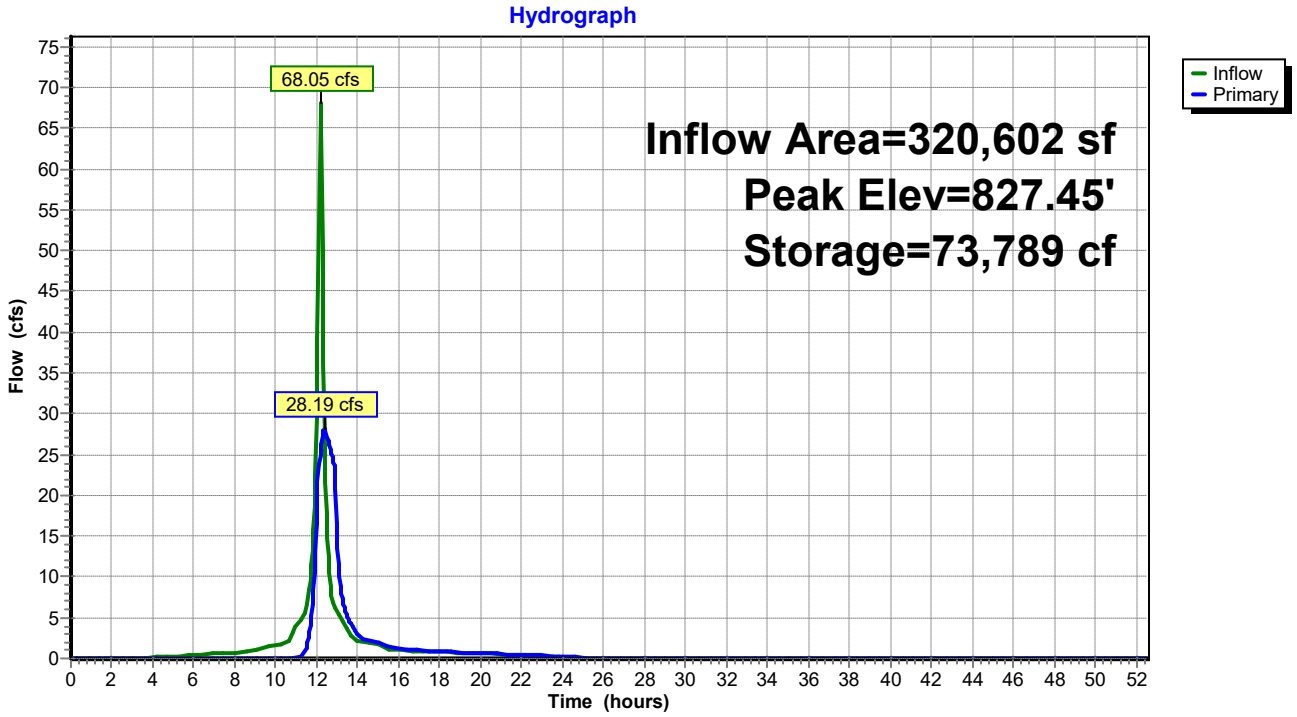
121,605.0 cf Field - 42,411.5 cf Chambers = 79,193.5 cf Stone x 40.0% Voids = 31,677.4 cf Stone Storage

Chamber Storage + Stone Storage = 74,088.9 cf = 1.701 af
Overall Storage Efficiency = 60.9%
Overall System Size = 242.00' x 67.00' x 7.50'

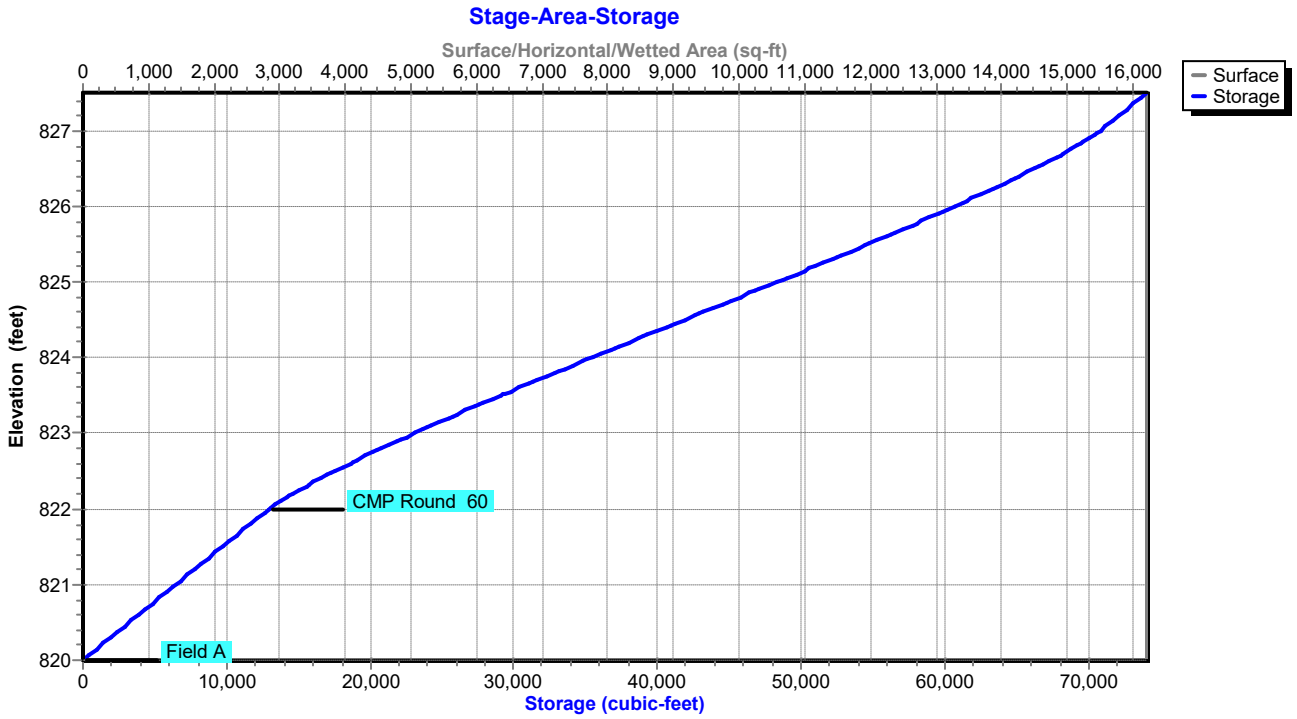
108 Chambers
4,503.9 cy Field
2,933.1 cy Stone



Pond 1P: SYSTEM #1



Pond 1P: SYSTEM #1



Summary for Pond 2P: SYSTEM #2

Inflow Area = 255,262 sf, 89.42% Impervious, Inflow Depth = 6.89" for 100-yr event
Inflow = 54.18 cfs @ 12.17 hrs, Volume= 146,636 cf
Outflow = 28.07 cfs @ 12.31 hrs, Volume= 124,079 cf, Atten= 48%, Lag= 8.5 min
Primary = 28.07 cfs @ 12.31 hrs, Volume= 124,079 cf
Routed to Reach 12R : AMERICAN BLVD

Routing by Dyn-Stor-Ind method, Time Span= 0.00-52.50 hrs, dt= 0.05 hrs
Peak Elev= 828.49' @ 12.31 hrs Surf.Area= 12,019 sf Storage= 54,880 cf

Plug-Flow detention time= 114.9 min calculated for 123,961 cf (85% of inflow)
Center-of-Mass det. time= 64.1 min (821.3 - 757.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	821.00'	23,491 cf	**59.50'W x 202.00'L x 7.50'H Field A** 90,143 cf Overall - 31,416 cf Embedded = 58,727 cf x 40.0% Voids
#2A	823.00'	31,416 cf	**CMP Round 60** x 80 Inside #1 Effective Size= 60.0"W x 60.0"H => 19.63 sf x 20.00'L = 392.7 cf Overall Size= 60.0"W x 60.0"H x 20.00'L 80 Chambers in 8 Rows
		54,907 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	821.00'	**24.0" Round Outlet to American Boulevard** L= 600.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 821.00' / 817.50' S= 0.0058 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 3.14 sf
#2	Device 1	821.00'	**6.0" Vert. Draintile X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Device 2	821.00'	**0.800 in/hr Filtration over Surface area above 821.00'** Excluded Surface area = 12,019 sf
#4	Device 1	824.60'	**6.0" Vert. Orifice in Weir X 5.00** C= 0.600 Limited to weir flow at low heads
#5	Device 1	825.48'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=28.03 cfs @ 12.31 hrs HW=828.47' TW=0.00' (Dynamic Tailwater)
- **1=Outlet to American Boulevard** (Barrel Controls 28.03 cfs @ 8.92 fps)
- **2=Draintile** (Passes 0.00 cfs of 5.08 cfs potential flow)
  - **3=Filtration** (Exfiltration Controls 0.00 cfs)
- **4=Orifice in Weir** (Passes < 8.99 cfs potential flow)
- **5=Sharp-Crested Rectangular Weir** (Passes < 74.26 cfs potential flow)

Pond 2P: SYSTEM #2 - Chamber Wizard Field A

Chamber Model = CMP Round 60 (Round Corrugated Metal Pipe)
Effective Size= 60.0"W x 60.0"H => 19.63 sf x 20.00'L = 392.7 cf
Overall Size= 60.0"W x 60.0"H x 20.00'L

60.0" Wide + 30.0" Spacing = 90.0" C-C Row Spacing

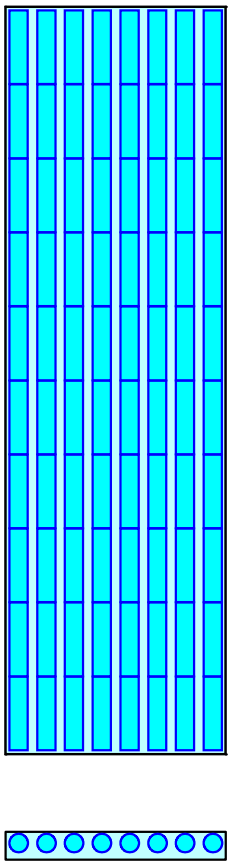
10 Chambers/Row x 20.00' Long = 200.00' Row Length +12.0" End Stone x 2 = 202.00' Base Length
8 Rows x 60.0" Wide + 30.0" Spacing x 7 + 12.0" Side Stone x 2 = 59.50' Base Width
24.0" Stone Base + 60.0" Chamber Height + 6.0" Stone Cover = 7.50' Field Height

80 Chambers x 392.7 cf = 31,415.9 cf Chamber Storage

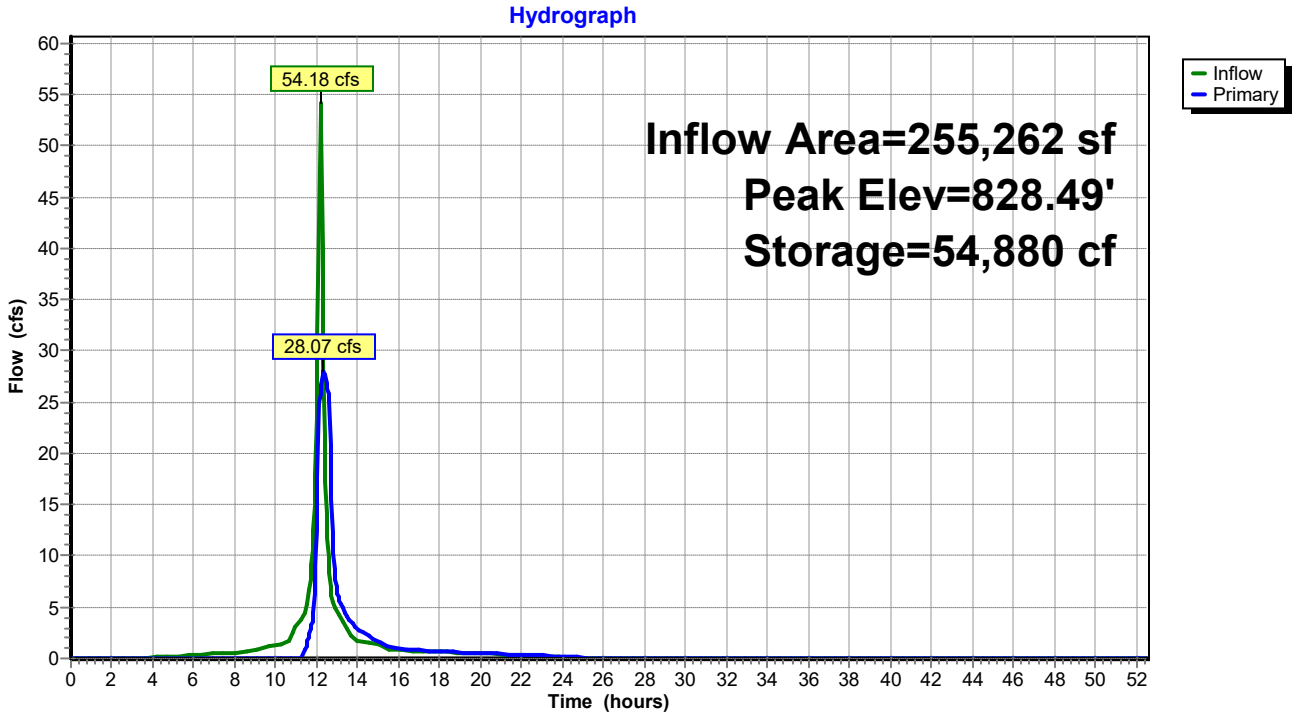
90,142.5 cf Field - 31,415.9 cf Chambers = 58,726.6 cf Stone x 40.0% Voids = 23,490.6 cf Stone Storage

Chamber Storage + Stone Storage = 54,906.6 cf = 1.260 af
Overall Storage Efficiency = 60.9%
Overall System Size = 202.00' x 59.50' x 7.50'

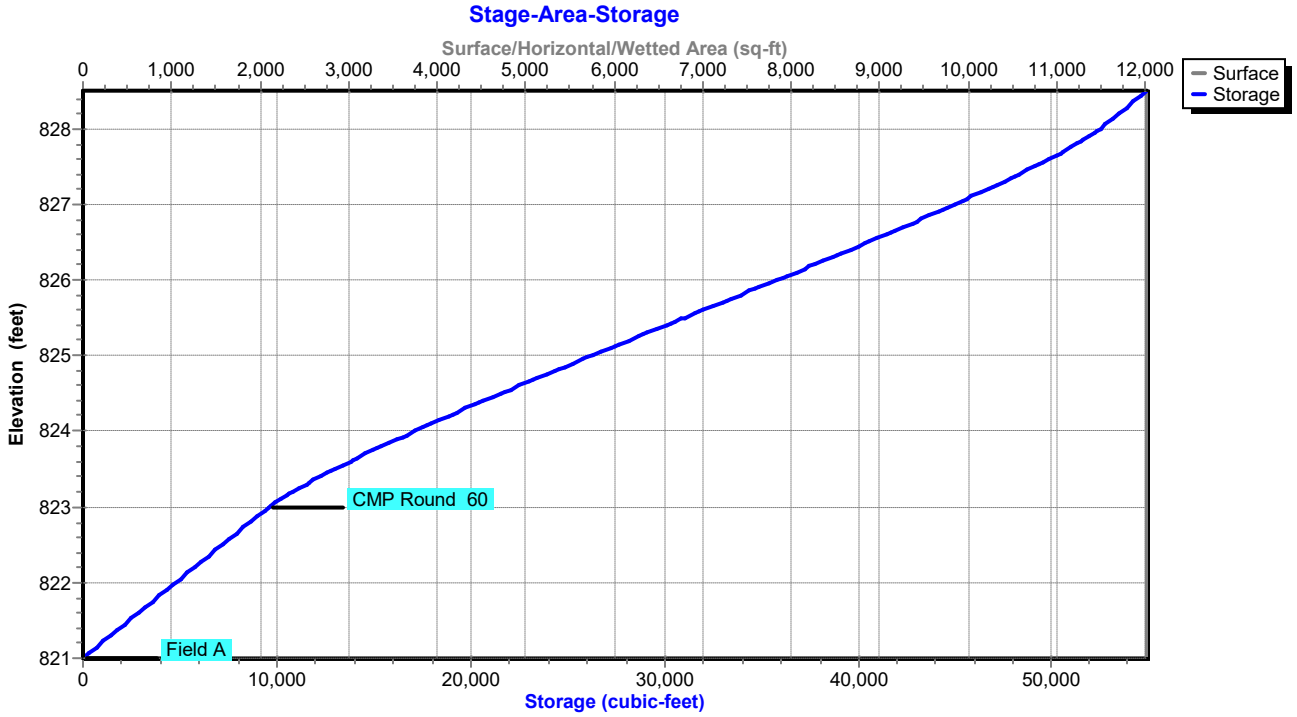
80 Chambers
3,338.6 cy Field
2,175.1 cy Stone



Pond 2P: SYSTEM #2



Pond 2P: SYSTEM #2



Appendix 4. Geotechnical Report

Geotechnical Evaluation Report

Southtown Redevelopment
Dick's House of Sports, Adjacent Retail Space and Site Improvements
7801-7997 Southtown Drive
Bloomington, Minnesota

Prepared for

Kraus Anderson Development Company

Professional Certification:
I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly licensed Professional Engineer under the laws of the State of Minnesota.

Steven B. Martin, PE
Senior Engineer
License Number: 41271
May 31, 2024

Project B2304507

Braun Intertec Corporation

Braun Intertec Corporation
11001 Hampshire Avenue S
Minneapolis, MN 55438

Phone: 952.995.2000
Fax: 952.995.2020
Web: braunintertec.com

May 31, 2024 Project B2304507

Mr. John Dreher
Kraus-Anderson Development Company
501 South 8th Street
Minneapolis, MN 55404

Re: Geotechnical Evaluation
Southtown Redevelopment – Dick's House of Sports, Adjacent Retail Space and site Improvements
7801-7997 Southtown Drive
Bloomington, Minnesota

Dear Mr. Dreher:

We are pleased to present this Geotechnical Evaluation Report for the proposed Dick's House of Sports, adjacent retail space and site improvements.

Thank you for making Braun Intertec your geotechnical consultant for this project. If you have questions about this report, or if there are other services that we can provide in support of our work to date, please contact Steve Martin at 612.221.2504 (smartin@braunintertec.com) or Bob Janssen at 612.865.8786 (bjanssen@braunintertec.com).

Sincerely,

BRAUN INTERTEC CORPORATION

Steven B. Martin, PE
Senior Engineer

Robert. J. Janssen, PE
Senior Vice President, Principal Engineer

c: Bob Janssen Jr., Kraus Anderson

Table of Contents

Description **Page**

Table of Contents (continued)

Description **Page**

Appendix

A. Introduction

A.1. Project Description

This Geotechnical Evaluation Report addresses the proposed reconstruction of the existing Southtown Retail Development, located southwest of Interstate 35W and 494 in Bloomington, Minnesota. Currently, the first phase of the redevelopment is planned to consist of demolition of the former Herberger's building and construction of a 2-level Dick's House of Sports (Dick's) overlying much of that former building footprint. The Dick's building will be approximately 60,000 square feet per level. A portion of the sporting goods building will extend west of the existing building footprint. An outdoor, artificial turf field will be constructed to the northwest of the proposed building. A smaller retail building, approximately 20,000 square feet, will share a portion of the east wall of the proposed Dick's building. Site improvements during this phase of the redevelopment will include installation of below grade storm management systems below the existing power lines. Various portions of the site bituminous pavements will be reconstructed during this phase of redevelopment. We understand that Kraus Anderson will be responsible for delivering a prepared pad for the proposed buildings. Table 1 provides known and assumed project details.

Table 1. Project Details

Aspect	Description
Below grade levels	None (Provided)
Above grade levels	Two - Dick's Building (Provided) One – Adjacent Retail building (Assumed)
Finished floor elevation	835 -both buildings (Assumed)
Column loads (kips)	Max of 355 – Dick's building (Provided) Max of 200 – Adjacent Retail building (Assumed)
Wall loads (kips/ft)	Max of 10 – Dick's Building (Assumed) Max of 5 – Adjacent Retail building (Assumed)
Floor slab loads – both buildings (psf)	125 – stock area 100 – sales area (Provided for Dick's; assumed for adjacent retail)

Aspect	Description
Nature of construction	Spread footings with precast concrete walls and steel framing – both buildings (Assumed)
Cuts or fills for buildings	Within 3 feet of existing grades – both buildings (Assumed)
Tolerable building settlement	1 inch total; less than 1/2 inch differential (Assumed)
Assumed pavement loads	Automobile parking: 35,000 ESALs*
	Drive/Delivery Lanes: 150,000 ESALs*

*Equivalent 18,000-lb single axle loads based on 20-year design.

The figure below shows an illustration of the proposed site layout with the previous and current boring locations shown on the drawing. Note that aerial photograph was taken prior to the demolition of the former Herberger's space but the second round of borings, shown in blue, were performed after the demolition had taken place in the spring of 2024.

Figure 1. Site Layout

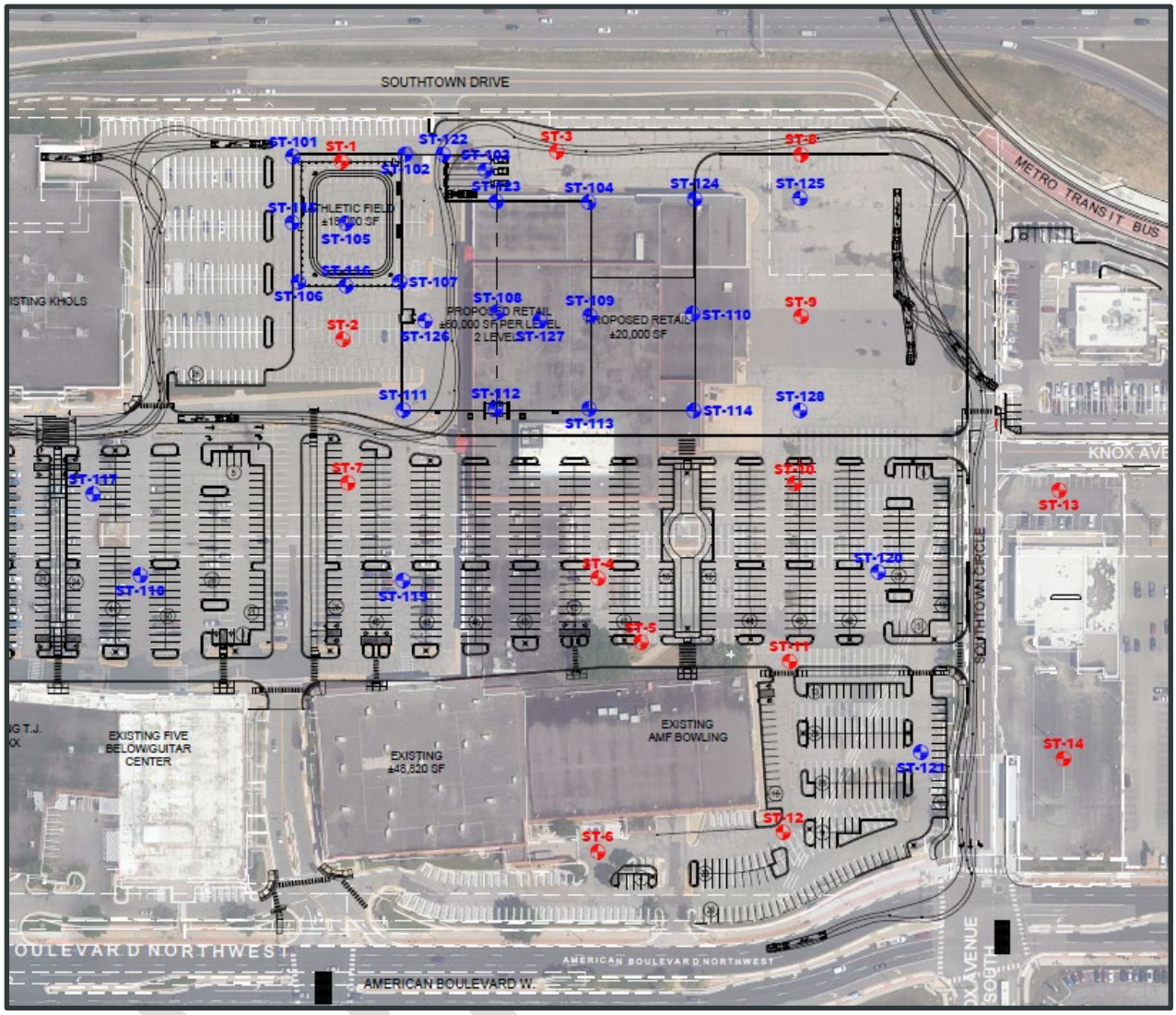


Figure provided by Kraus Anderson.

A.2. Site Conditions and History

Currently, the portion of the site located outside of the previous Herberger's building pad area is occupied by the existing pavements. The former Herberger's space was demolished this spring prior to us performing the recent round of borings. The demolition extended from the former Herberger's space south to the area near the overhead power lines. The existing ground surface for former Herberger's building pad area consists of sand soils.

Current grades at the boring locations range from 829 to 835. Generally, the site is gently sloping down and away from the proposed buildings. The lowest elevation occurred in parking lot south of the former automobile dealership in the southeastern portion of the site.

Photograph 1. Aerial Photograph of the Site in 2023

Photograph provided by Google.

A.3. Purpose

The purpose of our geotechnical evaluation will be to characterize subsurface geologic conditions at selected exploration locations, evaluate their impact on the project, and provide geotechnical recommendations for the design and construction of foundations, slabs, utilities, pavements, athletic field and stormwater management systems.

A.4. Background Information and Reference Documents

We reviewed the following information:

- Preliminary site plan prepared by Kimley-Horn and provided by Kraus Anderson.
- Previous geotechnical reports prepared by Braun Intertec for projects located throughout this site.
- Communications with Kraus Anderson Development regarding the planned project details.

We have described our understanding of the proposed construction and site to the extent others reported it to us. Depending on the extent of available information, we may have made assumptions based on our experience with similar projects. If we have not correctly recorded or interpreted the project details, the project team should notify us. New or changed information could require additional evaluation, analyses and/or recommendations.

A.5. Scope of Services

We performed our scope of services for the project in accordance with our Proposal QTB164728 to Kraus Anderson Development, dated May 3, 2023, and authorized on May 25, 2023. The following list describes the geotechnical tasks completed in accordance with our authorized scope of services.

- Reviewing the background information and reference documents previously cited.
- Staking and clearing the exploration location of underground utilities. Braun Intertec selected and staked the exploration locations. We acquired the surface elevations and locations with GPS technology using the State of Minnesota's permanent GPS base station network. The Soil Boring Location Sketch included in the Appendix shows the approximate locations of the borings.
- Performing 14 standard penetration test (SPT) borings in 2023, denoted as ST-1 to ST-14, to nominal depths of 14 to 24 1/2 feet below existing surface grades across the site.
- Performing 28 additional standard penetration test (SPT) borings in 2024, denoted as ST-101 to ST-128, to nominal depths of 16 to 31 feet below existing surface grades across the site.
- Performing laboratory testing on select samples to aid in soil classification and engineering analysis.

- Perform engineering analysis including bearing capacity and settlement estimates and pavement designs.

- Preparing this report containing a boring location sketch, logs of soil borings, a summary of the soils encountered, results of laboratory tests, and recommendations for structure and pavement subgrade preparation and the design of foundations, floor slabs, exterior slabs, utilities, athletic fiel, stormwater improvements and pavements.

Our scope of services did not include environmental services or testing and our geotechnical personnel performing this evaluation are not trained to provide environmental services or testing. We can provide environmental services or testing at your request.

B. Results

B.1. Geologic Overview

We based the geologic origins used in this report on the soil types, in-situ and laboratory testing, and available common knowledge of the geological history of the site. Because of the complex depositional history, geologic origins can be difficult to ascertain. We did not perform a detailed investigation of the geologic history for the site.

B.2. Previous Geotechnical Information

We reviewed several previous geotechnical reports that we prepared on sites south of American Boulevard. Those sites were located within the area bordered by American Boulevard on the north, Penn Avenue on the west, 82nd Avenue on the south and 35W on the east. Those sites generally had the same soil profile that was encountered on this site, consisting of sandy fill soils overlying localized deposits of organic soils prior to encountering and terminating alluvial sands. Groundwater was typically encountered at depths between about 15 and 20 feet below the current ground surface.

B.3. Boring Results

Table 2 provides a summary of the soil boring results, in the general order we encountered the strata. Please refer to the Log of Boring sheets in the Appendix for additional details. The Descriptive Terminology sheets in the Appendix include definitions of abbreviations used in Table 2.

Table 2. Subsurface Profile Summary*

Strata	Soil Type - ASTM Classification	Range of Penetration Resistances	Commentary and Details
Pavement section	--	--	▪ Encountered in areas outside of the previous building pad area ▪ Overall thicknesses range from 8 to 17 inches. ▪ Bituminous thicknesses were 3 to 10 inches. ▪ Apparent aggregate base thicknesses were 2 to 10 inches.
Fill	SP, SP-SM, SM	Weight of hammer to 31 BPF	▪ Moisture condition generally moist. ▪ Penetration resistance values generally between 6 and 9 BPF. ▪ The penetration resistance were noticeably higher in the fill encountered in the pavement areas as compared to the fill encountered in the previous building pad area. ▪ Thicknesses at boring locations varied from 1 to 11 feet, and appears to be thickest in the western portion of the site, and thinnest in the eastern and southern portions. ▪ Occasional layers of swamp deposited slightly organic to organic soils encountered below the fill, as encountered in Boring ST-14 in the far southeastern portion of the site. ▪ Buried topsoil encountered below the fill in Boring ST-1, performed in the northwestern portion of the site.
Alluvial – Silts and Clays	CL, ML	3 to 10 BPF	▪ Encountered interbedded within the predominate sandy alluvial sands in Borings ST-108, ST-110, ST-111, ST-114, ST-117 and ST-122. ▪ Brown and gray. ▪ Thickness was approximately to 2 to 3 feet.
Alluvial - Sands	SP, SP-SM, SM	3 to 66 BPF	▪ Moisture condition moist above the water table and becoming wet just above and below the water table. ▪

*Abbreviations defined in the attached Descriptive Terminology sheets.

We did not perform gradation analysis on the apparent aggregate base material encountered as part of the pavement section, in accordance with our scope of work. Therefore, we cannot conclusively determine if the encountered material satisfies a particular specification, and it should not be assumed it is suitable for reuse.

For simplicity in this report and based on the low penetration resistances recorded in much of the fill materials we define existing fill to mean existing, uncontrolled or undocumented fill.

B.4. Groundwater

Table 3 summarizes the depths where we observed groundwater; the attached Log of Boring sheets in the Appendix also include this information and additional details.

Table 3. Groundwater Summary

Location	Surface Elevation	Measured or Estimated Depth to Groundwater (ft)	Corresponding Groundwater Elevation (ft)
ST-1	831.2	20	811 1/2
ST-2	833.2	20	813
ST-3	832.7	20	812 1/2
ST-5	833.9	22	812
ST-6	832.7	18	815
ST-8	834.4	21	813 1/2
ST-9	834.9	22	813
ST-11	830.8	18	813
ST-12	830.8	20	810 1/2
ST-13	832.7	15	818*
ST-14	829.6	17	813
ST-101	831.0	20	811
ST-102	831.9	23	809
ST-104	834.7	25	810
ST-108	834.9	23	812
ST-111	832.9	25	808
ST-113	833.9	23	811

*-Water observed within the silt layer at 15 feet and is likely a perched condition

At the time of our observations, groundwater surface elevations appeared to be between about 818 to 808 feet, with most elevations between about 813 to 811. Project planning should expect groundwater will fluctuate in relation to seasonal and annual changes in precipitation, and it should be expected that higher groundwater levels will be encountered where groundwater is perched on top of the low-permeable silts within the predominate sandy soils.

B.5. Laboratory Test Results

The moisture contents of the fill soils varied from approximately 6 to 18 percent, indicating that the fill materials varied from below to above of its probable optimum moisture contents.

The moisture contents of the organic soils varied from approximately 20 to 46 percent, indicating that the organic soils were wet.

The moisture contents of the alluvial soils varied from approximately 6 to 37 percent, indicating that the alluvial soils varied from below to above of its probable optimum moisture contents.

Our mechanical analyses indicated that the samples tested contained 7 to 92 percent silt and clay by weight.

Organic content tests on the existing fill in Boring ST-3 were 2 percent indicating that fill tested was slightly organic. The organic content of the swamp deposits in Boring ST-14 ranged from 1 to 9 percent indicating those materials range from slightly organic to organic.

C. Recommendations

C.1. Site Grading and Subgrade Preparation

C.1.a. Soils Suitability

The soils encountered within the proposed building footprints generally consisted of 4 to 7 feet of existing sandy fill overlying native alluvial soils which primarily consist of sands. The penetration resistance values within the existing fill within the former Herberger's building pad area were typically between about weight of the hammer (WH) and 5 BPF, which are indicative of poor compaction. As compared to the penetration resistances of the fill encountered within the former Herberger's building

pad area, the penetration resistances of the fill in existing pavement areas were typically somewhat higher, with penetration resistances typically between 5 and 9 BPF. The existing fill also concealed buried topsoil in Boring ST-1 (which is located to the northwest of the proposed building pads) and concealed swamp deposited organic soils in Boring ST-14 (which is located in the far southeastern portion of the site).

Based on the low and variable penetration resistance values, it is our opinion that the existing fill, in particular the existing fill within the former Herberger's footprint, is considered to be somewhat compressible and we judged the existing fill to be unsuitable for support of the proposed Dick's building and adjacent retail building. We recommend that the existing fill be removed in its entirety below the proposed Dick's building and adjacent retail building, the exposed alluvial soils should then be surface compacted and the existing fill can be replaced in engineered lifts compacted to at least 98 percent of the standard Proctor maximum dry density.

Below the proposed athletic field, we recommend removing the existing pavements, utilities to be abandoned and the existing fill soils within 3 feet of the proposed athletic field surface. The remaining soils should then be surface compacted to at least 98 percent of the standard Proctor maximum dry density. We then recommend placing imported non-frost susceptible (NFS) soils in the upper 3 feet of the subgrade. NFS soils are soils with less than 50 percent passing the #40 sieve and less than 5 percent passing the #200 sieve.

C.1.b. Building Subgrade Excavations

We recommend removing unsuitable materials from the building pads. We define unsuitable materials as existing fill, frozen materials, organic soils, existing structures, existing utilities, vegetation and soft/loose native soils. Table 4 shows the anticipated excavation depths and bottom elevations for each of the borings near the planned building areas.

Table 4. Building Excavation Depths

Location	Approximate Surface Elevation (ft)	Anticipated Excavation Depth (ft)	Anticipated Bottom Elevation (ft)
ST-102	831.9	6	825 1/2
ST-103	832.4	7	825
ST-107	833.1	7	826
ST-108	834.9	7	827 ½
ST-109	834.6	6.5	828

Location	Approximate Surface Elevation (ft)	Anticipated Excavation Depth (ft)	Anticipated Bottom Elevation (ft)
ST-110	834.9	4	830 ½
ST-111	832.9	7	825 ½
ST-112	834.2	7	827
ST-113	833.9	7	826 ½
ST-114	831.7	4	827 ½
ST-122	832.3	7	825
ST-123	834.6	6	828 ½
ST-124	834.3	4	830
ST-126	833.8	7	826 ½
ST-127	834.8	7	827 ½

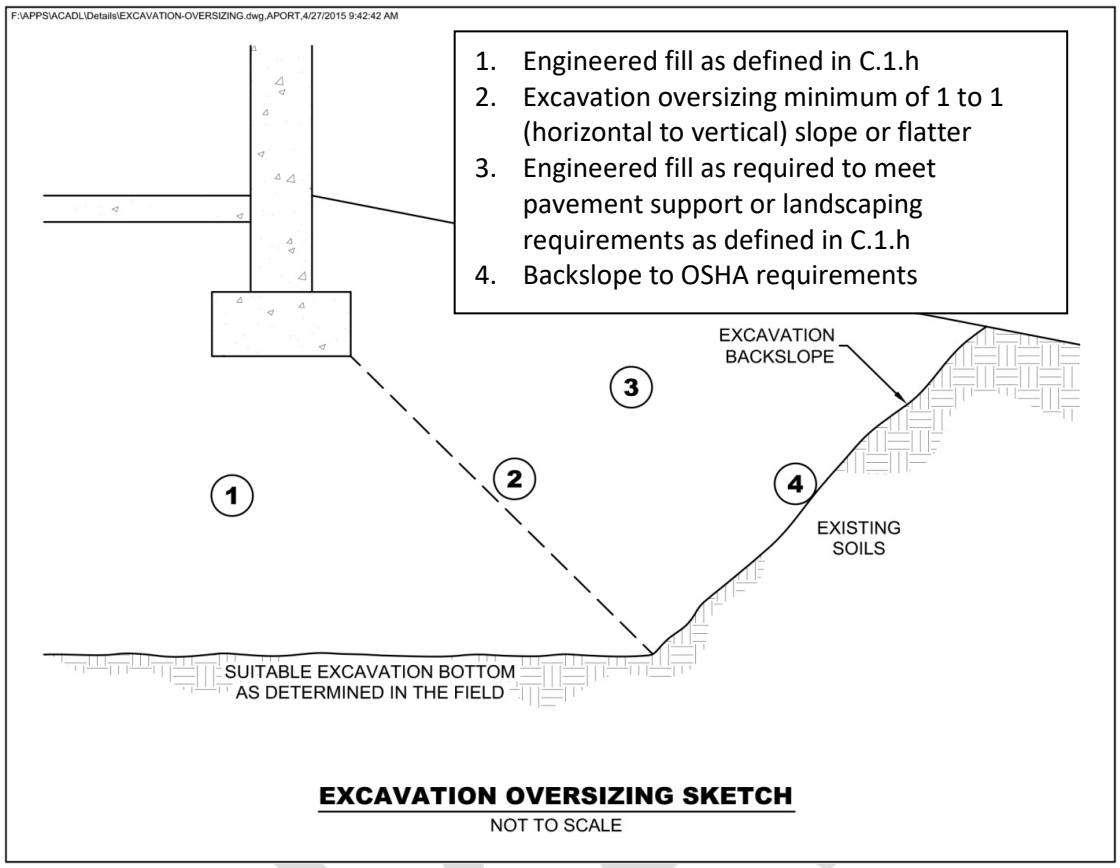
Excavation depths will vary between the borings. Portions of the excavations may also extend deeper than indicated by the borings. A geotechnical representative should observe the excavations to make the necessary field judgments regarding the suitability of the exposed soils.

The contractor should use equipment and techniques to minimize soil disturbance. If soils become disturbed or are wet, we recommend excavation and replacement, or the soils should be moisture conditioned and compacted.

C.1.c. Excavation Oversizing

When removing unsuitable materials below structures or pavements, we recommend the excavation extend outward and downward at a slope of 1H:1V (horizontal:vertical) or flatter. See Figure 2 for an illustration of excavation oversizing.

Figure 2. Generalized Illustration of Oversizing



C.1.d. Excavated Slopes

Based on the borings, we anticipate on-site soils in excavations will consist of fine-grained sands. These soils are typically considered Type C Soil under OSHA (Occupational Safety and Health Administration) guidelines. OSHA guidelines indicate unsupported excavations in Type C soils should have a gradient no steeper than 1 1/2H:1V. Slopes constructed in this manner may still exhibit surface sloughing. OSHA requires an engineer to evaluate slopes or excavations over 20 feet in depth.

An OSHA-approved qualified person should review the soil classification in the field. Excavations must comply with the requirements of OSHA 29 CFR, Part 1926, Subpart P, “Excavations and Trenches.” This document states excavation safety is the responsibility of the contractor. The project specifications should reference these OSHA requirements.

C.1.e. Excavation Dewatering

Excavations that extend near or below Elevation 818 will likely encounter wet soils and ground water. We recommend removing groundwater from the excavations. Dewatering of high-permeability soils (e.g., sands) from within the excavation with conventional pumps has the potential to loosen the soils, due to upward flow. A well contractor should develop a dewatering plan; the design team should review this plan.

C.1.f. Pavement and Exterior Slab Subgrade Preparation

We recommend the following steps for pavement and exterior slab subgrade preparation. Note that project planning may need to require additional subcuts to limit frost heave.

1. Strip unsuitable soils consisting of topsoil, organic soils, peat, vegetation, existing structures and pavements from the area, within 3 feet of the subgrade surface of the proposed pavement/slab grades.

2. Have a geotechnical representative observe the excavated subgrade to evaluate if additional subgrade improvements are necessary.

3. Slope subgrade soils to areas of sand or drain tile to allow the removal of accumulating water.

4. Scarify, moisture condition and surface compact the subgrade with at least 5 passes of a large roller with a minimum drum diameter of 3 1/2 feet.

5. Place pavement engineered fill to grade and compact in accordance with Section C.2.h to bottom of pavement and exterior slab section. See Section C.5 for additional considerations related to frost heave.

6. Proofroll the pavement or exterior slab subgrade as described in Section C.2.g.

C.1.g. Pavement Subgrade Proofroll

After preparing the subgrade as described above and prior to the placement of the aggregate base, we recommend proofrolling the subgrade soils with a fully loaded tandem-axle truck. We also recommend having a geotechnical representative observe the proofroll. Areas that fail the proofroll likely indicate soft or weak areas that will require additional soil correction work to support pavements.

The contractor should correct areas that display excessive yielding or rutting during the proofroll, as determined by the geotechnical representative. Possible options for subgrade correction include moisture conditioning and recompaction, subcutting and replacement with sands or crushed aggregate, and/or geotextiles. We recommend performing a second proofroll after the aggregate base material is in place, and just prior to placing bituminous or concrete pavement.

C.1.h. Engineered Fill Materials and Compaction

Table 5 below contains our recommendations for engineered fill materials.

Table 5. Engineered Fill Materials*

Locations To Be Used	Engineered Fill Classification	Possible Soil Type Descriptions	Gradation	Additional Requirements
▪ Below foundations ▪ Below interior slabs	Structural fill	SP, SP-SM, SM	100% passing 2-inch sieve < 20% passing #200 sieve	< 2% Organic Content (OC) Plasticity Index (PI) < 4%
▪ Drainage layer ▪ Non-frost-susceptible (NFS)	▪ Free-draining ▪ Non-frost-susceptible fill	GP, GW, SP, SW	100% passing 1-inch sieve < 50% passing #40 sieve < 5% passing #200 sieve	< 2% OC
Behind below-grade walls, beyond drainage layer	Retained fill	SP, SW, SP-SM, SW-SM, SM	100% passing 3-inch sieve < 20% passing #200 sieve	< 2% OC PI< 4%
Pavements	Pavement fill	SP, SP-SM, SM	100% passing 3-inch sieve < 20% passing #200 sieve	< 2% OC PI < 4%
Below landscaped surfaces, where subsidence is not a concern	Non-structural fill	SP, SP-SM, SM, SC, CL	100% passing 6-inch sieve	< 10% OC

* More select soils comprised of coarse sands with < 5% passing #200 sieve may be needed to accommodate work occurring in periods of wet or freezing weather.

We recommend spreading engineered fill in loose lifts of approximately 8 inches thick. We recommend moisture conditioning and compacting engineered fill in accordance with the criteria presented below in Table 6. The project documents should specify relative moisture content and compaction of engineered fill, based on the structure located above the engineered fill, and vertical proximity to that structure.

Table 6. Compaction Recommendations Summary

Reference	Relative Compaction, percent (ASTM D698 – Standard Proctor)	Moisture Content Variance from Optimum, percentage points	
		< 12% Passing #200 Sieve (typically SP, SP-SM)	> 12% Passing #200 Sieve (typically SM)
Below foundations and oversizing zones	98	±3	-1 to +3
Below interior slabs	98	±3	-1 to +3
Within 3 feet of pavement subgrade	100	±3	-2 to +2
More than 3 feet below pavement subgrade	95	±3	±3
Below landscaped surfaces	90	±5	±5
Adjacent to below-grade wall	95*	±3	-1 to +3

*Increase compaction requirement to meet compaction required for structure supported by this engineered fill.

The project documents should not allow the contractor to use frozen material as engineered fill or to place engineered fill on frozen material. Frost should not penetrate under foundations during construction.

We recommend performing moisture content and density tests in engineered fill to evaluate if the contractors are effectively moisture conditioning and compacting the soil and meeting project requirements.

C.1.i. Special Inspections of Soils

We recommend including the site grading and placement of engineered fill within the building pad under the requirements of Special Inspections, as provided in Chapter 17 of the International Building Code, which is part of the Minnesota State Building Code. Special Inspection requires observation of soil conditions below engineered fill or footings, evaluations to determine if excavations extend to the anticipated soils, and if engineered fill materials meet requirements for type of engineered fill and compaction condition of engineered fill. A licensed geotechnical engineer should direct the Special Inspections of site grading and engineered fill placement. The purpose of these Special Inspections is to evaluate whether the work is in accordance with the approved Geotechnical Report for the project. Special Inspections should include evaluation of the subgrade, observing preparation of the subgrade (surface compaction or dewatering, excavation oversizing, placement procedures and materials used for engineered fill, etc.) and compaction testing of the engineered fill.

C.2. Spread Footings

Table 7 below contains our recommended parameters for foundation design.

Table 7. Recommended Spread Footing Design Parameters

Item	Description
Maximum net allowable bearing pressure (psf)	4,000
Minimum factor of safety for bearing capacity failure	3.0
Minimum width (inches)	24 – strip footings 36 – column footings
Minimum embedment below final exterior grade for heated structures (inches)	42
Minimum embedment below final exterior grade for unheated structures or for footings not protected from freezing temperatures during construction (inches)	60
Total estimated settlement (inches)	Less than 1 inch
Differential settlement	Typically about 1/2 of total settlement*

* Actual differential settlement amounts will depend on final loads and foundation layout. We can evaluate differential settlement based on final foundation plans and loadings.

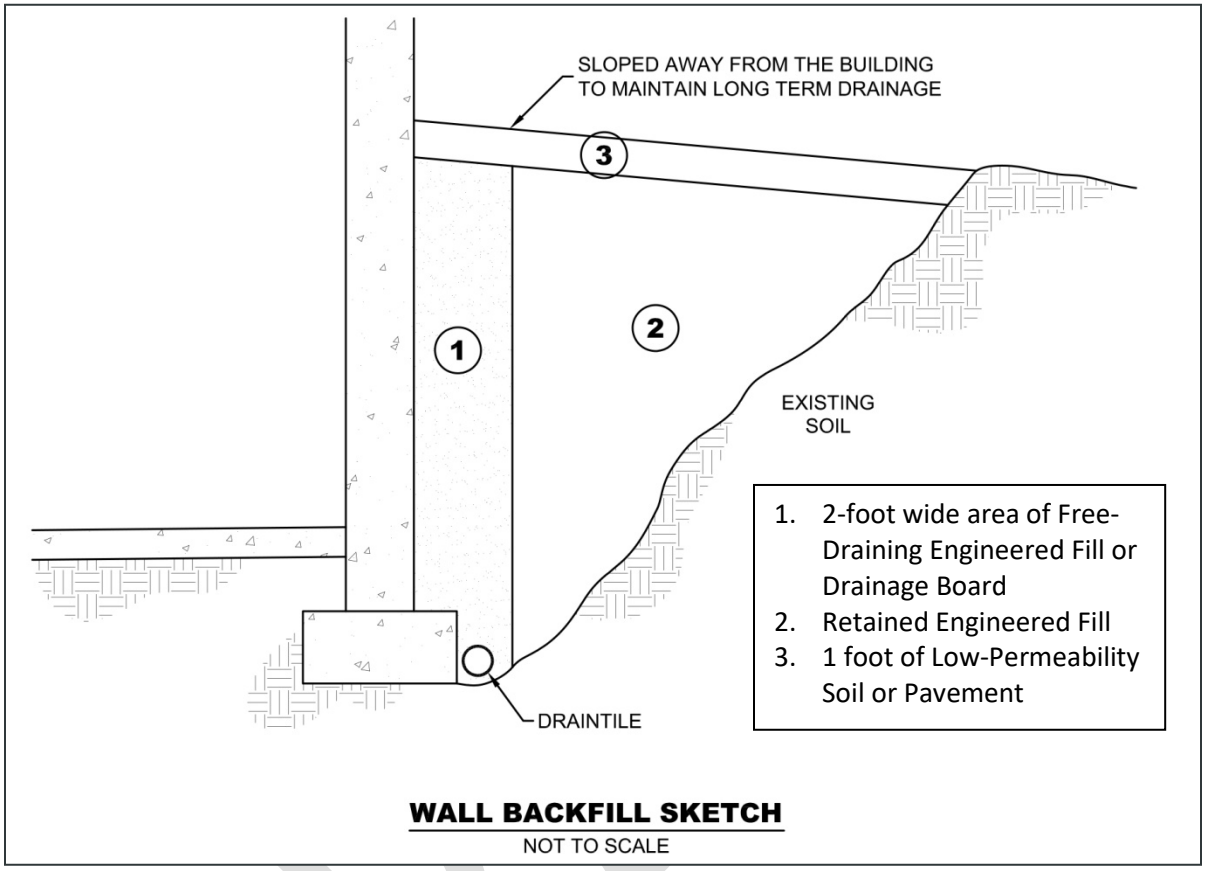
C.3. Below-Grade Walls

C.3.a. Drainage Control

We recommend installing drain tile to remove water behind the below-grade walls, at the location shown in Figure 3. The below-grade wall drainage system should also incorporate free-draining, engineered fill or a drainage board placed against the wall and connected to the drain tile.

Even with the use of free-draining, engineered fill, we recommend general waterproofing of below-grade walls that surround occupied or potentially occupied areas because of the potential cost impacts related to seepage after construction is complete.

Figure 3. Generalized Illustration of Wall Engineered Fill



The materials listed in the sketch should meet the definitions in Section C.1.h. Low-permeability is capable of directing water away from the wall, like clay, topsoil or pavement. The project documents should indicate if the contractor should brace the walls prior to filling and allowable unbalanced fill heights.

As shown in Figure 3, we recommend Zone 2 consist of retained, engineered fill, and this material will control lateral pressures on the wall.

C.3.b. Configuring and Resisting Lateral Loads

Below-grade wall design can use active earth pressure conditions, if the walls can rotate slightly. If the wall design cannot tolerate rotation, then design should use at-rest earth pressure conditions. Rotation up to 0.002 times the wall height is generally required for walls supporting sand.

Table 8 presents our recommended lateral coefficients and equivalent fluid pressures for wall design of active, at-rest and passive earth pressure conditions for sand backfill as defined and compacted in Section C.1.h. The table also provides recommended wet unit weights and internal friction angles. Designs should also consider the slope of any engineered fill and dead or live loads placed behind the walls within a horizontal distance that is equal to the height of the walls. Our recommended values assume the wall design provides drainage so water cannot accumulate behind the walls. The construction documents should clearly identify what soils the contractor should use for engineered fill of walls.

Table 8. Recommended Below-Grade Wall Design Parameters – Drained Conditions

Retained Soil	Wet Unit Weight (pcf)	Friction Angle (degrees)	Active Lateral Coefficient/ Equivalent Fluid Pressure (pcf)	At-Rest Lateral Coefficient/ Equivalent Fluid Pressure (pcf)	Passive Lateral Coefficient/ Equivalent Fluid Pressure* (pcf)
Retained Fill	120	30	0.4/48	0.5/60	3.0/360

* Based on Rankine model for soils in a region behind the wall extending at least 2 horizontal feet beyond the bottom outer edges of the wall footings and then rising up and away from the wall at an angle no steeper than 60 degrees from horizontal.

Sliding resistance between the bottom of the footing and the soil can also resist lateral pressures. We recommend assuming a sliding coefficient equal to 0.4 between the concrete and soil.

The values presented in this section are un-factored.

C.4. Interior Slabs

C.4.a. Subgrade Modulus

The anticipated floor subgrade is compacted fine-grained sands. We recommend using a modulus of subgrade reaction, k, of 150 pounds per square inch per inch of deflection (pci) to design the slabs. If the slab design requires placing 6 inches of compacted crushed aggregate base immediately below the slab, the slab design may increase the k-value by 50 pci. We recommend that the aggregate base materials be free of bituminous. In addition to improving the modulus of subgrade reaction, an aggregate base facilitates construction activities and is less weather sensitive.

C.4.b. Moisture Vapor Protection

Excess transmission of water vapor could cause floor dampness, certain types of floor bonding agents to separate, or mold to form under floor coverings. If project planning includes using floor coverings or coatings, we recommend placing a vapor retarder or vapor barrier immediately beneath the slab. We also recommend consulting with floor covering manufacturers regarding the appropriate type, use and installation of the vapor retarder or barrier to preserve warranty assurances.

C.5. Frost Protection

We consider the fine-grained sands and silty sands to be slightly to moderately frost susceptible. Unfavorable amounts of heaving could occur if these soils exist beneath the slab, and they become saturated and freeze. Grading to direct surface drainage away from buildings helps limit the potential for saturation and subsequent heaving to occur. Still, even limited amounts of movement can create tripping hazards.

One method to help limit the potential for heaving to occur is to remove frost-susceptible soils present below the overlying slab or pavement area down to bottom-of-footing grades, and replace the excavated material with non-frost-susceptible, engineered fill. We recommend providing drainage at the base of the subcut, as well as gradual transitions from this subcut (3H:1V or flatter gradient).

Figures 4a and 4b shows illustrations summarizing some of the recommendations above.

Figure 4a. Frost Protection Geometry Illustration

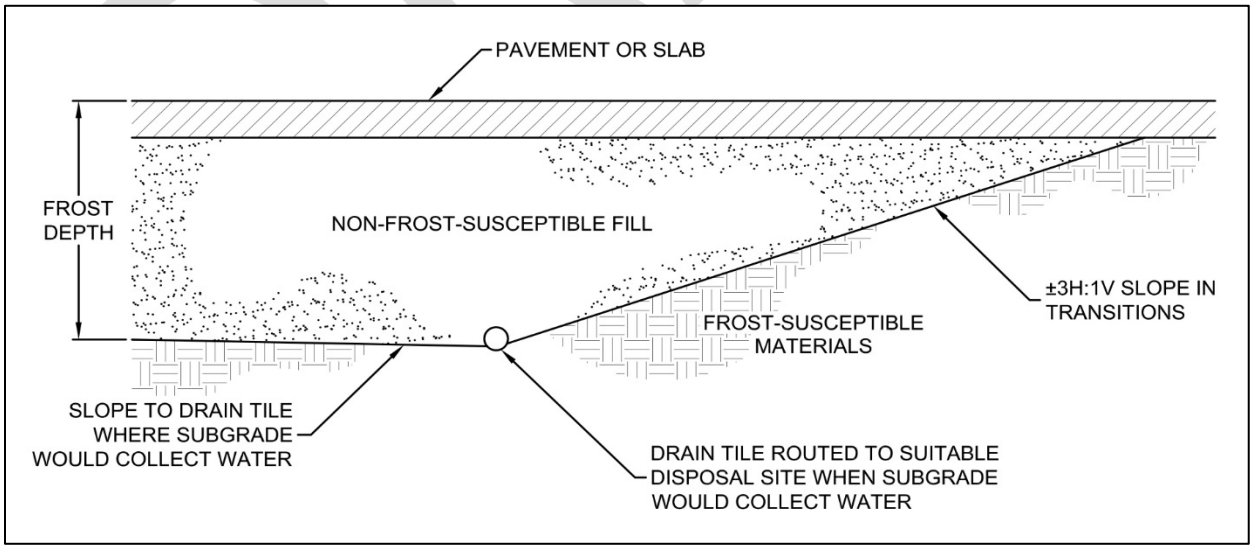
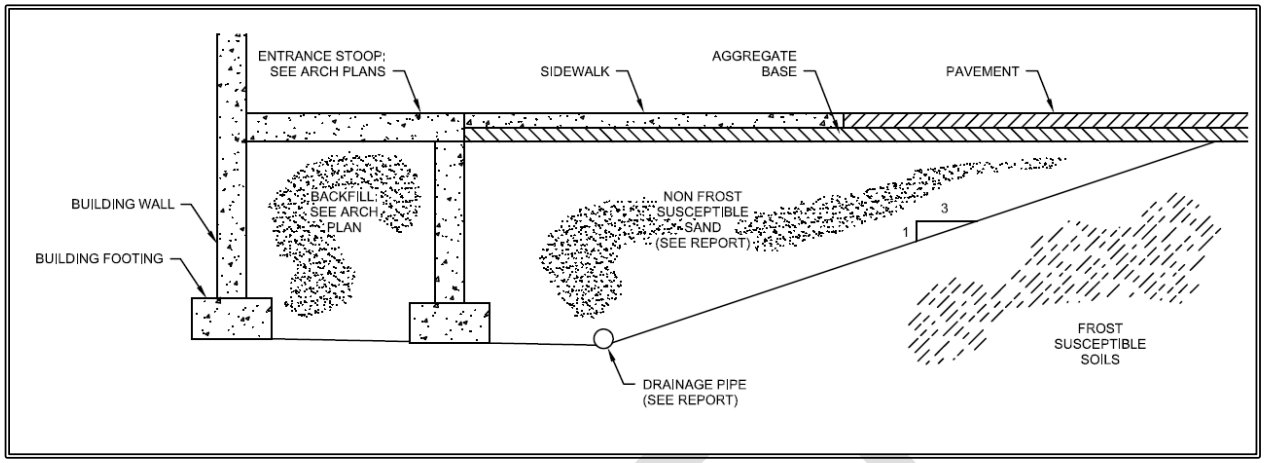


Figure 4b. Frost Protection Geometry Illustration with Stoop Alternative



Over the life of the pavement or slab, cracks may develop and joints may open up, which will expose the subgrade and allow water to enter the subgrade. This water entering the subgrade increases the likelihood of heave. It will be critical that the owner develop a detailed maintenance program to repair any cracks and joints that may develop during the useful life of the various surface features. The maintenance program should pay special attention to areas where dissimilar materials abut one another, where construction joints occur and where shrinkage cracks develop.

C.6. Pavements and Exterior Slabs

C.6.a. Design Sections

Our scope of services for this project did not include laboratory tests on subgrade soils to determine an R-value for pavement design. Based on our experience with similar fine-grained sands anticipated at pavement subgrade elevations, we recommend pavement design assume an R-value of 35. Note the contractor may need to perform limited removal of unsuitable or less suitable soils to achieve that value. Table 9 provides recommended pavement sections, based on the soils support value indicated above and the assumed traffic loads as indicated in Section A.1.

Table 9. Recommended Pavement Sections

Use	Light Duty	Heavy Duty	Concrete Loading Dock
Minimum asphalt thickness (inches)	3.5	4.5	---
Concrete thickness (inches)	--	--	6
Minimum aggregate base thickness (inches)	8	8	4

C.6.b. Bituminous Pavement Materials

We recommend that the bituminous wear and base courses meet the requirements of Specifications 2360, Type SP. With that, we recommend using the following mix designations for pavements:

- Wear: SPWEA340C
- Non-wear: SPNWB330C

We recommend that the bituminous pavement be compacted to an average of at least 92 percent of the maximum theoretical Rice density, with no individual result less than 90 percent.

C.6.c. Subgrade Drainage

We recommend installing perforated drainpipes throughout pavement areas at low points, around catch basins, and behind curb in landscaped areas. We also recommend installing drainpipes along pavement and exterior slab edges where exterior grades promote drainage toward those edge areas. The contractor should place drainpipes in small trenches, extended at least 8 inches below the granular subbase layer, or below the aggregate base material where no subbase is present.

C.6.d. Performance and Maintenance

We based the above pavement designs on a 20-year performance life for bituminous pavements. This is the amount of time before we anticipate the pavement will require reconstruction. This performance life assumes routine maintenance, such as seal coating and crack sealing. The actual pavement life will vary depending on variations in weather, traffic conditions and maintenance.

It is common to place the non-wear course of bituminous and then delay placement of wear course. For this situation, we recommend evaluating if the reduced pavement section will have sufficient structure to support construction traffic.

Many conditions affect the overall performance of the exterior slabs and pavements. Some of these conditions include the environment, loading conditions and the level of ongoing maintenance. With regard to bituminous pavements in particular, it is common to have thermal cracking develop within the first few years of placement, and continue throughout the life of the pavement. We recommend developing a regular maintenance plan for filling cracks in exterior slabs and pavements to lessen the potential impacts for cold weather distress due to frost heave or warm weather distress due to wetting and softening of the subgrade.

C.7. Utilities

C.7.a. Subgrade Stabilization

Earthwork activities associated with utility installations located inside the building area should adhere to the recommendations in Section C.1.h.

For exterior utilities, we anticipate the soils at typical invert elevations will be suitable for utility support. However, if construction encounters unfavorable conditions such as soft clay, organic soils or perched water at invert grades, the unsuitable soils may require some additional subcutting and replacement with sand or crushed rock to prepare a proper subgrade for pipe support. Project design and construction should not place utilities within the 1H:1V oversizing of foundations.

If utilities extend near or below Elevation 818, wet soils/groundwater will likely be encountered. Dewatering should be performed to facilitate installation of the utilities in those areas.

C.7.b. Corrosion Potential

A majority of the soil borings indicated the site predominantly consists of sandy soils. We consider these soils non- to slightly-corrosive to metallic conduits. If utilities extend through clay soils, we recommend bedding the utilities in sandy soil free of any clay lumps or constructing the utilities with non-corrosive materials.

C.8. Stormwater

We estimated infiltration rates for some of the soils we encountered in our soil borings, as listed in Table 10. These infiltration rates represent the long-term infiltration capacity of a practice and not the capacity of the soils in their natural state. Field testing, such as with a double-ring infiltrometer (ASTM D3385),

may justify the use of higher infiltration rates. However, we recommend adjusting field test rates by the appropriate correction factor, as provided for in the Minnesota Stormwater Manual or as allowed by the local watershed. We recommend consulting the Minnesota Stormwater Manual for stormwater design.

Table 10. Estimated Design Infiltration Rates Based on Soil Classification

Soil Type	Infiltration Rate * (inches/hour)
Fine-grained alluvial sands (SP, SP-SM)	0.45
Silts (ML) and fine-grained silty sand (SM)	0.2

* From Minnesota Stormwater Manual. Rates may differ at individual sites.

Fine-grained soils (silts and clays), topsoil or organic matter that mixes into or washes onto the soil will lower the permeability. The contractor should maintain and protect infiltration areas during construction. Furthermore, organic matter and silt washed into the system after construction can fill the soil pores and reduce permeability over time. Proper maintenance is important for long-term performance of infiltration systems.

This geotechnical evaluation does not constitute a review of site suitability for stormwater infiltration or evaluate the potential impacts, if any, from infiltration of large amounts of stormwater.

C.9. Equipment Support

The recommendations included in the report may not be applicable to equipment used for the construction and maintenance of this project. We recommend evaluating subgrade conditions in areas of shoring, scaffolding, cranes, pumps, lifts and other construction equipment prior to mobilization to determine if the exposed materials are suitable for equipment support, or require some form of subgrade improvement. We also recommend project planning consider the effect that loads applied by such equipment may have on structures they bear on or surcharge – including pavements, buried utilities, below-grade walls, etc. We can assist you in this evaluation.

D. Procedures

D.1. Penetration Test Borings

We drilled the penetration test borings with a truck-mounted core and auger drill equipped with hollow-stem auger. We performed the borings in general accordance with ASTM D6151 taking penetration test samples at 2 1/2- or 5-foot intervals in general accordance with ASTM D1586. The boring logs show the actual sample intervals and corresponding depths.

We sealed penetration test boreholes meeting the Minnesota Department of Health (MDH) Environmental Borehole criteria with an MDH-approved grout. We will forward/forwarded a sealing record (or sealing records) for those boreholes to the Minnesota Department of Health Well Management Section.

D.2. Exploration Logs

D.2.a. Log of Boring Sheets

The Appendix includes Log of Boring sheets for our penetration test borings. The logs identify and describe the penetrated geologic materials, and present the results of penetration resistance tests performed. The logs also present the results of laboratory tests performed on penetration test samples, and groundwater measurements.

We inferred strata boundaries from changes in the penetration test samples and the auger cuttings. Because we did not perform continuous sampling, the strata boundary depths are only approximate. The boundary depths likely vary away from the boring locations, and the boundaries themselves may occur as gradual rather than abrupt transitions.

D.2.b. Geologic Origins

We assigned geologic origins to the materials shown on the logs and referenced within this report, based on: (1) a review of the background information and reference documents cited above, (2) visual classification of the various geologic material samples retrieved during the course of our subsurface exploration, (3) penetration resistance testing performed for the project, (4) laboratory test results, and (5) available common knowledge of the geologic processes and environments that have impacted the site and surrounding area in the past.

D.3. Material Classification and Testing

D.3.a. Visual and Manual Classification

We visually and manually classified the geologic materials encountered based on ASTM D2488. When we performed laboratory classification tests, we used the results to classify the geologic materials in accordance with ASTM D2487. The Appendix includes a chart explaining the classification system we used.

D.3.b. Laboratory Testing

The exploration logs in the Appendix note most of the results of the laboratory tests performed on geologic material samples. The remaining laboratory test results follow the exploration logs. We performed the tests in general accordance with ASTM procedures.

D.4. Groundwater Measurements

The drillers checked for groundwater while advancing the penetration test borings, and again after auger withdrawal. We then filled the boreholes or allowed them to remain open for an extended period of observation, as noted on the boring logs.

E. Qualifications

E.1. Variations in Subsurface Conditions

E.1.a. Material Strata

We developed our evaluation, analyses and recommendations from a limited amount of site and subsurface information. It is not standard engineering practice to retrieve material samples from exploration locations continuously with depth. Therefore, we must infer strata boundaries and thicknesses to some extent. Strata boundaries may also be gradual transitions, and project planning should expect the strata to vary in depth, elevation and thickness, away from the exploration locations.

Variations in subsurface conditions present between exploration locations may not be revealed until performing additional exploration work, or starting construction. If future activity for this project reveals any such variations, you should notify us so that we may reevaluate our recommendations. Such variations could increase construction costs, and we recommend including a contingency to accommodate them.

E.1.b. Groundwater Levels

We made groundwater measurements under the conditions reported herein and shown on the exploration logs, and interpreted in the text of this report. Note that the observation periods were relatively short, and project planning can expect groundwater levels to fluctuate in response to rainfall, flooding, irrigation, seasonal freezing and thawing, surface drainage modifications and other seasonal and annual factors.

E.2. Continuity of Professional Responsibility

E.2.a. Plan Review

We based this report on a limited amount of information, and we made a number of assumptions to help us develop our recommendations. We should be retained to review the geotechnical aspects of the designs and specifications. This review will allow us to evaluate whether we anticipated the design correctly, if any design changes affect the validity of our recommendations, and if the design and specifications correctly interpret and implement our recommendations.

E.2.b. Construction Observations and Testing

We recommend retaining us to perform the required observations and testing during construction as part of the ongoing geotechnical evaluation. This will allow us to correlate the subsurface conditions exposed during construction with those encountered by the borings and provide professional continuity from the design phase to the construction phase. If we do not perform observations and testing during construction, it becomes the responsibility of others to validate the assumption made during the preparation of this report and to accept the construction-related geotechnical engineer-of-record responsibilities.

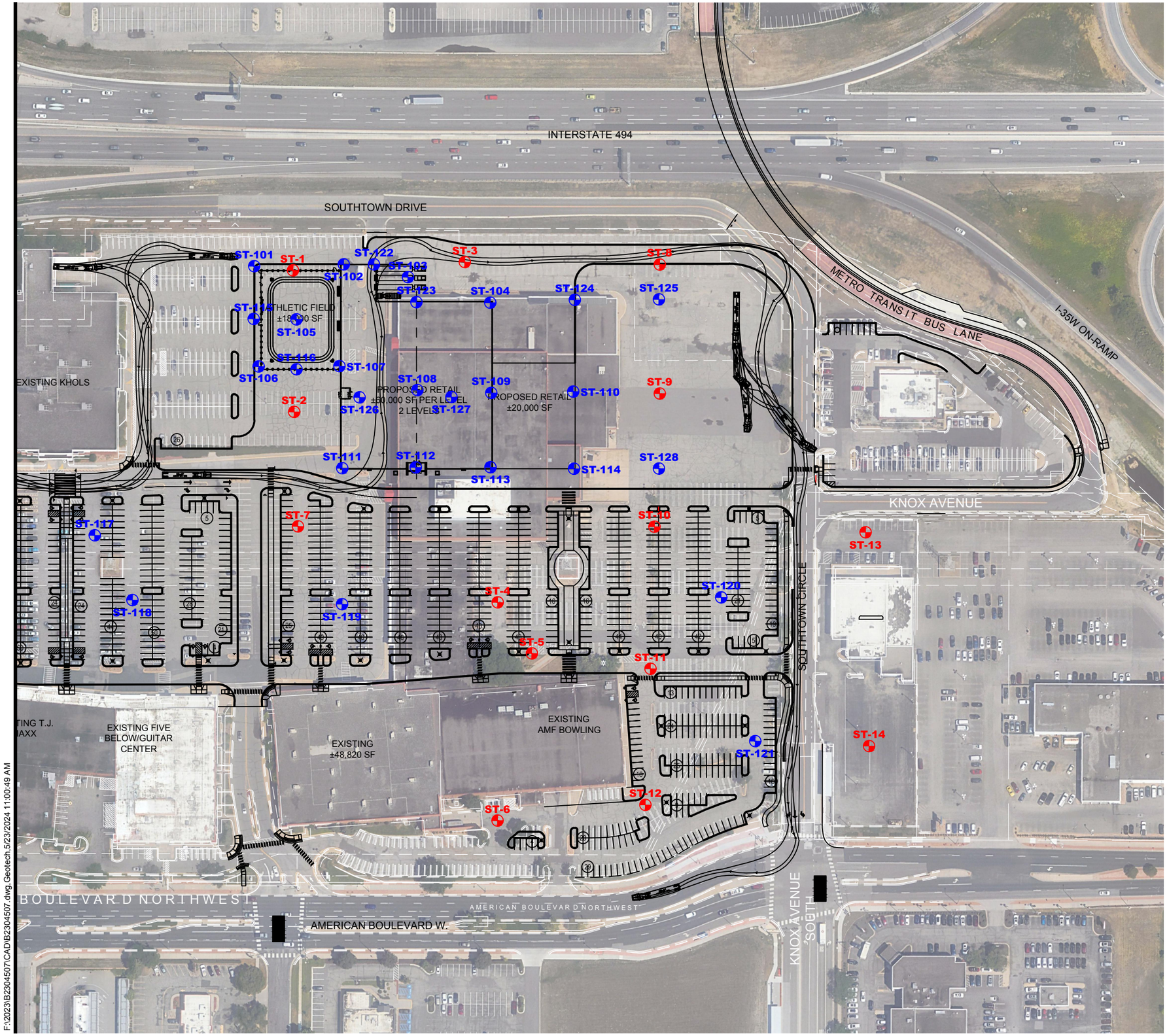
E.3. Use of Report

This report is for the exclusive use of the addressed parties. Without written approval, we assume no responsibility to other parties regarding this report. Our evaluation, analyses and recommendations may not be appropriate for other parties or projects.

E.4. Standard of Care

In performing its services, Braun Intertec used that degree of care and skill ordinarily exercised under similar circumstances by reputable members of its profession currently practicing in the same locality. No warranty, express or implied, is made.

Appendix



DENOTES APPROXIMATE LOCATION OF STANDARD PENETRATION TEST BORING

DENOTES APPROXIMATE LOCATION OF PREVIOUSLY PERFORMED SOIL BORING

N

75' 0 150'

SCALE: 1"= 150'

F:\2023\B2304507\CAD\B2304507.dwg,Geotech,5/23/2024 11:00:49 AM

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11001 Hampshire Avenue S
Minneapolis, MN 55438
952.995.2000
braunintertec.com

Drawing Information

Project No:	B2304507
Drawing No:	B2304507
Drawn By:	JAG
Date Drawn:	5/30/23
Checked By:	SBM
Last Modified:	5/23/24

Project Information

Southtown Development

7801-7997 Southtown Drive

Bloomington, Minnesota

Soil Boring Location Sketch

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-1**
LOCATION: See attached sketch
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 125596 EASTING: 520368
DRILLER: C. McClain LOGGED BY: S. Martin
START DATE: 06/05/23 END DATE: 06/05/23
SURFACE ELEVATION: 831.2 ft RIG: 7514 METHOD: 3 1/4" HSA
SURFACING: Bituminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
830.2		PAVEMENT, 6 inches of bituminous over 6 inches of apparent aggregate base					
1.0		FILL: SILTY SAND (SM), fine to medium-grained, trace roots, dark brown to brown, moist		5-10-8 (18) 18"		11	
				5-3-4 (7) 18"			
824.2			5				
7.0		SANDY SILT (ML), trace roots, dark brown to brown, moist (BURIED TOPSOIL)		4-3-4 (7) 18"			
823.2							
8.0		SILTY SAND (SM), fine-grained, brown, moist to wet, loose to medium dense (ALLUVIUM)		4-5-6 (11) 18"			
			10	5-4-4 (8) 18"			
				4-4-5 (9) 17"			
	▽	*Becoming wet at 20 feet*	15				
				2-3-4 (7) 16"			
			20				
				3-6-7 (13) 18"			
806.7							
24.5		END OF BORING	25				Water observed at 20.0 feet while drilling.
		Boring immediately grouted					
			30				

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-2**
LOCATION: See attached sketch
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 125382 EASTING: 520370
DRILLER: C. McClain LOGGED BY: S. Martin
START DATE: 06/05/23 END DATE: 06/05/23
SURFACE ELEVATION: 833.2 ft RIG: 7514 METHOD: 3 1/4" HSA
SURFACING: Bituminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
832.4		PAVEMENT, 5 inches of bituminous over 4 inches of apparent aggregate base					
0.8		FILL: SILTY SAND (SM), fine to medium-grained, trace Gravel, dark brown to brown, moist		5-14-17 (31) 15"		6	
			5	5-4-3 (7) 16"		8	
826.2							
7.0		SILTY SAND (SM), fine-grained, light brown to brown, moist to wet, loose to medium dense (ALLUVIUM)		3-4-5 (9) 18"			
			10	4-4-4 (8) 18"			
				5-5-5 (10) 18"			
			15	4-4-5 (9) 18"			
	▽	*Becoming wet at 20 feet*	20	7-10-11 (21) 18"			
				8-14-12 (26) 16"			
808.7							
24.5		END OF BORING	25				Water observed at 20.0 feet while drilling.
		Boring immediately grouted					
			30				

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-3**
LOCATION: See attached sketch
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 125608 EASTING: 520628
DRILLER: C. McClain LOGGED BY: S. Martin START DATE: 06/08/23 END DATE: 06/08/23
SURFACE ELEVATION: 832.7 ft RIG: 7514 METHOD: 3 1/4" HSA SURFACING: Bituminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
831.9		PAVEMENT, 4 inches of bituminous over 6 inches of apparent aggregate base					
0.8		FILL: SILTY SAND (SM), fine to medium-grained, trace roots, dark brown, moist		3-3-4 (7) 14"		13	OC=2%
			5	4-3-3 (6) 17"		13	OC=2%
825.7							
7.0		POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained, brown, moist, loose (ALLUVIUM)		5-5-5 (10) 15"			
			10	4-3-3 (6) 17"			
820.7							
12.0		SILTY SAND (SM), fine-grained, brown, moist to wet, loose to medium dense (ALLUVIUM)		7-6-8 (14) 17"			
			15	5-5-7 (12) 18"			
	▽	*Becoming wet at 20 feet*	20	6-6-8 (14) 15"			
				4-4-5 (9) 18"			
808.2							
24.5		END OF BORING	25				Water observed at 20.0 feet while drilling.
		Boring immediately grouted					
			30				

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-4**
LOCATION: See attached sketch
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 125093 EASTING: 520678
DRILLER: C. McClain LOGGED BY: S. Martin START DATE: 06/08/23 END DATE: 06/08/23
SURFACE ELEVATION: 834.9 ft RIG: 7514 METHOD: 3 1/4" HSA SURFACING: Bituminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
834.1		PAVEMENT, 3 1/2 inches of bituminous over 6 inches of apparent aggregate base					
0.8		FILL: SILTY SAND (SM), fine to medium-grained, dark brown, moist		5-9-9 (18) 14"		12	
829.9				14-17-18 (35) 18"			
5.0		SILTY SAND (SM), fine-grained, light brown to brown, moist, medium dense to dense (ALLUVIUM)	5	5-6-7 (13) 17"			
				7-7-7 (14) 16"		11	P200=47%
820.9			10	6-7-9 (16) 17"			
14.0		END OF BORING Boring immediately backfilled	15				Water not observed while drilling.
			20				
			25				
			30				

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See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-5**
LOCATION: See attached sketch
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 125016 EASTING: 520729
DRILLER: C. McClain LOGGED BY: S. Martin START DATE: 06/08/23 END DATE: 06/08/23
SURFACE ELEVATION: 833.9 ft RIG: 7514 METHOD: 3 1/4" HSA SURFACING: Bituminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
832.7		PAVEMENT, 8 inches of bituminous over 7 inches of apparent aggregate base					
1.2		FILL: POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained, brown, moist		3-6-7 (13) 12"		7	
			5	4-3-4 (7) 15"		18	
827.9							
6.0		SILTY SAND (SM), fine-grained, brown, moist, medium dense to dense (ALLUVIUM)		5-5-7 (12) 15"		27	
			10	7-6-8 (14) 16"			
		Layer of wet Silt at 12 1/2 feet		7-7-8 (15) 18"		30	P200=92%
			15	9-11-13 (24) 15"			
			20	6-12-19 (31) 12"			
811.9	▽						
22.0		POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained, trace Gravel, brown, wet, dense (ALLUVIUM)		21-23-15 (38) 11"			
809.4							
24.5		END OF BORING	25				Water observed at 22.0 feet while drilling.
		Boring immediately grouted					
			30				

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See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-6**
LOCATION: See attached sketch
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 124763 EASTING: 520678
DRILLER: C. McClain LOGGED BY: S. Martin
START DATE: 06/06/23 END DATE: 06/06/23
SURFACE ELEVATION: 832.7 ft RIG: 7514 METHOD: 3 1/4" HSA
SURFACING: Bituminous WEATHER: Overcast

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
831.9		PAVEMENT, 3 inches of bituminous over 7 inches of apparent aggregate base					
0.8		FILL: SILTY SAND (SM), fine to medium-grained, brown, moist		3-7-9 (16) 10"		8	
827.7			5	4-4-6 (10) 13"			
5.0		SILTY SAND (SM), fine-grained, light brown to brown, moist, loose to medium dense (ALLUVIUM)		5-4-5 (9) 15"			
			10	5-5-6 (11) 17"			
				9-8-10 (18) 17"			
			15	8-7-8 (15) 18"			
814.7	▽						
18.0		POORLY GRADED SAND (SP), fine to medium-grained, trace Gravel, brown, wet, loose to medium dense (ALLUVIUM)	20	8-9-7 (16) 10"			
				4-4-6 (10) 13"			
808.2							
24.5		END OF BORING	25				Water observed at 18.0 feet while drilling.
		Boring immediately grouted					
			30				

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-7**
LOCATION: See attached sketch
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 125208 EASTING: 520376
DRILLER: C. McClain LOGGED BY: S. Martin START DATE: 06/08/23 END DATE: 06/08/23
SURFACE ELEVATION: 832.2 ft RIG: 7514 METHOD: 3 1/4" HSA SURFACING: Bituminous WEATHER: Overcast

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
830.8		PAVEMENT, 7 inches of bituminous over 10 inches of apparent aggregate base					
1.4		FILL: POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained, brown, moist		2-4-6 (10) 13"			
828.2							
4.0		FILL: SILTY SAND (SM), fine to medium-grained, dark brown to brown, moist to wet		6-5-6 (11) 17"			
823.2				3-4-5 (9) 18"			
9.0		SILTY SAND (SM), fine-grained, brown, moist, loose to medium dense (ALLUVIUM)		3-4-6 (10) 13"			
818.2				5-5-7 (12) 17"			
14.0		END OF BORING Boring immediately backfilled					Water not observed while drilling.

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-8**
LOCATION: See attached sketch
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 125605 EASTING: 520923
START DATE: 06/05/23 END DATE: 06/05/23
DRILLER: C. McClain LOGGED BY: S. Martin
SURFACE ELEVATION: 834.4 ft RIG: 7514 METHOD: 3 1/4" HSA
SURFACING: Bituminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
833.5		PAVEMENT, 5 inches of bituminous over 6 inches of apparent aggregate base					
0.9		FILL: SILTY SAND (SM), fine to medium-grained, brown, moist		2-5-5 (10) 15"			
830.4							
4.0	▽	SILTY SAND (SM), fine-grained, light brown to brown, moist to wet, loose to dense (ALLUVIUM)	5	3-3-5 (8) 18"		13	
				4-3-4 (7) 18"			
			10	3-3-4 (7) 18"			
				3-4-6 (10) 18"			
			15	3-6-6 (12) 18"			
		Becoming wet at 21 feet	20	11-14-18 (32) 16"			
809.9				8-14-18 (32) 18"			
24.5		END OF BORING	25				Water observed at 18.0 feet while drilling.
		Boring immediately grouted					
			30				

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See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-9**
LOCATION: See attached sketch
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 125409 EASTING: 520923
DRILLER: C. McClain LOGGED BY: S. Martin START DATE: 06/07/23 END DATE: 06/07/23
SURFACE ELEVATION: 834.9 ft RIG: 7514 METHOD: 3 1/4" HSA SURFACING: Bituminous WEATHER: Overcast

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
834.1		PAVEMENT, 4 inches of bituminous over 6 inches of apparent aggregate base					
0.8							
832.9		FILL: SILTY SAND (SM), fine to medium-grained, brown, moist					
2.0		SILTY SAND (SM), fine-grained, light brown to brown, moist to wet, medium dense to dense (ALLUVIUM)		5-5-8 (13) 13"		6	
			5	9-10-11 (21) 17"			
				6-6-9 (15) 18"			
			10	8-6-7 (13) 18"			
				6-12-17 (29) 18"			
			15	11-16-19 (35) 18"			
	▽	*Becoming wet at 22 feet*	20	8-10-24 (34) 14"			
				5-7-9 (16) 15"			
810.4							
24.5		END OF BORING	25				Water observed at 22.0 feet while drilling.
		Boring immediately grouted					
			30				

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See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-10**
LOCATION: See attached sketch
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 125208 EASTING: 520915
START DATE: 06/08/23 END DATE: 06/08/23
SURFACE ELEVATION: 833.0 ft
DRILLER: C. McClain LOGGED BY: S. Martin
RIG: 7514 METHOD: 3 1/4" HSA
SURFACING: Bituminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
832.0		PAVEMENT, 5 inches of bituminous over 7 inches of apparent aggregate base					
1.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained, light brown, moist, loose to medium dense (ALLUVIUM)		2-5-6 (11) 13"			
				4-4-4 (8) 16"			
				4-4-5 (9) 15"		9	P200=7%
				8-7-6 (13) 17"			
				11-13-14 (27) 18"			
819.0							
14.0		END OF BORING Boring immediately backfilled					Water not observed while drilling.

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See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
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BORING: **ST-11**
LOCATION: See attached sketch
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 124993 EASTING: 520909
DRILLER: C. McClain LOGGED BY: S. Martin START DATE: 06/05/23 END DATE: 06/05/23
SURFACE ELEVATION: 830.8 ft RIG: 7514 METHOD: 3 1/4" HSA SURFACING: Bituminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
830.0		PAVEMENT, 4 inches of bituminous over 5 inches of apparent aggregate base					
0.8		FILL: SILTY SAND (SM), fine to medium-grained, brown, moist		1-4-4 (8) 13"			
828.3		SILTY SAND (SM), fine-grained, brown, moist to wet, loose to dense (ALLUVIUM)					
2.5			5	3-4-4 (8) 18"			
				6-4-6 (10) 18"			
			10	6-9-12 (21) 17"			
				8-9-14 (23) 17"			
	▽	*Becoming wet at 18 feet*	15	21-18-17 (35) 10"			
			20	7-8-12 (20) 14"			
				9-6-7 (13) 18"			
806.3							
24.5		END OF BORING	25				Water observed at 18.0 feet while drilling.
		Boring immediately grouted					
			30				

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-12**
LOCATION: See attached sketch
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 124993 EASTING: 520909
DRILLER: C. McClain LOGGED BY: S. Martin
START DATE: 06/05/23 END DATE: 06/05/23
SURFACE ELEVATION: 830.8 ft RIG: 7514 METHOD: 3 1/4" HSA
SURFACING: Bituminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
830.0		PAVEMENT, 4 inches of bituminous over 5 inches of apparent aggregate base					
0.8		FILL: SILTY SAND (SM), fine to medium-grained, dark brown, moist		3-4-6 (10) 16"			
			5	2-3-3 (6) 18"		14	
823.8							
7.0		SILTY SAND (SM), fine-grained, brown, moist to wet, very loose to medium dense (ALLUVIUM)		5-4-5 (9) 18"			
			10	5-4-5 (9) 18"			
				4-4-6 (10) 18"			
			15	3-6-7 (13) 17"			
	▽	*Becoming wet at 20 feet*	20	3-2-2 (4) 16"			
				3-7-11 (18) 18"			
806.3							
24.5		END OF BORING	25				Water observed at 20.0 feet while drilling.
		Boring immediately grouted					
			30				

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See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-13**
LOCATION: See attached sketch
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 124876 EASTING: 521240
DRILLER: C. McClain LOGGED BY: S. Martin
START DATE: 06/07/23 END DATE: 06/07/23
SURFACE ELEVATION: 829.6 ft RIG: 7514 METHOD: 3 1/4" HSA
SURFACING: Bituminous WEATHER: Overcast

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
828.9		PAVEMENT, 4 inches of bituminous over 4 inches of apparent aggregate base					
0.7		FILL: POORLY GRADED SAND (SP), fine to medium-grained, trace Gravel, brown, moist		1-4-5 (9) 12"			
			5	5-6-7 (13) 13"			
823.6							
6.0		SILTY SAND (SM), fine-grained, brown, moist to wet, loose to medium dense (ALLUVIUM)		5-5-6 (11) 14"			
			10	6-6-8 (14) 13"			
				5-4-6 (10) 15"			
	▽	*Becoming wet at 15 feet*	15	5-5-5 (10) 16"			
			20	12-13-16 (29) 17"			
807.6							
22.0		POORLY GRADED SAND (SP), fine to medium-grained, trace Gravel, brown, wet, loose (ALLUVIUM)		6-4-4 (8) 9"			
805.1							
24.5		END OF BORING	25				Water observed at 15.0 feet while drilling.
		Boring immediately grouted					
			30				

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See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-14**
LOCATION: See attached sketch
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 125199 EASTING: 521235
DRILLER: C. McClain LOGGED BY: S. Martin START DATE: 06/07/23 END DATE: 06/07/23
SURFACE ELEVATION: 832.7 ft RIG: 7514 METHOD: 3 1/4" HSA SURFACING: Bituminous WEATHER: Overcast

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
832.0		PAVEMENT, 3 inches of bituminous over 5 inches of apparent aggregate base					
0.7		FILL: SILTY SAND (SM), fine to medium-grained, intermixed with Lean Clay, dark brown, moist to wet		1-3-4 (7) 13"			
			5	2-1-1 (2) 15"		19	
826.7							
6.0		FILL: POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained, trace Gravel, brown, moist		2-1-2 (3) 10"			
823.7							
9.0		ORGANIC CLAY (OL), with roots, black to dark gray, wet, soft (SWAMP DEPOSIT)	10	4-2-2 (4) 14"		46	OC=9%
				2-1-3 (4) 13"		20	OC=1%
818.7							
14.0	▽	SILTY SAND (SM), fine-grained, gray, moist to wet, medium dense (ALLUVIUM)	15	6-7-8 (15) 17"			
		Becoming wet at 17 feet	20	4-6-6 (12) 14"			
				4-6-7 (13) 18"			
808.2							
24.5		END OF BORING	25				Water observed at 17.0 feet while drilling.
		Boring immediately grouted					
			30				

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See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-101**
LOCATION:
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 125602 EASTING: 520309
START DATE: 04/23/24 END DATE: 04/23/24
SURFACE ELEVATION: 831.0 ft
DRILLER: C. McClain LOGGED BY: S. Martin
RIG: 7514 METHOD: 3 1/4" HSA
SURFACING: Bituminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
830.3		PAVEMENT, 4 inches of bituminous over 4 inches of apparent aggregate base					
0.7		FILL: SILTY SAND (SM), fine to medium-grained, trace Gravel, dark brown to brown, moist		4-7-6 (13) 12"			
			5	3-4-4 (8) 16"			
				2-4-3 (7) 14"			
822.0							
9.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained, brown, moist to wet, very loose to loose (ALLUVIUM)	10	2-2-2 (4) 14"			
				1-3-3 (6) 16"			
			15	2-3-4 (7) 14"			
	▽	*Becoming wet at 20 feet*	20	3-5-4 (9) 16"			
810.0							
21.0		END OF BORING					Water observed at 20.0 feet while drilling.
		Boring immediately grouted					
			25				
			30				

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See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-102**
LOCATION:
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 125605 EASTING: 520445
START DATE: 04/23/24 END DATE: 04/23/24
SURFACE ELEVATION: 831.9 ft
DRILLER: C. McClain LOGGED BY: S. Martin
RIG: 7514 METHOD: 3 1/4" HSA
SURFACING: Bituminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
831.0		PAVEMENT, 7 inches of bituminous over 3 inches of apparent aggregate base					
0.9		FILL: SILTY SAND (SM), fine to medium-grained, dark brown to black, moist		4-10-8 (18) 12"		10	
825.9			5	4-4-4 (8) 18"			
6.0		SILTY SAND (SM), fine-grained, brown, moist, loose (ALLUVIUM)		2-3-3 (6) 14"			
820.9			10	3-2-3 (5) 18"			
11.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained, brown, moist to wet, loose to dense (ALLUVIUM)		4-3-3 (6) 16"			
			15	2-3-3 (6) 16"			
	▽	*Becoming wet at 23 feet*	20	3-3-3 (6) 14"			
			25	3-3-5 (8) 12"			
			30	4-23-25 (48) 18"			
800.9							
31.0		END OF BORING					Water observed at 23.0 feet while drilling.

Boring immediately grouted.

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See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-103**
LOCATION:
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 125585 EASTING: 520542
START DATE: 04/25/24 END DATE: 04/25/24
SURFACE ELEVATION: 832.4 ft
DRILLER: C. McClain LOGGED BY: S. Martin
RIG: 7514 METHOD: 3 1/4" HSA
SURFACING: Bituminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
831.5		PAVEMENT, 5 inches of bituminous over 5 1/2 inches of apparent aggregate base					
0.9		FILL: SILTY SAND (SM), fine to medium-grained, dark brown, moist		1-1-1 (2) 9"			
			5	2-3-3 (6) 16"			
825.4							
7.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained, brown, moist, loose to medium dense (ALLUVIUM)		2-4-4 (8) 17"			
			10	4-4-4 (8) 18"			
				3-6-7 (13) 17"			
			15	5-5-5 (10) 18"			
			20	3-5-4 (9) 17"			
811.4							
21.0		END OF BORING Boring immediately grouted					Water not observed while drilling.
			25				
			30				

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See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-104**
LOCATION:
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 125547 EASTING: 520666
START DATE: 04/25/24 END DATE: 04/25/24
SURFACE ELEVATION: 834.7 ft
DRILLER: C. McClain LOGGED BY: S. Martin
RIG: 7514 METHOD: 3 1/4" HSA
SURFACING: Soil WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
		FILL: POORLY GRADED SAND with SILT (SP-SM), fine-grained, brown, moist		1-2-3 (5) 11"			
			5	2-2-3 (5) 13"			
827.7 7.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained, brown, moist to wet, loose to dense (ALLUVIUM)		2-3-3 (6) 17"			
			10	4-4-4 (8) 14"			
				2-5-6 (11) 18"			
			15	3-5-5 (10) 18"			
			20	4-7-6 (13) 18"			
	▽	*Becoming wet at 25 feet*	25	9-15-18 (33) 14"			
			30	9-16-27 (43) 18"			
803.7 31.0		END OF BORING					Water observed at 25.0 feet while drilling.

Boring immediately grouted

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See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-105**
LOCATION:
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 125522 EASTING: 520373
START DATE: 04/24/24 END DATE: 04/24/24
SURFACE ELEVATION: 832.1 ft RIG: 7514 METHOD: 3 1/4" HSA
SURFACING: Bituminous WEATHER: Clear
DRILLER: C. McClain LOGGED BY: S. Martin

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
830.7		PAVEMENT, 7 inches of bituminous over 8 inches of apparent aggregate base					
1.4		FILL: SILTY SAND (SM), fine to medium-grained, dark brown brown, moist		3-10-10 (20) 16"			
			5	7-7-7 (14) 18"			
825.1							
7.0		SILTY SAND (SM), fine-grained, brown, moist, loose (ALLUVIUM)		2-4-4 (8) 18"			
823.1							
9.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained, brown, moist, loose (ALLUVIUM)	10	4-3-5 (8) 18"			
				2-5-5 (10) 18"			
			15	2-3-3 (6) 18"			
816.1							
16.0		END OF BORING					Water not observed while drilling.
		Boring immediately grouted					
			20				
			25				
			30				

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See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-106**
LOCATION:
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 125450 EASTING: 520316
START DATE: 04/23/24 END DATE: 04/23/24
SURFACE ELEVATION: 832.5 ft
DRILLER: C. McClain LOGGED BY: S. Martin
RIG: 7514 METHOD: 3 1/4" HSA
SURFACING: Bituminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
831.3		PAVEMENT, 8 inches of bituminous over 6 inches of apparent aggregate base					
1.2		FILL: SILTY SAND (SM), fine to medium-grained, dark brown, moist		5-10-10 (20) 14"			
			5	7-5-4 (9) 14"		18	
826.5							
6.0		SILTY SAND (SM), fine-grained, brown, moist, loose (ALLUVIUM)		2-3-3 (6) 16"			
			10	2-2-3 (5) 14"			
820.5							
12.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained, light brown, moist, loose (ALLUVIUM)		3-4-4 (8) 18"			
			15	2-3-3 (6) 16"			
			20	3-3-3 (6) 16"			
811.5							
21.0		END OF BORING Boring immediately grouted					Water not observed while drilling.
			25				
			30				

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-107**
LOCATION:
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 125451 EASTING: 520438
START DATE: 04/23/24 END DATE: 04/23/24
SURFACE ELEVATION: 833.1 ft
DRILLER: C. McClain LOGGED BY: S. Martin
RIG: 7514 METHOD: 3 1/4" HSA
SURFACING: Bituminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
832.3		PAVEMENT, 6 inches of bituminous over 4 inches of apparent aggregate base					
0.8		FILL: SILTY SAND (SM), fine to medium-grained, black, moist		3-6-7 (13) 12"		11	
			5	3-3-2 (5) 14"		17	OC=2%
826.1							
7.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained, brown, moist, loose to medium dense (ALLUVIUM)		2-4-4 (8) 16"			
			10	3-4-4 (8) 16"			
				5-5-7 (12) 18"			
			15	4-3-3 (6) 18"			
815.1							
18.0		SILTY SAND (SM), fine-grained, brown, moist, loose (ALLUVIUM)					
			20	2-3-3 (6) 18"			
812.1							
21.0		END OF BORING					Water not observed while drilling.
		Boring immediately grouted					
			25				
			30				

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-108**
LOCATION:
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 125415 EASTING: 520556
START DATE: 04/25/24 END DATE: 04/25/24
DRILLER: C. McClain LOGGED BY: S. Martin
SURFACE ELEVATION: 834.9 ft RIG: 7514 METHOD: 3 1/4" HSA
SURFACING: Soil WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
		FILL: SILTY SAND (SM), fine to medium-grained, trace Gravel, dark brown to brown, moist		1-1-1 (2) 11"			
			5	1-1-1 (2) 13"			
827.9 7.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained, brown, moist, loose (ALLUVIUM)		2-4-3 (7) 14"			
825.9 9.0		SILT (ML), gray, wet, loose (ALLUVIUM)	10	4-2-4 (6) 16"			
823.9 11.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained, brown, moist, medium dense (ALLUVIUM)		5-8-9 (17) 16"			
			15	6-12-10 (22) 16"			
			20	8-9-11 (20) 15"			
811.9 23.0	▽	POORLY GRADED SAND (SP), fine to medium-grained, trace Gravel, brown, wet, dense (ALLUVIUM)					
			25	11-14-18 (32) 18"			
			30	20-16-15 (31) 18"			
803.9 31.0		END OF BORING					Water observed at 23.0 feet while drilling.

Boring immediately grouted.

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See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-109**
LOCATION:
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 125410 EASTING: 520668
START DATE: 04/24/24 END DATE: 04/24/24
SURFACING: Soil WEATHER: Sunny

DRILLER: C. McClain LOGGED BY: S. Martin
SURFACE ELEVATION: 834.6 ft RIG: 7514 METHOD: 3 1/4" HSA

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
		FILL: SILTY SAND (SM), fine to medium-grained, trace Gravel, dark brown to brown, moist		1-1-1 (2) 18"			
			5	0-0-1 (1) 18"			
828.1 6.5		POORLY GRADED SAND with SILT (SP-SM), fine-grained, brown to light brown, moist, loose to medium dense (ALLUVIUM)		3-3-6 (9) 18"			
			10	9-8-7 (15) 18"			
				12-8-10 (18) 18"			
			15	10-6-6 (12) 18"			
			20	10-8-10 (18) 18"			
813.6 21.0		END OF BORING Boring immediately grouted					Water not observed while drilling.
			25				
			30				

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-110**
LOCATION:
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 125455 EASTING: 520792
START DATE: 04/25/24 END DATE: 04/25/24
SURFACE ELEVATION: 834.9 ft RIG: 7514 METHOD: 3 1/4" HSA
SURFACING: Soil WEATHER: Clear
DRILLER: C. McClain LOGGED BY: S. Martin

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
830.9		FILL: SILTY SAND (SM), fine to medium-grained, brown, moist		2-6-7 (13) 12"			
4.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained, light brown, moist, loose (ALLUVIUM)	5	3-4-3 (7) 13"			
				3-4-6 (10) 14"			
823.9			10	3-4-4 (8) 17"			
11.0		SILT (ML), brown, wet, loose (ALLUVIUM)		1-1-4 (5) 18"			
820.9							
14.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained, brown, moist, medium dense (ALLUVIUM)	15	3-7-9 (16) 17"			
813.9			20	6-11-12 (23) 15"			
21.0		END OF BORING Boring immediately grouted	25				Water not observed while drilling.
			30				

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-111**
LOCATION:
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 125296 EASTING: 520443
START DATE: 04/23/24 END DATE: 04/23/24
DRILLER: C. McClain LOGGED BY: S. Martin
SURFACE ELEVATION: 832.9 ft RIG: 7514 METHOD: 3 1/4" HSA
SURFACING: Bituminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
831.7		PAVEMENT, 10 inches of bituminous over 4 inches of apparent aggregate base					
1.2		FILL: SILTY SAND (SM), fine to medium-grained, dark brown, moist		4-6-5 (11) 14"			
			5	2-2-2 (4) 14"			
825.9							
7.0		SILT (ML), brown, wet, very loose (ALLUVIUM)		1-2-1 (3) 16"		33	
823.9							
9.0		SILTY SAND (SM), fine-grained, brown, moist, medium dense (ALLUVIUM)	10	1-2-1 (3) 16"			
820.9							
12.0		SILT (ML), brown, wet, very loose (ALLUVIUM)		3-2-2 (4) 18"			
818.9							
14.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained, brown, moist to wet, medium dense (ALLUVIUM)	15	3-6-6 (12) 14"			
			20	8-10-12 (22) 16"			
	▽	*Becoming wet at 25 feet*	25	10-10-11 (21) 14"			
804.9							
28.0		POORLY GRADED SAND (SP), fine to medium-grained, trace Gravel, brown, wet, medium dense (ALLUVIUM)	30	5-6-8 (14) 12"			
801.9							
31.0		END OF BORING					Water observed at 25.0 feet while drilling.
		Boring immediately grouted					

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See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-112**
LOCATION:
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 125298 EASTING: 520554
START DATE: 04/24/24 END DATE: 04/24/24
SURFACING: Soil WEATHER: Sunny

DRILLER: C. McClain LOGGED BY: S. Martin
SURFACE ELEVATION: 834.2 ft RIG: 7514 METHOD: 3 1/4" HSA

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
		FILL: SILTY SAND (SM), fine to medium-grained, dark brown to brown, moist		3-3-3 (6) 10"			
		Wood stake at 2 1/2 feet		1-1-1 (2) 18"			
827.2			5				
7.0		SILTY SAND (SM), fine-grained, brown, moist, very loose to dense (ALLUVIUM)		7-6-8 (14) 18"			
			10	12-7-7 (14) 18"			
				4-3-1 (4) 181"			
			15	5-4-5 (9) 18"			
			20	20-20-17 (37) 18"			
813.2							
21.0		END OF BORING					Water not observed while drilling.
		Boring immediately grouted					
			25				
			30				

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See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-113**
LOCATION:
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 125298 EASTING: 520667
START DATE: 04/24/24 END DATE: 04/24/24
DRILLER: C. McClain LOGGED BY: S. Martin
SURFACE ELEVATION: 833.9 ft RIG: 7514 METHOD: 3 1/4" HSA
SURFACING: Soil WEATHER: Sunny

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
		FILL: SILTY SAND (SM), fine to medium-grained, brown, moist		4-3-2 (5) 16"		9	
			5	8-2-2 (4) 14"			
826.9 7.0		SILTY SAND (SM), fine-grained, brown, moist, dense (ALLUVIUM)		50-15-20 (35) 18"			
824.9 9.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained, brown, moist, medium dense (ALLUVIUM)	10	11-7-11 (18) 16"			
				11-10-10 (20) 18"			
			15	4-6-8 (14) 18"			
			20	7-8-10 (18) 18"			
810.9 23.0	▽	POORLY GRADED SAND (SP), fine to medium-grained, trace Gravel, brown, wet, medium dense (ALLUVIUM)	25	35-6-12 (18) 18"			
			30	4-5-7 (12) 18"			
802.9 31.0		END OF BORING					Water observed at 23.0 feet while drilling.

Boring immediately grouted.

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-114**
LOCATION:
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 125296 EASTING: 520793
START DATE: 04/24/24 END DATE: 04/24/24
SURFACE ELEVATION: 831.7 ft
DRILLER: C. McClain LOGGED BY: S. Martin
RIG: 7514 METHOD: 3 1/4" HSA
SURFACING: Soil WEATHER: Sunny

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
831.2		SILTY SAND (SM), fine-grained, dark brown, moist (TOPSOIL FILL)					
0.5		FILL: SILTY SAND (SM), fine-grained, brown, moist		5-5-5 (10) 18"			
827.7							
4.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained, brown, moist, loose (ALLUVIUM)	5	6-4-3 (7) 18"			
824.7							
7.0		SANDY SILT (ML), brown, wet, loose (ALLUVIUM)		4-2-4 (6) 18"		37	
821.7							
10.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained, brown, moist, medium dense to dense (ALLUVIUM)	10	12-7-8 (15) 18"			
				26-20-18 (38) 18"			
			15	40-20-20 (40) 18"			
			20	20-22-44 (66) 18"			
810.7							
21.0		END OF BORING					Water not observed while drilling.
		Boring immediately grouted					
			25				
			30				

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-115**
LOCATION:
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 125553 EASTING: 520208
START DATE: 04/24/24 END DATE: 04/24/24
SURFACE ELEVATION: 831.5 ft
DRILLER: C. McClain LOGGED BY: S. Martin
RIG: 7514 METHOD: 3 1/4" HSA
SURFACING: Bituminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
830.6		PAVEMENT, 4 inches of bituminous over 7 inches of apparent aggregate base					
0.9		FILL: SILTY SAND (SM), fine to medium-grained, dark brown to black, moist		4-8-11 (19) 14"			
			5	7-9-5 (14) 16"			
				1-4-4 (8) 18"		18	
			10	4-4-4 (8) 17"			
820.5							
11.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained, brown, moist, loose (ALLUVIUM)		2-4-4 (8) 17"			
			15	2-3-4 (7) 17"			
815.5							
16.0		END OF BORING					Water not observed while drilling.
		Boring immediately grouted					
			20				
			25				
			30				

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-116**
LOCATION:
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 125361 EASTING: 520210
START DATE: 04/24/24 END DATE: 04/24/24
SURFACING: Bituminous WEATHER: Clear

DRILLER: C. McClain LOGGED BY: S. Martin
SURFACE ELEVATION: 832.0 ft RIG: 7514 METHOD: 3 1/4" HSA

Elev./ Depth ft	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
830.6	PAVEMENT, 5 inches of bituminous over 10 inches of apparent aggregate base					
1.4	FILL: SILTY SAND (SM), fine to medium-grained, dark brown to black, moist		4-12-7 (19) 13"			
		5	3-3-4 (7) 18"		16	OC=3%
825.0						
7.0	SILTY SAND (SM), fine-grained, brown, moist, loose (ALLUVIUM)		3-3-2 (5) 17"			
		10	2-2-3 (5) 17"			
820.0						
12.0	POORLY GRADED SAND with SILT (SP-SM), fine-grained, light brown, moist, loose (ALLUVIUM)		2-3-4 (7) 17"			
		15	5-3-4 (7) 18"			
816.0						
16.0	END OF BORING					Water not observed while drilling.
	Boring immediately grouted					
		20				
		25				
		30				

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See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-117**
LOCATION:
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 125195 EASTING: 520068
START DATE: 04/24/24 END DATE: 04/24/24
SURFACE ELEVATION: 830.5 ft RIG: 7514 METHOD: 3 1/4" HSA
SURFACING: Bituminous WEATHER: Clear
DRILLER: C. McClain LOGGED BY: S. Martin

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
829.6		PAVEMENT, 8 inches of bituminous over 3 inches of apparent aggregate base					
0.9		SILTY SAND (SM), fine-grained, brown, moist, loose (ALLUVIUM)		2-5-5 (10) 13"			
			5	2-4-5 (9) 17"			
824.5							
6.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained, brown, moist, loose to medium dense (ALLUVIUM)		1-5-5 (10) 18"			
			10	4-7-16 (23) 16"			
				4-5-6 (11) 13"			
816.5							
14.0		SANDY SILT (ML), brown, moist, loose (ALLUVIUM)	15	2-3-4 (7) 16"			
814.5							
16.0		END OF BORING Boring immediately grouted					Water not observed while drilling.
			20				
			25				
			30				

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See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-118**
LOCATION:
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 125097 EASTING: 520125
START DATE: 04/24/24 END DATE: 04/24/24
SURFACE ELEVATION: 831.5 ft
DRILLER: C. McClain LOGGED BY: S. Martin
RIG: 7514 METHOD: 3 1/4" HSA
SURFACING: Bituminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
831.0		PAVEMENT, 4 1/2 inches of bituminous over 2 inches of apparent aggregate base					
0.5		POORLY GRADED SAND with SILT (SP-SM), fine-grained, light brown, moist, loose to medium dense (ALLUVIUM)		2-4-3 (7) 10"			
				4-7-7 (14) 14"			
				4-10-9 (19) 13"			
				4-7-6 (13) 14"			
				2-5-5 (10) 15"			
				4-6-7 (13) 17"			
815.5							
16.0		END OF BORING					Water not observed while drilling.
		Boring immediately grouted					

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See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-119**
LOCATION:
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 125091 EASTING: 520442
START DATE: 04/24/24 END DATE: 04/24/24
SURFACE ELEVATION: 833.5 ft
DRILLER: C. McClain LOGGED BY: S. Martin
RIG: 7514 METHOD: 3 1/4" HSA
SURFACING: Bituminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
832.8		PAVEMENT, 6 1/2 inches of bituminous over 3 inches of apparent aggregate base					
0.7		FILL: SILTY SAND (SM), fine-grained, brown, moist		1-4-5 (9) 13"			
830.5		POORLY GRADED SAND with SILT (SP-SM), fine-grained, brown, moist, loose to medium dense (ALLUVIUM)		2-4-4 (8) 15"			
3.0			5	2-4-6 (10) 17"			
			10	3-5-5 (10) 16"			
				2-5-6 (11) 16"			
			15	3-8-10 (18) 15"			
817.5							
16.0		END OF BORING					Water not observed while drilling.
		Boring immediately grouted	20				
			25				
			30				

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See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-120**
LOCATION:
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 125101 EASTING: 521016
START DATE: 05/03/24 END DATE: 05/03/24
SURFACING: Bituminous WEATHER: Clear

DRILLER: C. McClain LOGGED BY: S. Martin
SURFACE ELEVATION: 831.4 ft RIG: 7514 METHOD: 3 1/4" HSA

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
830.8		PAVEMENT, 4 1/2 inches of bituminous over 3 inches of apparent aggregate base					
0.6		POORLY GRADED SAND with SILT (SP-SM), fine-grained, light brown, moist, loose to medium dense (ALLUVIUM)		2-3-4 (7) 12"			
			5	3-3-4 (7) 14"			
				3-3-6 (9) 16"			
			10	4-4-5 (9) 16"			
				5-6-7 (13) 14"			
			15	8-7-10 (17) 14"			
815.4							
16.0		END OF BORING					Water not observed while drilling.
		Boring immediately grouted	20				
			25				
			30				

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See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-121**
LOCATION:
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 124883 EASTING: 521068
START DATE: 05/03/24 END DATE: 05/03/24
SURFACING: Bituminous WEATHER: Clear

DRILLER: C. McClain LOGGED BY: S. Martin
SURFACE ELEVATION: 830.4 ft RIG: 7514 METHOD: 3 1/4" HSA

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
829.7		PAVEMENT, 5 inches of bituminous over 3 inches of apparent aggregate base					
0.7		SILTY SAND (SM), fine-grained, brown, moist, loose to medium dense (ALLUVIUM)		3-4-5 (9) 10"			
			5	7-5-6 (11) 14"			
823.4							
7.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained, brown, moist, loose to medium dense (ALLUVIUM)		5-4-4 (8) 14"			
			10	3-4-7 (11) 16"			
				5-5-6 (11) 14"			
			15	5-6-8 (14) 16"			
814.4							
16.0		END OF BORING					Water not observed while drilling.
		Boring immediately grouted					
			20				
			25				
			30				

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-122**
LOCATION:
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 125605 EASTING: 520491
START DATE: 04/24/24 END DATE: 04/24/24
SURFACING: Bituminous WEATHER: Sunny

DRILLER: C. McClain LOGGED BY: S. Martin
SURFACE ELEVATION: 832.3 ft RIG: 7514 METHOD: 3 1/4" HSA

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
		FILL: SILTY SAND (SM), fine to medium-grained, dark brown, moist		7-11-6 (17) 18"		13	OC=2%
			5	7-5-6 (11) 18"		11	
825.3 7.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained, brown, moist, loose to medium dense (ALLUVIUM)		6-3-4 (7) 18"			
			10	6-5-5 (10) 18"			
				18-12-10 (22) 18"			
			15	6-4-5 (9) 16"			
813.3 19.0		SANDY SILT (ML), brown, wet, loose (ALLUVIUM)	20	7-5-5 (10) 18"			
811.3 21.0		END OF BORING Boring immediately grouted					Water not observed while drilling.
			25				
			30				

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-123**
LOCATION:
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 125548 EASTING: 520555
START DATE: 04/24/24 END DATE: 04/24/24
SURFACE ELEVATION: 834.6 ft
DRILLER: C. McClain LOGGED BY: S. Martin
RIG: 7514 METHOD: 3 1/4" HSA
SURFACING: Soil WEATHER: Sunny

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
		FILL: SILTY SAND (SM), fine to medium-grained, trace Gravel, dark brown, moist		5-6-4 (10) 18"		12	OC=1%
828.6			5	3-2-1 (3) 18"			
6.0		SILTY SAND (SM), fine-grained, brown, moist, loose to medium dense (ALLUVIUM)		4-7-7 (14) 18"			
823.6			10	4-2-5 (7) 18"			
11.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained, brown, moist, medium dense (ALLUVIUM)		9-8-8 (16) 18"			
		SILTY SAND (SM), fine-grained, brown, moist, loose (ALLUVIUM)	15	12-10-10 (20) 18"			
816.6							
18.0							
813.6			20	4-2-4 (6) 18"			
21.0		END OF BORING Boring immediately grouted					Water not observed while drilling.
			25				
			30				

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See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-124**
LOCATION:
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 125551 EASTING: 520795
START DATE: 04/25/24 END DATE: 04/25/24
SURFACE ELEVATION: 834.3 ft RIG: 7514 METHOD: 3 1/4" HSA
SURFACING: Soil WEATHER: Clear
DRILLER: C. McClain LOGGED BY: S. Martin

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
		FILL: SILTY SAND (SM), fine to medium-grained, trace Gravel, brown, moist		1-3-2 (5) 13"		12	P200=11%
830.3							
4.0		SILTY SAND (SM), fine-grained, brown, moist, loose (ALLUVIUM)	5	3-4-6 (10) 15"			
				3-6-4 (10) 16"			
825.3							
9.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained, moist, very loose to medium dense (ALLUVIUM)	10	2-2-2 (4) 15"			
				2-2-2 (4) 17"			
			15	2-3-4 (7) 17"			
			20	4-7-7 (14) 18"			
813.3							
21.0		END OF BORING					Water not observed while drilling.
		Boring immediately grouted					
			25				
			30				

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See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-125**
LOCATION:
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 125552 EASTING: 520922
DRILLER: C. McClain LOGGED BY: S. Martin START DATE: 05/03/24 END DATE: 05/03/24
SURFACE ELEVATION: 834.6 ft RIG: 7514 METHOD: 3 1/4" HSA SURFACING: Bituminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
834.0		PAVEMENT, 6 inches of bituminous over 2 inches of apparent aggregate base					
0.6		SILTY SAND (SM), fine-grained, brown, moist, loose (ALLUVIUM)		3-3-3 (6) 12"			
			5	3-2-6 (8) 12"			
828.6							
6.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained, light brown, moist, loose to medium dense (ALLUVIUM)		5-6-6 (12) 14"			
			10	3-4-8 (12) 16"			
				5-4-6 (10) 16"			
			15	8-10-13 (23) 16"			
			20	10-13-20 (33) 18"			
813.6							
21.0		END OF BORING Boring immediately grouted					Water not observed while drilling.
			25				
			30				

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-126**
LOCATION:
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 125404 EASTING: 520469
START DATE: 04/24/24 END DATE: 04/24/24
SURFACE ELEVATION: 833.8 ft
DRILLER: C. McClain LOGGED BY: S. Martin
RIG: 7514 METHOD: 3 1/4" HSA
SURFACING: Bituminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
833.3		PAVEMENT, 3 1/2 inches of bituminous over 3 inches of apparent aggregate base					
0.5		FILL: SILTY SAND (SM), fine to medium-grained, brown, moist		4-10-5 (15) 14"		8	
			5	2-3-3 (6) 13"		10	
826.8							
7.0		SILTY SAND (SM), fine-grained, brown, moist, medium dense (ALLUVIUM)		5-6-6 (12) 18"			
824.8							
9.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained, brown, moist, loose to medium dense (ALLUVIUM)	10	3-3-4 (7) 15"			
				3-3-4 (7) 18"			
			15	4-4-3 (7) 16"			
			20	6-9-9 (18) 18"			
812.8							
21.0		END OF BORING					Water not observed while drilling.
		Boring immediately grouted					
			25				
			30				

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-127**
LOCATION:
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 125404 EASTING: 520608
START DATE: 04/24/24 END DATE: 04/24/24
SURFACE ELEVATION: 834.8 ft
DRILLER: C. McClain LOGGED BY: S. Martin
RIG: 7514 METHOD: 3 1/4" HSA
SURFACING: Soil WEATHER: Sunny

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
		FILL: SILTY SAND (SM), fine to medium-grained, trace Gravel, dark brown to brown, moist		2-1-1 (2) 18"			
			5	0-0-0 WOH/18" 18"		11	P200=15%
827.8 7.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained, light brown to brown, moist, loose to medium dense (ALLUVIUM)		4-6-6 (12) 18"			
			10	11-9-9 (18) 18"			
				6-5-5 (10) 18"			
			15	9-7-8 (15) 18"			
			20	7-4-6 (10) 18"			
813.8 21.0		END OF BORING Boring immediately grouted					Water not observed while drilling.
			25				
			30				

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2304507
Geotechnical Evaluation
Southtown Development
7801-7997 Southtown Drive
Bloomington, Minnesota

BORING: **ST-128**
LOCATION:
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 125296 EASTING: 520922
START DATE: 05/03/24 END DATE: 05/03/24
SURFACING: Bituminous WEATHER: Clear

DRILLER: C. McClain LOGGED BY: S. Martin
SURFACE ELEVATION: 834.4 ft RIG: 7514 METHOD: 3 1/4" HSA

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
833.7		PAVEMENT, 5 inches of bituminous over 3 inches of apparent aggregate base					
0.7		POORLY GRADED SAND with SILT (SP-SM), fine-grained, light brown, moist, loose to medium dense (ALLUVIUM)		5-7-8 (15) 16"			
			5	3-5-4 (9) 14"			
				3-4-6 (10) 16"			
			10	3-4-6 (10) 14"			
				4-6-13 (19) 18"			
			15	8-9-16 (25) 16"			
			20	10-14-12 (26) 16"			
813.4							
21.0		END OF BORING					Water not observed while drilling.
		Boring immediately grouted					
			25				
			30				

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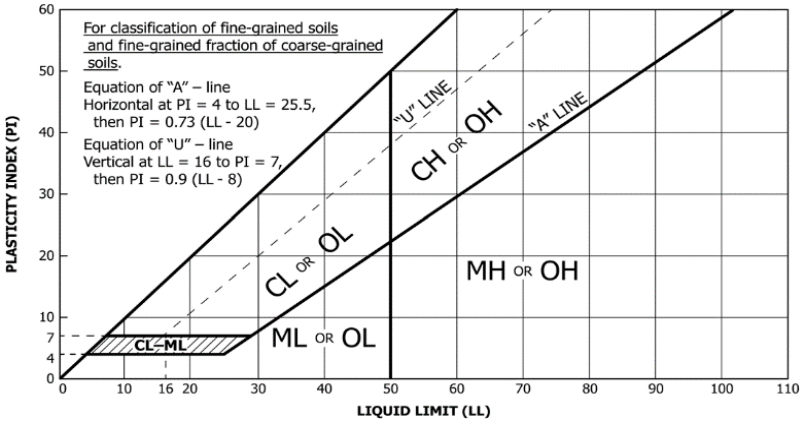
Descriptive Terminology of Soil

Based on Standards ASTM D2487/2488
(Unified Soil Classification System)

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A]				Soil Classification	
				Group Symbol	Group Name[B]
Coarse-grained Soils (more than 50% retained on No. 200 sieve)	Gravels (More than 50% of coarse fraction retained on No. 4 sieve)	Clean Gravels (Less than 5% fines[C])	$C_u \geq 4$ and $1 \leq C_c \leq 3$[D]	GW	Well-graded gravel[E]
			$C_u < 4$ and/or ($C_c < 1$ or $C_c > 3$)[D]	GP	Poorly graded gravel[E]
		Gravels with Fines (More than 12% fines[C])	Fines classify as ML or MH	GM	Silty gravel[E F G]
			Fines Classify as CL or CH	GC	Clayey gravel[E F G]
	Sands (50% or more coarse fraction passes No. 4 sieve)	Clean Sands (Less than 5% fines[H])	$C_u \geq 6$ and $1 \leq C_c \leq 3$[D]	SW	Well-graded sand[I]
			$C_u < 6$ and/or ($C_c < 1$ or $C_c > 3$)[D]	SP	Poorly graded sand[I]
		Sands with Fines (More than 12% fines[H])	Fines classify as ML or MH	SM	Silty sand[F G I]
			Fines classify as CL or CH	SC	Clayey sand[F G I]
Fine-grained Soils (50% or more passes the No. 200 sieve)	Silts and Clays (Liquid limit less than 50)	Inorganic	PI > 7 and plots on or above "A" line[J]	CL	Lean clay[K L M]
			PI < 4 or plots below "A" line[J]	ML	Silt[K L M]
		Organic	Liquid Limit – oven dried / Liquid Limit – not dried <0.75	OL	Organic clay[K L M N] / Organic silt[K L M O]
	Silts and Clays (Liquid limit 50 or more)	Inorganic	PI plots on or above "A" line	CH	Fat clay[K L M]
			PI plots below "A" line	MH	Elastic silt[K L M]
		Organic	Liquid Limit – oven dried / Liquid Limit – not dried <0.75	OH	Organic clay[K L M P] / Organic silt[K L M Q]
Highly Organic Soils		Primarily organic matter, dark in color, and organic odor		PT	Peat

A. Based on the material passing the 3-inch (75-mm) sieve.
B. If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
C. Gravels with 5 to 12% fines require dual symbols:
   GW-GM well-graded gravel with silt
   GW-GC well-graded gravel with clay
   GP-GM poorly graded gravel with silt
   GP-GC poorly graded gravel with clay
D. $C_u = D_{60} / D_{10}$ $C_c = (D_{30})^2 / (D_{10} \times D_{60})$
E. If soil contains ≥ 15% sand, add "with sand" to group name.
F. If fines classify as CL-ML, use dual symbol GC-GM or SC-SM.
G. If fines are organic, add "with organic fines" to group name.
H. Sands with 5 to 12% fines require dual symbols:
   SW-SM well-graded sand with silt
   SW-SC well-graded sand with clay
   SP-SM poorly graded sand with silt
   SP-SC poorly graded sand with clay
I. If soil contains ≥ 15% gravel, add "with gravel" to group name.
J. If Atterberg limits plot in hatched area, soil is CL-ML, silty clay.
K. If soil contains 15 to < 30% plus No. 200, add "with sand" or "with gravel", whichever is predominant.
L. If soil contains ≥ 30% plus No. 200, predominantly sand, add "sandy" to group name.
M. If soil contains ≥ 30% plus No. 200 predominantly gravel, add "gravelly" to group name.
N. PI ≥ 4 and plots on or above "A" line.
O. PI < 4 or plots below "A" line.
P. PI plots on or above "A" line.
Q. PI plots below "A" line.



Laboratory Tests

DD	Dry density, pcf	**q_p**	Pocket penetrometer strength, tsf
WD	Wet density, pcf	**q_U**	Unconfined compression test, tsf
P200	% Passing #200 sieve	**LL**	Liquid limit
MC	Moisture content, %	**PL**	Plastic limit
OC	Organic content, %	**PI**	Plasticity index

Particle Size Identification

Boulders..... over 12"
Cobbles..... 3" to 12"
Gravel
  Coarse..... 3/4" to 3" (19.00 mm to 75.00 mm)
  Fine..... No. 4 to 3/4" (4.75 mm to 19.00 mm)
Sand
  Coarse..... No. 10 to No. 4 (2.00 mm to 4.75 mm)
  Medium..... No. 40 to No. 10 (0.425 mm to 2.00 mm)
  Fine..... No. 200 to No. 40 (0.075 mm to 0.425 mm)
Silt..... No. 200 (0.075 mm) to .005 mm
Clay..... < .005 mm

Relative Proportions[L, M]

trace..... 0 to 5%
little..... 6 to 14%
with..... ≥ 15%

Inclusion Thicknesses

lens..... 0 to 1/8"
seam..... 1/8" to 1"
layer..... over 1"

Apparent Relative Density of Cohesionless Soils

Very loose ..... 0 to 4 BPF
Loose ..... 5 to 10 BPF
Medium dense..... 11 to 30 BPF
Dense..... 31 to 50 BPF
Very dense..... over 50 BPF

Consistency of Cohesive Soils	Blows Per Foot	Approximate Unconfined Compressive Strength
Very soft	0 to 1 BPF	< 0.25 tsf
Soft	2 to 4 BPF	0.25 to 0.5 tsf
Medium	5 to 8 BPF	0.5 to 1 tsf
Stiff	9 to 15 BPF	1 to 2 tsf
Very Stiff	16 to 30 BPF	2 to 4 tsf
Hard	over 30 BPF	> 4 tsf

Moisture Content:

Dry: Absence of moisture, dusty, dry to the touch.
Moist: Damp but no visible water.
Wet: Visible free water, usually soil is below water table.

Drilling Notes:

Blows/N-value: Blows indicate the driving resistance recorded for each 6-inch interval. The reported N-value is the blows per foot recorded by summing the second and third interval in accordance with the Standard Penetration Test, ASTM D1586.

Partial Penetration: If the sampler could not be driven through a full 6-inch interval, the number of blows for that partial penetration is shown as #/x" (i.e. 50/2"). The N-value is reported as "REF" indicating refusal.

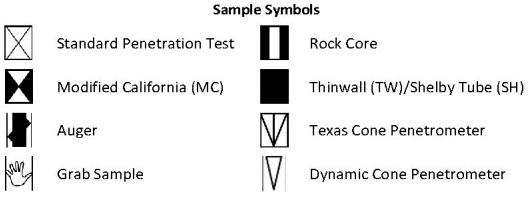
Recovery: Indicates the inches of sample recovered from the sampled interval. For a standard penetration test, full recovery is 18", and is 24" for a thinwall/shelby tube sample.

WOH: Indicates the sampler penetrated soil under weight of hammer and rods alone; driving not required.

WOR: Indicates the sampler penetrated soil under weight of rods alone; hammer weight and driving not required.

Water Level: Indicates the water level measured by the drillers either while drilling (▽), at the end of drilling (▼), or at some time after drilling (▼).

Sample Symbols



5/2021

Appendix 5. MIDS Analysis

Project Information

Calculator Version:	Version 2: June 2014
Project Name:	Southtown
User Name / Company Name:	ACL - Kimley-Horn
Date:	6/18/2024
Project Description:	Kraus Anderson proposes to redevelop the Southtown Shopping Center by adding a sporting goods building, and providing space for an additional building. All associated parking lot improvements, underground utilities, landscaping, stormwater management, and other appurtenances are proposed to be constructed.

Site Information

Retention Requirement (inches):	1.1
Site's Zip Code:	55431
Annual Rainfall (inches):	31.3
Phosphorus EMC (mg/l):	0.3
TSS EMC (mg/l):	54.5

Total Site Area

Land Cover	A Soils (acres)	B Soils (acres)	C Soils (acres)	D Soils (acres)	Total (acres)
Forest/Open Space - Undisturbed, protected forest/open space or reforested land					0
Managed Turf - disturbed, graded for yards or other turf to be mowed/managed			1.76		1.76
				Impervious Area (acres)	12.75
				Total Area (acres)	14.51

Site Areas Routed to BMPs

Land Cover	A Soils (acres)	B Soils (acres)	C Soils (acres)	D Soils (acres)	Total (acres)
Forest/Open Space - Undisturbed, protected forest/open space or reforested land					0
Managed Turf - disturbed, graded for yards or other turf to be mowed/managed			1.42		1.42
				Impervious Area (acres)	11.8
				Total Area (acres)	13.22

Summary Information

Performance Goal Requirement

Performance goal volume retention requirement:	50911	ft3
Volume removed by BMPs towards performance goal:		ft^3
Percent volume removed towards performance goal		**%**

Annual Volume and Pollutant Load Reductions

Post development annual runoff volume	29.343	acre-ft
Annual runoff volume removed by BMPs:	0	acre-ft
Percent annual runoff volume removed:	**0**	**%**
Post development annual particulate P load:	13.17	lbs
Annual particulate P removed by BMPs:	11.9	lbs
Post development annual dissolved P load:	10.77	lbs
Annual dissolved P removed by BMPs:	3.58	lbs
Percent annual total phosphorus removed:	**65**	**%**
Post development annual TSS load:	4350	lbs
Annual TSS removed by BMPs:	3932	lbs
Percent annual TSS removed:	**90**	**%**

BMP Summary

Performance Goal Summary

BMP Name	BMP Volume Capacity (ft3)	Volume Recieved (ft3)	Volume Retained (ft3)	Volume Outflow (ft3)	Percent Retained (%)
Filtration System #1	0	26194	0	26194	0
Filtration System #2	0	20923	0	20923	0
System #2 Bayfilter	0	20923	0	20923	0
System #1 Bayfilter	0	26194	0	26194	0

Annual Volume Summary

BMP Name	Volume From Direct Watershed (acre-ft)	Volume From Upstream BMPs (acre-ft)	Volume Retained (acre-ft)	Volume outflow (acre-ft)	Percent Retained (%)
Filtration System #1	15.0428	0	0	15.0428	0
Filtration System #2	12.0061	0	0	12.0061	0
System #2 Bayfilter	0	0	0	0	0
System #1 Bayfilter	0	0	0	0	0

Particulate Phosphorus Summary

BMP Name	Load From Direct Watershed (lbs)	Load From Upstream BMPs (lbs)	Load Retained (lbs)	Outflow Load (lbs)	Percent Retained (%)
Filtration System #1	6.75	0	5.74	1.01	85
Filtration System #2	5.39	0	4.58	0.81	85
System #2 Bayfilter	0	0.81	0.7	0.11	87
System #1 Bayfilter	0	1.01	0.88	0.13	87

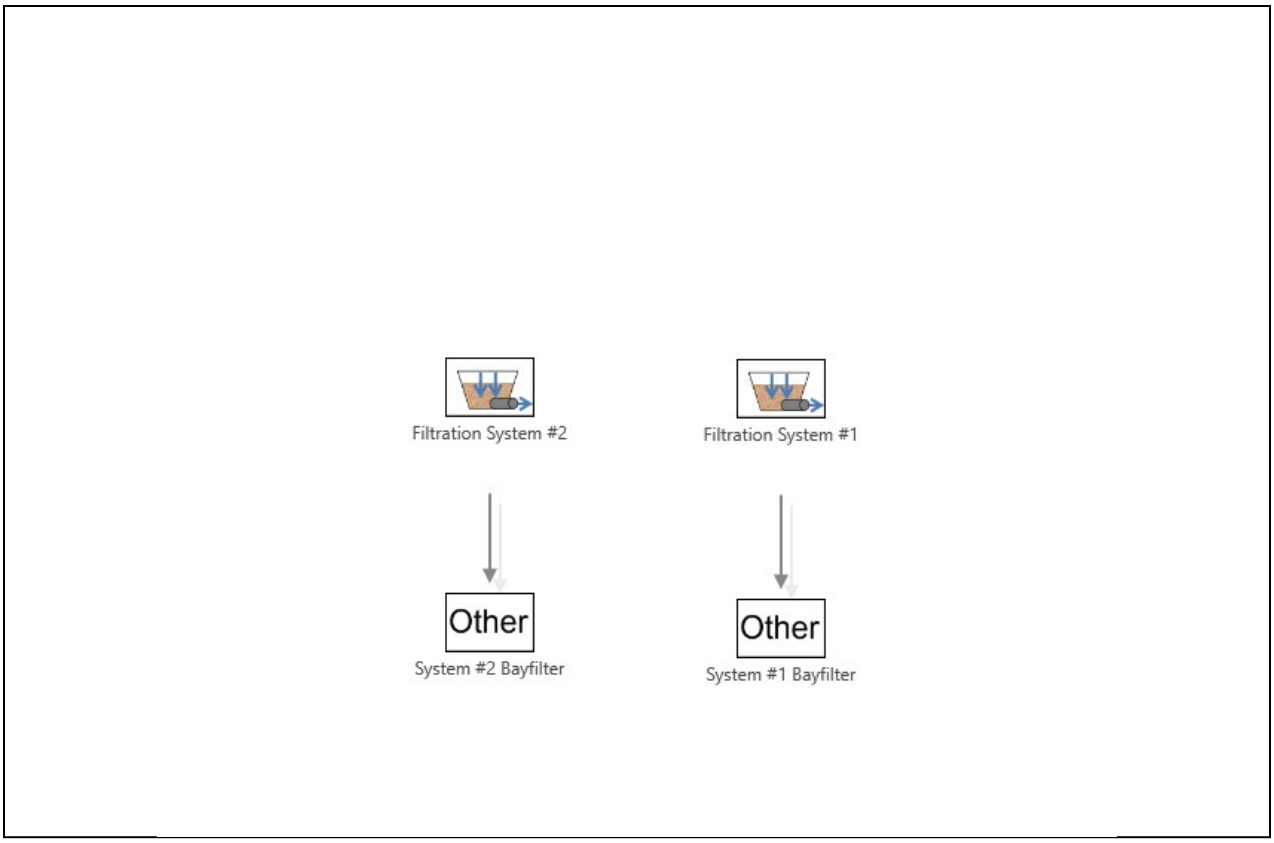
Dissolved Phosphorus Summary

BMP Name	Load From Direct Watershed (lbs)	Load From Upstream BMPs (lbs)	Load Retained (lbs)	Outflow Load (lbs)	Percent Retained (%)
Filtration System #1	5.52	0	0	5.52	0
Filtration System #2	4.41	0	0	4.41	0
System #2 Bayfilter	0	4.41	1.59	2.82	36
System #1 Bayfilter	0	5.52	1.99	3.53	36

TSS Summary

BMP Name	Load From Direct Watershed (lbs)	Load From Upstream BMPs (lbs)	Load Retained (lbs)	Outflow Load (lbs)	Percent Retained (%)
Filtration System #1	2230	0	1896	334	85
Filtration System #2	1780	0	1513	267	85
System #2 Bayfilter	0	267	232	35	87
System #1 Bayfilter	0	334	291	43	87

BMP Schematic


Filtration System #2
Filtration System #1
Other
System #2 Bayfilter
Other
System #1 Bayfilter