raSmith

CREATIVITY BEYOND ENGINEERING

Storm Water Management Report for

Reserve at Waukesha

City of Waukesha, WI

Project No. 3170302

REV. July 29, 2019
May 10, 2019

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PURPOSE

raSmith has been retained by the Campbell Capital Group to prepare a Stormwater Management Plan for the proposed Reserve at Waukesha project.

The project is located at the southwest corner of E. Saint Paul Avenue and Mary Street, along the Fox River in downtown Waukesha. The entire site is classified by USGS Web Soil Survey as loam soils (hydraulic soil group D). The site is currently developed with mowed grass and pavement for parking. A large portion of the site was previously building per a 2010 aerial photograph. In this analysis, 2010 conditions will be used as existing conditions. The site generally drains north to south and ultimately to the Fox River

The proposed project consists of a multi-level luxury apartment complex with associated parking, sidewalks, and landscaping. To meet stormwater management requirements, an underground detention system has been proposed.

Storm water management for this redevelopment site is regulated by the City of Waukesha Municipal Code Chapter 32 and the Wisconsin Department of Natural Resources NR 151. The analysis presented in this report addresses post-construction water quantity, water quality, and infiltration requirements.

RUNOFF MANAGEMENT REGULATIONS

The total site under investigation is 2.14 acres. Only areas within the property boundaries have been included in the analysis. This project is classified as redevelopment as relating to stormwater management.

Water Quantity: Chapter 32 of the Waukesha code requires that the proposed peak discharge rate for the 1-yr, 2-yr, 10-yr, and 100-yr 24-hr storm events must be no more than the existing peak discharge rate the same storm event

Water Quality: Chapter 32 of the Waukesha code and NR 151.122, total suspended solids (TSS) generated from parking lots and roads must be reduced by 40% as compared with no controls.

Site Infiltration: Per NR 151, redevelopment sites are exempt from infiltration requirements. Per chapter 32 of the Waukesha code, development with more than 40% and up to 80% connected imperviousness shall infiltrate sufficient runoff volume so that the post-development infiltration volume shall be at least 75% of the pre-development infiltration volume, based on an average annual rainfall.

METHODS OF ANALYSIS

Hydrologic analysis included in this report was performed using the HydroCAD hydrologic simulation computer model, version 10.00 by HydroCAD Software Solutions LLC. The discharges were generated using the SCS Dimensionless Unit Hydrograph Method for a 24-hour duration storm. Model parameters include drainage area, SCS runoff curve number, time of concentration and 24-hour precipitation with an MSE Type III distribution.

Table 1 – Design Storm Events
Per Chapter 32.10 Table 3

Frequency (years)	Duration (hours)	Rainfall Depth (inches)
1	24	2.40
2	24	2.70
10	24	3.81
100	24	6.18

WATER QUANTITY DESIGN

The study area is 2.14 acres. Table 2 summarizes the pre-development site parameters and peak discharge rates for the 1-yr, 2-yr, 10-yr, and 100-yr storm events. See the attached hydrographs and existing hydrology exhibit for additional information.

Table 2 – Pre-Development Stormwater Quantity Summary

Watershed ID	**Watershed Characteristics**			**Peak Discharge (cfs)**			
	Area	CN	Tc	1-year	2-year	10-year	100-year
E-1	1.28	95	8.0	3.83	4.39	6.43	10.73
E-2	0.86	98	6.0	3.01	3.40	4.84	7.89
TOTAL	2.14	-	-	**6.76**	**7.70**	**11.14**	**18.42**

The post-developed site increases peak discharge rates due to the increased impervious area. Table 3 summarizes the post-developed site parameters and peak discharge rates generated by the 1-year, 2-year, 10-year, and 100-year storm events prior to detention. Refer to the proposed conditions hydrographs (Before Detention) and proposed hydrology exhibit for more detail.

Table 3 – Post-Developed Peak Discharge Rates (Before Detention)

				Peak Discharge (cfs)			
Watershed	Area (ac)	CN	Tc (min)	1-year	2-year	10-year	100-year
P-1	0.38	96	6.0	1.30	1.48	2.14	3.54
P-2	1.76	97	6.0	6.02	6.83	9.78	16.05
TOTAL	2.14	-	-	**7.32**	**8.31**	**11.93**	**19.59**

A reduction in peak discharge rates will be achieved by routing a portion of the post-developed site (P-1) through the underground detention system. Table 4 summarizes the parameters and peak discharge rates generated by the 1-year, 2-year, 10-year, and 100-year storm events after detention. Refer to the proposed conditions hydrographs (After Detention) and proposed hydrology exhibit for more detail.

Table 4 – Post-Developed Peak Discharge Rates (After Detention)

	Peak Discharge (cfs)				Routed 100-yr Elevation	100-yr Storage (ft^3)
Pond	1-year	2-year	10-year	100-year		
UG Det	0.85	1.00	1.42	3.00	**28.12**	**2,874**
P-2	6.02	6.83	9.78	16.05	**-**	**-**
TOTAL	**6.65**	**7.67**	**11.04**	**17.97**	**-**	**-**

Table 5 – Summary of City of Waukesha Peak Discharge Requirements (cfs)

	1-year	2-year	10-year	100-year
Pre-Development	**6.76**	**7.70**	**11.14**	**18.42**
Post-Development	**6.65**	**7.67**	**11.04**	**17.97**

WATER QUALITY DESIGN

Water quality treatment was obtained through the use of an underground detention system with a normal water level at the midpoint of the pipe. The underground detention basin was designed to reduce the average annual total suspended solids (TSS) load generated for new parking and roads only. Runoff from non-pavement areas such as roofs, sidewalks, and grass has been accounted for while excluding pollutant loading. Storm water quality was evaluated using the Source Loading and Management Model (WinSLAMM). The results are shown in Table 6 with the applicable computer generated information located in the appendix.

Table 6 –Proposed Site TSS Loads With and Without Controls

	TSS Generated (lbs/year)
No Control (Parking Lots & Roads Only)	295.4
No Control (Entire Project Limits)	778.9
With Controls (Entire Project Limits)	617.5

REQUIRED REDUCTION OF TSS
FROM PARKING LOTS AND ROADS = 295.4 x 40% = 118.2 lbs

REDUCTION OF TSS FROM SITE = 778.9-617.5 = 161.4 lbs

(161.4/295.4) = **54.63% TSS REDUCTION**

INFILTRATION DESIGN

The DNR exempts redevelopment sites like this one from stormwater infiltration based on NR 151.124(3)(b)3.

The City of Waukesha promotes infiltration on any site that allows. There are a couple of factors on this project that would prohibit infiltration including the following:

- Soils where infiltration is less than 0.6 inches per hour.
- Contaminated soils from previous ownership

In discussions with the Geotechnical Engineer, PSI, it was determined that most of the site was not suitable for infiltration based on soil type. There were some marginal areas (B1-B3 and B6-B7) where infiltration would be possible, but are at the same location of the proposed building. Using these locations for infiltration would not make the project feasible. The areas in the proposed park that make the most sense for infiltration (B16-B17) are not suitable areas due to soil type. An exhibit has been provided in Section V.e. for reference.

Additionally, The Sigma Group has prepare a Phase I Environmental Assessment for the project. Within this report, Sigma has identified a history of possible contamination on this site, including the following:

- Possible contamination that could have negatively impacted the subject property via soil, groundwater or vapor from a 275 gallon fuel oil tank.
- Historic occupants that performed operations with hazardous materials that could have negatively impacted the subject site via soil, groundwater, or vapor. Some of these occupants include a

woodworking shop with storage and painting, a lumber company with coal storage, and machine shop for auto repair.

- A review of City directories indicated that a dry cleaner was located adjacent to the subject parcel for some time. Based on the relative distance between the sites, a release from dry cleaning operations could have negatively impacted the subject property via soil, groundwater, or vapor.

Due to these concerns, we have not provided infiltration on this project.

CONSTRUCTION COST ESTIMATE & INSPECTION OF STORMWATER BMP

The underground detention system shall be inspected by City of Waukesha at least once during construction and once after final stabilization of the site. The underground detention system will be checked to verify that the parameters of the system has been constructed as designed.

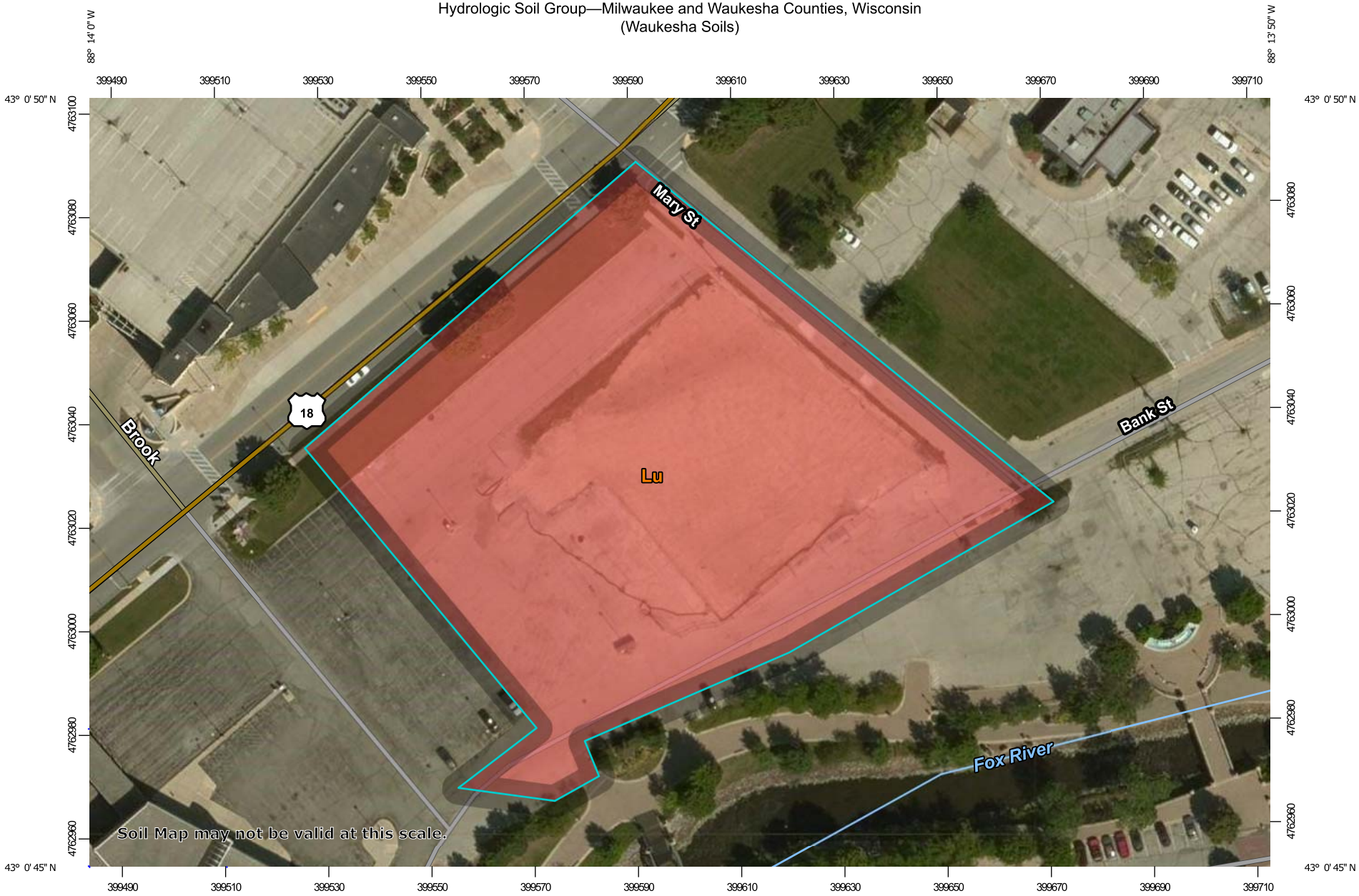
For the purpose of financial assurance per City code section 32.08(c), it is estimated that the underground detention system shall cost $27,000. This includes the 84" diameter pipe, outlet structure, and construction.

SUMMARY

The analysis of the project and the proposed underground detention facility indicates the requirements of the City of Waukesha Chapter 32 and the Wisconsin Department of Natural Resources NR 151 have been satisfied.

Soil & Geotechnical Data

Hydrologic Soil Group—Milwaukee and Waukesha Counties, Wisconsin
(Waukesha Soils)



Map Scale: 1:1,050 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 15 30 60 90

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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

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

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

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

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

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

Soil Survey Area: Milwaukee and Waukesha Counties, Wisconsin
Survey Area Data: Version 14, Sep 12, 2018

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

Date(s) aerial images were photographed: Sep 7, 2014—Sep 22, 2014

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Lu	Loamy land	D	2.2	100.0%
Totals for Area of Interest			**2.2**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

May 20, 2019

Campbell Capital Group, LLC
587 Glenridge Drive NE
Suite 360
Sandy Springs, GA 30328

Attn: Mr. Michael J. Campbell
Managing Member

Re: Geotechnical Exploration Report
Proposed Residential Apartment/Parking Structure and Restaurant Development
East St. Paul Avenue
Waukesha, Wisconsin
PSI Proposal No.: 00522340

Dear Mr. Campbell:

Professional Service Industries, Inc. (PSI), an Intertek Company, is pleased to submit our Geotechnical Exploration Report for the proposed Residential Apartment/Parking Structure and Restaurant Development located in Waukesha, Wisconsin. This report includes the results of field and laboratory testing; recommendations for foundations, floor slabs, and pavements; as well as general site development recommendations.

PSI appreciates the opportunity to perform this geotechnical study and we look forward to continued participation during the design and construction phases of this project. If you have any questions pertaining to this report, or if we may be of further service, please contact our office.

Respectfully submitted,

PROFESSIONAL SERVICE INDUSTRIES, INC

Bradley J. Broback, P.E.
Project Engineer

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PROFESSIONAL ENGINEER

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The above Professional Engineering Seal and signature is an electronic reproduction of the original seal and signature. An original copy may be sent if requested. This electronic reproduction shall not be construed as an original or certified document
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GEOTECHNICAL EXPLORATION REPORT

For the:

Proposed Residential Apartment/Parking Structure and
Restaurant Development
East St. Paul Avenue
Waukesha, Wisconsin

Prepared for:

Campbell Capital Group, LLC
587 Glenridge Drive NE
Suite 360
Sandy Springs, GA 30328

Prepared by:

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(262) 521-2125
Fax (262) 521-2471

PSI Report Number: 00522340

May 20, 2019

Bradley J. Broback, P.E.
Project Engineer

Ted A. Cera, P.E.
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PROJECT INFORMATION

Project Authorization

The following table summarizes, in chronological order, the Project Authorization History for the services performed and represented in this report by Professional Service Industries, Inc. (PSI):

DOCUMENT AND REFERENCE NUMBER	DATE	SOURCE OF REQUEST	AUTHOR OR AGENT
PSI Proposal Number: 266404	2/11/2019	PSI	Mr. Ted A. Cera, P.E.
Notice to Proceed (via signed proposal)	2/13/2019	Campbell Capital Group, LLC.	Mr. Michael J. Campbell
Change Order No. 1	4/23/2019	PSI	Mr. Bradley J. Broback, P.E.
Notice to Proceed (via signed change order)	4/24/2019	Campbell Capital Group, LLC.	Mr. Michael J. Campbell

Project Description

It is understood that the proposed project includes the construction of a residential apartment building, parking structure, and restaurant in Waukesha, Wisconsin. The following table lists the material and information provided for this project:

DESCRIPTION OF MATERIAL	PROVIDER/SOURCE	DATE
Site Survey	RA Smith	12/21/2018
Concept Plan	Poole & Poole Architecture	1/22/2019

The proposed development will reportedly consist of three slab-on-grade buildings without lower levels, including a 4-story apartment building, attached 5-story parking structure with an exposed parking deck, and a 2-story brewery/restaurant. Based on the concept plan provided, the development may also include paved parking and drive areas, as well as a small park area near the Fox River with sidewalk.

The apartment and restaurant building are estimated to be of wood frame construction. Although no structural loading has been provided, the maximum loads for the restaurant and apartment building are estimated to be on the order of about 100 and 300 kips for columns and 4 and 8 kips per linear foot for walls, respectively. The parking structure is estimated to be constructed of precast concrete plank floors. Maximum wall loads on the order of about 20 kips per linear foot and maximum column loads on the order of about 1,000 kips are estimated for the parking structure. Floor slab loads for the buildings are anticipated to be on the order of 150 to 250 pounds per square foot (psf).

Although no planned finished floor elevations have been provided for the buildings, based on the understanding that the existing grades will be raised at least about 2 feet, the

finished floor elevation for all three buildings has been estimated as EL. 34 (local). All elevations referenced in this report are relative to the City of Waukesha local datum.

It is understood that the Sigma Group is performing Phase 1 and 2 Environmental Site Assessments for the property and that contamination may be present at this site.

The following table lists the structural loads and site features that are the design basis for the conclusions contained in this report:

STRUCTURAL LOAD/PROPERTY	REQUIREMENT/DESIGN BASIS	
PROPOSED APARTMENT BUILDING		
Estimated Maximum Column Load	300 kips	B
Estimated Maximum Wall Load	8 kips per linear foot (klf)	B
Estimated Maximum Floor Load	150 to 250 pounds per square foot (psf)	B
Estimated Finished Floor Elevation	EL. 34 (local)	B
PROPOSED PARKING STRUCTURE		
Estimated Maximum Column Load	1,000 kips	B
Estimated Maximum Wall Load	20 kips per linear foot (klf)	B
Estimated Maximum Floor Load	150 to 250 pounds per square foot (psf)	B
Estimated Finished Floor Elevation	EL. 34 (local)	B
PROPOSED BREWERY/RESTAURANT		
Estimated Maximum Column Load	100 kips	B
Estimated Maximum Wall Load	4 kips per linear foot (klf)	B
Estimated Maximum Floor Load	150 to 250 pounds per square foot (psf)	B
Estimated Finished Floor Elevation	EL. 34 (local)	B
PAVEMENT		
Design Period	20 years	B
Pavement 18-kip ESALs (cycle & duration)	Light Duty - 30,000 ESALs	B
Pavement 18-kip ESALs (cycle & duration)	Heavy Duty - 60,000 ESALs	B

B = Report has been prepared based on this estimated parameter in the absence of client supplied information at the time of this report preparation
R = Based on information supplied by others

The geotechnical recommendations presented in this report are based on the available project information, building locations, and the subsurface materials described in this report. If any of the above noted information is incorrect, please inform PSI in writing so that we may amend the recommendations presented in this report if appropriate and if desired by the client. PSI will not be responsible for the implementation of its recommendations when it is not notified of changes in the project.

Purpose and Scope of Services

The purpose of this study was to explore the subsurface conditions at the site and develop geotechnical design criteria regarding foundations, floor slabs, and pavements

for the planned project. Subgrade preparation recommendations and construction considerations are also provided. As requested, PSI's scope of services included drilling a total of sixteen soil borings (B-1 through B-16), performing eight test pit excavations (TP-1 through TP-8), performing select laboratory testing, and preparing this geotechnical report. Upon completion of the borings, it was elected to perform test pit excavations to further evaluate the fill material rubble content and the size of the rubble, to help estimate the difficulty which may occur with conventional excavation and other foundation types installed by drilling, such as rammed aggregate piers. The test pits were also performed to better estimate the lateral extent of the buried organic soils encountered along the southeast end of the apartment/parking structure building.

The scope of services did not include an environmental assessment for determining the presence or absence of wetlands, or hazardous or toxic materials in the soil, bedrock, surface water, groundwater, or air on or below, or around this site. Any statements in this report or on the logs regarding odors, colors, and unusual or suspicious items or conditions are strictly for informational purposes.

SITE AND SUBSURFACE CONDITIONS

Site Location and Description

The project site is located to the south of the intersection of E. St. Paul Avenue and N. Barstow Street in Waukesha, Wisconsin. The approximate Latitude and Longitude near the center of the proposed development are 43.0132˚N and 88.2314˚W, respectively. The project site was generally vacant at the time of the exploration. The ground surface in the areas of the proposed development consisted of asphalt pavement and grass. An approximate 3 to 4-foot tall retaining wall was present near the northwest boundary of the site near E. St. Paul Avenue. This wall retains a higher grade that exists along the east side of E. St. Paul Avenue.

Based on the survey, the site is gently rolling with existing grades ranging from about EL. 29 to EL. 36. The Fox River is present to the south and Waukesha State Bank is present to the southwest. Historical aerials indicate that there were former buildings in the area of the proposed development as recent as 2011.

Subsurface Conditions

The subsurface conditions were explored within 16 soil test borings (B-1 to B-16) and 8 test pits (TP-1 through TP-8) as requested. The proposed depths of the borings ranged from about 15 to 30 feet. However, auger refusal was encountered at all borings but B-15 and B-16 at depths ranging from about 9.5 to 26.5 feet (EL. 26.5 to EL. 9.5) on possible cobbles, boulders, or bedrock. The following table indicates the general boring locations, approximate ground surface elevations at each boring, and depths to which the borings were completed:

Boring Number	General Location	Approximate Ground Surface Elevation (feet)	Planned Boring Depth (feet)	Approx. Completion Depth/Elevation (feet)
B-1	Apartment Building West	EL. 35	25	17.5/EL. 17.5
B-2	Parking Structure West	EL. 36	30	26.5/EL. 9.5
B-3	Apartment Building Center	EL. 30	25	19.5/EL. 10.5
B-4	Apartment Building South	EL. 29	25	16/EL. 13
B-5	Parking Structure South	EL. 30	30	19/EL. 11
B-6	Parking Structure North	EL. 36	30	9.5/EL. 26.5
B-7	Parking Structure West Center	EL. 31	30	21.5/EL. 9.5
B-8	Parking Structure East Center	EL. 33	30	23/EL. 10
B-9	Parking Structure East	EL. 30	30	17.5/EL. 12.5
B-10	Brewery/Restaurant Northwest	EL. 32	20	16/EL. 16
B-11	Brewery/Restaurant Northeast	EL. 32	20	18.5/EL. 13.5
B-12	Brewery/Restaurant Center	EL. 32	20	18.5/EL. 13.5
B-13	Brewery/Restaurant Southwest	EL. 32	20	19.5/EL. 12.5
B-14	Brewery/Restaurant Southeast	EL. 33	20	18/EL. 15
B-15	Pavement	EL. 30	15	15/EL. 15
B-16	Pavement	EL. 31	15	15/EL. 16

The borings were located in the field by PSI utilizing a consumer-grade handheld GPS device. The approximate boring and test pit locations can be found on the Test Location Plan within the appendix of this report. They are considered accurate to within about 10 feet. The test pit locations were approximated relative to various site features and the borings performed. The elevations of the existing ground surface at the borings and test pits were estimated by interpolation from the site survey provide which included existing grades with one-foot contour intervals. The elevations are considered accurate to within about 1 foot and were rounded to the nearest foot for ease of interpretation within this report.

The borings were advanced utilizing hollow-stem auger drilling methods and soil samples were routinely obtained during the drilling process. Drilling and sampling techniques were accomplished generally in accordance with ASTM procedures. The test pits were performed with a mini excavator. Representative soil samples were obtained from the soil borings and test pits and were returned to PSI's laboratory where they were visually classified using the Unified Soil Classification System (USCS) as a guideline. Further, PSI conducted limited laboratory testing on select soil samples to aid in identifying and describing the physical characteristics of the soils and to aid in defining the site soil stratigraphy. The results of the field exploration and laboratory tests were used in PSI's engineering analysis and in the formulation of our engineering recommendations.

Soil Borings (B-1 through B-16)

The surficial materials at B-3, B-4, B-15, and B-16 consisted of about 3 to 5 inches of asphalt pavement overlying about 7 to 9 inches of sand and gravel aggregate base. The surface materials at the remaining locations consisted of about 4 to 12 inches of topsoil fill generally comprised of dark brown silty sand with root matter.

Below the surface materials at all the borings were fill and possible fill materials extending to depths ranging from about 3 to 8 feet (EL. 28 to EL. 24) generally consisting of brown, dark brown, gray, and black silty sand and gravel, or silty/lean clay with varying amounts of sand, gravel, asphalt rubble, concrete rubble, root matter, and wood. The fill soils at B-5 included an area of black clay with vegetative fibers from about 5.5 to 8 feet (EL. 24.5 to EL. 22). Moisture contents of the granular fill/possible fill materials were in the range of about 3 to 18 percent, indicating a moist to very moist condition. Moisture content of the cohesive fill/possible fill soils were in the range of about 11 to 27 percent, indicating a moist to very moist condition.

Below the above described fill materials at borings B-4, B-9, B-15, and B-16 were organic soils comprised of possible buried topsoil, topsoil fill, and natural silt with vegetative fibers, with low to moderate organic content, extending to depths of about 6.5 to 12 feet (EL. 23.5 to EL. 19) below the ground surface. Several organic content tests by Loss-On-Ignition (LOI) method were performed on these materials. The results of the tests indicated organic contents ranging from about 5.1 to 16.6 percent. Moisture contents of these soils ranged from about 29 to 89 percent. The individual test results are shown on the boring logs in the appendix. A summary of the organic materials encountered in the soil borings are presented in the table below:

Boring Number	Approx. Depth/Bottom El. (feet)	Description	Moisture Content (%)	Organic Content (%)
B-4	8/EL. 21	Possible Buried Topsoil, Dark Gray Lean Clay with Root Matter	45	5.1
B-5	8/EL. 22	Fill, Black Sandy Silty Clay with Vegetative Fibers	29	9.1
B-9	8/EL. 22	Possible Buried Topsoil, Black Silty Clay with Vegetative Fibers	62	10.1
	9.5/EL. 20.5	Dark Brown Silt with Vegetative Fibers	89	not tested
B-15	6.5/EL. 23.5	Possible Buried Topsoil, Black Silty Clay with Root Matter	37	16.6
B-16	5.5/EL. 25.5	Possible Buried Topsoil, Black and Brown Lean Clay, Trace Root Matter	34	not tested
	8/EL. 23	Dark Gray Lean Clay with Root Matter	84	not tested
	12/EL. 19	Dark Brown Silt with Vegetative Fibers	51	not tested

Below the above described fill, possible fill, and organic soils, native brown and gray silty sand and gravel with clay seams were encountered extending to the termination depths of the borings. The exceptions to the foregoing occurred at B-10 through B-12, where

natural lean clay and silty clay were encountered above the silty sand and gravel to depths ranging from about 8 to 12 feet (EL. 24 to EL. 20). Moisture contents of the natural silty sand and gravel ranged from about 3 to 14 percent, indicating a moist to wet condition. Strength tests indicated medium dense to very dense relative density with N-values ranging from about 11 blows per foot to 50 blows for 1 inch of split spoon sampler penetration (generally greater than about 20 bpf). Moisture contents of the native clay soils were in the range of about 16 to 27 percent, indicating a moist to very moist condition. The native brown lean clay soils were generally stiff to hard in consistency with estimated unconfined compressive strengths in the range of about 1.75 to 4.3 tsf. As an exception, the natural lean clay at B-11 below the existing fill, to a depth of about 12 feet displayed soft consistency with estimated unconfined compressive strengths on the order of about 0.25 tsf.

It should be noted that at B-7 and B-8, black and dark gray silty sand and gravel with possible petroleum-type odors were encountered at depths of about 12 to 17 (EL. 19 to EL. 14 and EL. 21 to EL. 16, respectively).

Auger refusal was encountered at all the borings except B-15 and B-16, on possible cobbles, boulders, or bedrock. Refusal depths ranged from about 9.5 to 26.5 feet (EL. 26.5 to EL. 9.5) below existing grades.

Test Pit Excavations (TP-1 through TP-8)

Upon completion of the borings, it was elected to perform test pit excavations with a mini excavator to further evaluate the fill material rubble content and the size of the rubble, to help estimate the difficulty which may occur with conventional excavation and other foundation types installed by drilling, such as rammed aggregate piers. The test pits were also performed to better estimate the lateral extent of the buried organic soils encountered along the southeast end of the apartment/parking structure building.

Below the surface topsoil fill at all the test pits, was existing fill to depths of about 6 to 9 feet (EL. 29 to EL. 21) below existing grades. The existing fill generally consisted of brown, gray, and black silty sand with lean clay pockets, concrete pieces (about 18 to 24 inches wide), bricks, cobbles, boulders, possible coal cinders, and possible foundry slag. At TP-2, TP-3, and TP-5, the excavations ended within the existing fill materials, due to difficult excavation on cobbles and boulders. Below the existing silty sand and gravel fill at TP-1, TP-7, and TP-8, were possible buried topsoil (black lean clay or silty clay with vegetative fibers and root matter), lean clay fill with root matter, or brown organic fibrous silt to depths of about 9 to 10 feet (EL. 21 to EL. 20). Several organic content tests by Loss-On-Ignition (LOI) method were performed on these materials. The results of the tests indicated organic contents ranging from about 10.3 to 32.7 percent. Moisture contents of these soils ranged from about 45 to 134 percent. The individual test results are shown on the test pit logs in the appendix. A summary of the organic materials encountered in the test pits are presented in the table below:

BORING NUMBER	DEPTH/BOTTOM EL. (FEET)	DESCRIPTION	MOISTURE CONTENT (%)	ORGANIC CONTENT (%)
TP-1	7/EL. 23	Possible Buried Topsoil, Black Silty Clay with Vegetative Fibers	92	17.6
	9/EL. 21	Brown Vegetative Fibrous Silt	103	23.9
TP-7	7.5/EL. 22.5	Fill, Black Lean Clay with Root Matter	45	12.7
TP-8	7/EL. 23	Possible Buried Topsoil, Black Lean Clay with Root Matter	48	10.3
	8.5/EL. 21.5	Brown Vegetative Fibrous Silt	134	32.7

Below the existing fill and buried organic soils at TP-1, TP-4, TP-6, TP-7, and TP-8, were natural gray or light brown silty sand and gravel or lean clay to the termination depths of the test pits.

The above subsurface descriptions are of a generalized nature to highlight the major subsurface stratification features and material characteristics. The boring and test pit logs included in the appendix should be reviewed for specific information at individual test locations. These records include soil descriptions, stratifications, penetration resistances, locations of the samples and laboratory test data. The stratifications shown on the logs represent the conditions at the actual test locations only. Variations may occur and should be expected between test locations. The stratification represents the approximate boundaries between subsurface materials and the actual transitions may be gradual. Water level information obtained during field operations is also shown on these boring logs. The samples that were not discarded during classification or altered by laboratory testing will be retained for 60 days from the date of this report and then will be discarded.

Groundwater Information

Groundwater observations were made during the drilling operations, and in the open boreholes and test pits at completion. Water was encountered during auger advancement at most of the borings performed at depths ranging from about 8 to 13.5 feet (EL. 24.5 to EL. 18). Upon completion and removal of the augers, water was present at borings B-4, B-5, and B-7 through B-16 above the caved soils, at depths ranging from about 8 to 10 feet (EL. 23 to EL. 19). No water was encountered in any of the test pit excavations. The following table summarizes the water levels observed during and upon completion of drilling.

BORING NUMBER	APPROXIMATE GROUND SURFACE ELEVATION (FEET)	APPROX. DEPTH OF WATER/EL. DURING DRILLING (FEET)	APPROX. DEPTH OF WATER/EL. UPON COMPLETION OF DRILLING (FEET)
B-1	EL. 35	13.5/EL. 21.5	Not Observed*
B-2	EL. 36	12/EL. 24	Not Observed*
B-3	EL. 30	8.5/EL. 21.5	Not Observed*
B-4	EL. 29	8.5/EL. 20.5	10/EL. 19
B-5	EL. 30	12/EL. 18	9/EL. 21
B-6	EL. 36	Not Observed	Not Observed*
B-7	EL. 31	8/EL. 23	8/EL. 23
B-8	EL. 33	12/EL. 21	10/EL. 23
B-9	EL. 30	12/EL. 18	10/EL. 20
B-10	EL. 32	12/EL. 20	10/EL. 22
B-11	EL. 32	8.5/EL. 23.5	9/EL. 23
B-12	EL. 32	8.5/EL. 23.5	9.5/EL. 22.5
B-13	EL. 32	8/EL. 24	10/EL. 22
B-14	EL. 33	8.5/EL. 24.5	10/EL. 23
B-15	EL. 30	12/EL. 18	9/EL. 21
B-16	EL. 31	12/EL. 19	9/EL. 22

*Not observed above caved soils upon removal of augers

The groundwater level at the site, as well as perched water levels and volumes, will fluctuate based on variations in rainfall, snowmelt, evaporation, surface run-off and other related hydrogeologic factors. The water level at the site may also vary with the level of the adjacent Fox River. The water level measurements presented in this report are the levels that were measured at the time of PSI's field activities. The possibility of groundwater level fluctuation and perched water conditions should be considered when developing the design and construction plans for the project. Longer term monitoring would be required to better evaluate groundwater levels on this site.

EVALUATION AND RECOMMENDATIONS

Geotechnical Discussion

There are ***four*** primary geotechnical related concerns at this site. The following summarizes these concerns:

1) ***Existing undocumented fill and possible fill were encountered within all the borings and test pits, extending to depths of about 3 to 9 feet (EL. 29 to EL. 21) below the ground surface. In addition, possible buried topsoil, fill with***

root matter, and natural organic fibrous silt were encountered within building borings B-4, B-5, and B-9, and test pits TP-1, TP-7, and TP-8, extending to depths of about 8 to 10 feet (EL. 22 to EL. 20) below the ground surface. It should be anticipated that the depth and composition of these soils will vary between test locations.

In addition, low strength natural lean clay soils were present at B-11 down to about 12 feet (EL. 20). The organic content of the buried organic soils ranged from about 5.1 to 32.7, indicating moderate to high organic content. The existing fill, underlying organic soils, and low strength natural soils are not considered suitable for support of foundations due to their potential for overall and differential settlement and resultant distress to the overlying foundations. As such, these materials must be removed where present below foundations. Based on an estimated finished floor elevation of EL. 34 for all the buildings, over-excavations of about 2 to 12 feet below frost depth are estimated. Where conventional over-excavation of the organic soils and replacement with structural fill is not considered feasible due to the over-excavation depths, possible soil contamination, and possible difficulties with encountering groundwater in the over-excavations, alternative foundation systems such as grade beams supported by drilled piers, or rammed aggregate piers, such as a Geopier® system, can be considered. Where these alternative systems are being considered, PSI can offer additional recommendations when requested.

It is anticipated that for the most part, the existing fill and possible fill materials, which are not underlain by the buried organic soils, will be suitable for subgrade support within the slab-on-grade areas for the proposed buildings, provided they are properly prepared as outlined in the report. However, it appears that the buried organic materials are present within the approximate southeastern half of the proposed apartment/parking structure building. The existing buried organic soils are not considered suitable for support of the proposed floor slabs. The organic materials must be removed in their entirety from the building footprints and replaced with suitable materials which are placed and compacted as indicated in the Site Preparation section; or the floor slabs in this area must be designed as structural slabs supported by the foundations. As an alternative, the floor slab subgrade may be able to be reinforced with rammed aggregate piers, with the floor slab being supported by the improved subgrade.

Design of a conventional flexible (asphalt) pavement on the existing subgrade soils will generally require a somewhat thicker pavement section and an increased maintenance program throughout the pavement design life.

2) It should be anticipated that the near surface clayey and silty soils at this site may be in a very moist to wet condition once exposed below the surface materials, which may result in these materials being unstable.

The subgrade soils encountered at the borings and test pits below the surface topsoil consisted of silty sand or clay soils which were generally moist to very moist during the exploration. Additionally, rainfall, thaw, or snow melt prior to construction may further

increase the moisture contents of these soils. These soils are very sensitive to moisture and disturbance. Higher moisture contents, if encountered during site preparation, will cause the clayey and silty soils to be unstable, especially when subjected to construction traffic. Based on the near surface soils at many of the boring locations being very moist during the exploration, significant difficulty is anticipated with respect to subgrade preparation and may become widespread depending upon site conditions at the time of construction. Where observed during construction, very moist or wet, unstable soils may either be scarified, dried and recompacted to a minimum of 95 percent of the maximum dry density as obtained by the standard Proctor test (ASTM D698), or excavated below subgrade (EBS), and replaced with a select granular material such as the dense graded material specified in Sections 209 or 305 of the WisDOT Standard Specifications. A representative of the geotechnical engineer should be present at the time of construction to help determine the areas requiring remediation and the over-excavation depths necessary.

3) Auger refusal on possible cobbles, boulders, or bedrock was observed within most of the borings.

Auger refusal was encountered within all the borings except B-15 and B-16 at depths of about 9.5 to 26.5 feet (EL. 26.5 to EL. 9.5) below existing grades. In addition, generally very dense conditions were encountered with increasing depth. Although it is anticipated that foundation excavations and shallow utility excavations will remain above these refusal depths, specialized excavation techniques, and/or blasting may be necessary where planned utility invert elevations are below refusal depths. It is recommended that additional exploration with backhoe excavated test pits be performed in any areas where it is anticipated that the boring refusal depths may be present above planned development grades, in order to better evaluate the depth, type, and excavatability of the refusal materials. Also, difficult digging is anticipated with increasing depth due to the general dense nature of the natural soils and the possible presence of cobbles and boulders. Longer excavation times should be expected.

Additionally, asphalt and concrete rubble, cobbles, and boulders were encountered within the existing fill. Based on the test pits performed, concrete rubble approximately 18 to 24 inches wide, as well as cobbles and boulders, were present within some of the fill materials. At least some difficulty is anticipated with conventional excavation as well as any drilling necessary for foundations within the existing fill, especially where the concrete rubble fill is in a dense to very dense condition.

4) Groundwater levels observed within the borings generally ranged between about EL. 24.5 to EL. 18.

Based upon an estimated finished floor elevation of EL. 34 feet, the groundwater level observed is not considered to be an issue with the slab-on-grade construction proposed. However, where over-excavation is performed in the area of foundation or floor slab subgrade, these excavations will likely encroach upon or extend below the groundwater level. Where over-excavations encroach upon or extend only several inches below the

groundwater, conventional dewatering with filtered pumps and sumps may be sufficient to control the water. However, where excavations extend more than several inches below the groundwater, dewatering with a series of sumps or well-points along with high capacity pumps may be necessary to maintain the water level at least two feet beneath the over-excavation depth to maintain stability. The contractor must determine the site water levels and the means and methods that will be required for appropriate dewatering prior to bidding and construction.

The following geotechnical related recommendations have been developed on the basis of the subsurface conditions encountered and PSI's understanding of the proposed development. Should changes in the project criteria occur, a review must be made by PSI to determine if modifications to our recommendations will be required.

Environmental Issues

Possible petroleum type odors were encountered at B-7 and B-8 from depths of about 12 to 17 feet (EL. 21 feet to EL. 14 feet). In addition, possible coal cinders and foundry sand or slag were observed at borings B-9, B-13, and B-15, and at test pits TP-1, TP-6 and TP-8. These materials are generally considered to pose some possible environmental concerns for the project. It is understood that the project environmental consultant was in the process of performing Phase 1 and 2 Environmental Site Assessments at the time of this report preparation. The project environmental consultant should be provided with a copy of this report. At that time, additional borings or test pits may be recommended by the environmental consultant to further evaluate the possible presence of petroleum affected soils, coal cinders, and foundry materials.

In general, however, if petroleum affected soils are encountered during construction, a more detailed evaluation and possible remediation may be required. In addition, special disposal of petroleum affected soils at an approved landfill may be necessary, resulting in substantially increased costs (excavation, trucking, and backfill) and construction delays.

The Wisconsin Department of Natural Resources (WDNR) considers foundry sands and other industrial derived wastes to be solid waste and as such their use and disposal are regulated. Construction of the proposed buildings may result in generating an excess of these fill and waste materials, which may need to be disposed of offsite. In accordance with current regulations, prior to disposing of these materials, they must be first characterized to verify they are acceptable for disposal at an approved solid waste disposal facility. It may also be possible to manage and/or beneficially reuse the existing foundry materials on-site. This alternative, however, would require the development of a site-specific materials handling plan.

Site Preparation

Prior to the placement of new fill or preparation of the construction area subgrade, PSI recommends that any surficial topsoil materials, vegetation, or other unsuitable soils be removed from within and to a minimum distance of 10 feet or equal to the depth of fill to

be placed below the floor slab, whichever is greater, beyond the proposed building footprints, pavements, and other structural areas. The topsoil depth at the borings ranged from about 4 to 12 inches in thickness. The existing pavement in new building or pavement areas must be also be removed in its entirety. Where properly pulverized or milled, the asphalt materials can be used as new structural fill or aggregate base where permissible. The existing pavement at the borings consisted of about 3 to 5 inches of asphalt overlying about 7 to 9 inches of aggregate base. Existing below grade utilities may need to be rerouted around the proposed construction.

The subsurface materials may also include former foundations, foundation walls, floor slabs, or other structural elements which all must be removed from within new building areas where encountered. Complete removal of foundations, foundation walls, or concrete floor slabs need not be performed within pavement areas; however, PSI recommends they be removed to a minimum depth of 2 feet below subgrade to provide a uniform subgrade condition. It should be noted however, that where foundations and foundation walls are left in-place, they may create obstructions during utility installation.

Subsequent to cutting high areas of the site to planned grades, and prior to placement of new fills in low areas, the subgrades within the building and pavement areas should be thoroughly proof compacted with surface compaction with overlapping passes and at right angles with a heavy (minimum 10-ton static weight) compactor. After proof compaction, the exposed subgrade must be proof rolled to identify soft or loose zones which must be properly remediated. A fully loaded tandem axle dump truck, or rubber-tired vehicle of similar size and weight, typically 9 tons/axle, should be used for the proof roll. Based on the borings, unstable areas will likely be encountered in many areas of the site, and could be widespread across the project area, especially where the existing clayey or silty soils are in a very moist or wet condition. The subgrade soils below the surface materials at B-4, B-6 through B-11, and B-15 were in a very moist condition at the time of the exploration. These areas and other areas of the site may be in a very moist condition at the time of construction. Soils that are observed to rut or deflect excessively under the moving load (typically greater than about 1 inch) should be scarified, aerated, and recompacted, if feasible; or undercut and replaced with properly compacted engineered fill such as those materials identified in WisDOT Standard Specifications Sections 305. In areas of over-excavation, excavation below subgrade to a depth of about 1 to 2 feet and the placement of select granular fill, along with the placement of a geotextile, if necessary, can generally be used to improve the stability of the subgrade. However, greater over-excavation depths may be necessary in isolated areas, depending on stability observed. The use of a coarse crushed material (such as 3-inch Breaker Run) can also be utilized as necessary to aid in stabilizing subgrades. Subgrade preparation during dry periods will help facilitate this process. Due care must be used during proof rolling to avoid damage to any existing structures or underground utilities. Soils that are observed to rut or deflect excessively under the moving load (typically greater than about 1 inch) must be removed or improved by appropriate preparation and compaction techniques. The proof compacting, proof rolling, and any undercutting activities should be monitored and documented by a representative of a qualified geotechnical engineer and should be performed during a period of dry weather.

After subgrade preparation and observation have been completed, placement of new fills required to obtain proposed grades may begin. Where structural fill placement is required for this project, newly placed engineered fill should be free of organic, frozen, or other deleterious materials, have a maximum particle less than 3 inches. Clay fills should have a liquid limit less than 45 and plasticity index less than 25. If a fine-grained clay soil is used for fill, close moisture content control will be required to achieve the recommended degree of compaction. Engineered fill should be placed in maximum lifts of eight inches of loose material and compacted to at least 95 percent of the maximum dry density and within 3 percent of the optimum moisture content as determined by the standard Proctor ASTM Designation D698. Also, PSI recommends that a qualified geotechnical engineer test and document the engineered fill materials during placement.

If water is to be added, it should be uniformly applied and thoroughly mixed into the soil by disking or scarifying. Each lift of compacted engineered fill should be observed and tested by a representative of PSI prior to placement of subsequent lifts. The lateral extent of the over-excavation of unstable soil and subsequent placement and compaction of engineered fill should be equal to or greater than the depth of over-excavation below finished floor elevation. As for the pavement areas, the newly placed compacted engineered fill should extend at least 5 feet beyond the edges of the pavement for fills less than or equal to 5 feet.

Every effort must be made to keep excavations dry. If construction proceeds during wet weather, some additional over-excavation may be necessary. If weather permits, the soil could be dried and recompacted. A crushed stone working mat, possibly in conjunction with a geotextile fabric may also be feasible to help stabilize subgrades. Site grading runoff should be directed to catch basins, so that the potential for the softening of the foundation and pavement subgrade soils is reduced.

The adherence to the initial site preparation recommendations are considered critical to verify a suitable subgrade exists, prior to the placement of any new fills required to obtain project grades. Some surficial instability should be anticipated across the site due to the moisture sensitive nature of the clay soils and the presence of fill in areas. During earthwork operations, a representative of the geotechnical engineer should be present on-site on a full-time basis to verify the subgrade conditions and placement and compaction of new fills.

Foundation Recommendations

Based on the borings and test pits performed, existing fill and possible fill were present at all the building borings and test pits to depths ranging from about 3 to 12 feet (EL. 28 to EL. 18) below existing grades. Additionally, possible buried topsoil, topsoil fill, and natural organic fibrous silt was present at B-4, B-9, TP-1, TP-7, and TP-8 below the existing fill to depths of about 8 to 10 feet (EL. 21 to EL. 20). The organic content of the buried organic soils ranged from about 5.1 to 32.7, indicating moderate to high organic content. At B-11, natural very soft and wet lean clay was also present. Fill, buried organics, and low

strength natural soils are not considered suitable for support of foundations based on their potential for settlement and resultant distress to the overlying foundation elements. As such, foundations must be extended through these materials to bear upon suitable underlying natural soils. However, it must be recognized that due to the depth of over-excavation required in many areas, and the potential for encountering groundwater and contaminated soils in the over-excavations, significant difficulty with excavation and subgrade stability, and difficulties with groundwater will likely be encountered with an over-excavation option.

The finished floor elevations of the proposed buildings were not provided to PSI at the time of this report. However, it is understood that at least about 2 feet of fill will be required across the site. As such, it has been estimated that the finished floor elevation of all the buildings will be at EL. 34. The following table indicates the depth of fill/possible fill, soft natural soils, and buried organic soils (where present) at each building boring and test pit location, and the estimated depth of these materials below the approximate frost foundation depth.

Boring	Estimated Perimeter Foundation Bearing Grade (feet)	Estimated Depth/Elevation of Existing Fill/Possible Fill and Buried Organics (feet)	Estimated Depth of Existing Fill/Possible Fill and Buried Organics Below Frost Depth (feet)
B-1	EL. 30	8/EL. 27	3
B-2	EL. 30	8/EL. 28	2
B-3	EL. 30	3/EL. 27	3
B-4	EL. 30	8/EL.21	9
B-5	EL. 30	12/EL. 18	12
B-6	EL. 30	8/EL. 28	2
B-7	EL. 30	3/EL. 28	2
B-8	EL. 30	5.5/EL. 27.5	2.5
B-9	EL. 30	9.5/EL. 20.5	9.5
B-10	EL. 30	5.5/EL. 26.5	3.5
B-11	EL. 30	12/EL. 20*	10
B-12	EL. 30	5.5/EL. 26.5	3.5
B-13	EL. 30	8/EL. 24	6
B-14	EL. 30	8/EL. 25	5
TP-1	EL. 30	10/EL. 20	10
TP-2	EL. 30	>9/<EL. 21	>9
TP-3	EL. 30	>7/<EL.<29	>1
TP-4	EL. 30	6.5/EL. 25.5	4.5
TP-5	EL. 30	>6/<EL. 26	>4
TP-6	EL. 30	6.5/EL. 24.5	5.5
TP-7	EL. 30	9/EL. 21	9
TP-8	EL. 30	9.5/EL. 20.5	9.5

*Includes layer of soft natural wet lean clay

The above depths are estimates and should not be considered to yield exact and final quantities. Interpolation between test locations can be performed for rough estimating purposes. However, variations in depths can occur over short distances between and beyond the borings and test pits performed. The depth of fill and buried organics within the proposed apartment/parking structure buildings generally increases from northwest to southeast (generally toward the river). The elevation of suitable natural soils in the apartment/parking structure building varies from about EL. 28 to EL. 18. Within the proposed restaurant, the elevation of natural soils generally ranged from about EL. 26.5 to EL. 24. However, very soft natural clay soils were present at B-11 down to EL. 20.

Based on the foregoing, foundations bearing upon suitable natural medium dense to very dense granular soils that have been observed, tested, and prepared as recommended in the Site Preparation section of this report, or upon lean concrete placed upon these natural granular soils, can be designed for a maximum net allowable soil bearing pressure of **5,000 pounds per square foot (psf)** based on dead load plus design live load. Some over-excavation of the natural lean clay soils will be necessary in the areas of B-10 and B-12 in order to utilize the 5,000 psf allowable bearing capacity. Where foundations are bearing upon the natural lean clay soils or upon compacted backfill materials placed upon suitable natural soils, they may be designed for a net allowable bearing pressure of **3,000 psf**.

Where the existing fill, buried organic soils, or other unsuitable soils are encountered below foundation subgrade, the excavation should be deepened to competent bearing natural soil, and the footing could be lowered, or an over-excavation and backfill procedure could be performed. Over-excavation and backfilling require a lateral extension of the excavation beyond the outside edge of the foundation element for a distance at least equal to the over-excavation depth below planned bearing grade. Suitable backfill materials such as those specified in WisDOT Standard Specifications sections 209 or 305, can then be placed in lifts and compacted to a minimum of 95 percent of the maximum dry density as determined by the Standard Proctor Test (ASTM D698). However, use of this option will result in a recommended net allowable bearing pressure of 3,000 psf.

In lieu of the use of deep spread footings, or backfilling with compacted structural fill, any unsuitable materials could be removed from beneath footings and the excavation backfilled to the original planned bearing depth with a lean concrete slurry mix. If it is elected to utilize a lean concrete slurry to replace the unsuitable soils, the foundation excavations should be 4 inches wider than the proposed footing width and must extend through the unsuitable materials to expose suitable underlying natural soils. The slurry must be placed immediately after excavation to avoid intrusion of soil into the excavation. The concrete should contain sufficient aggregate and cement to attain a 28-day compressive strength of at least 1,000 psi. Some sloughing or caving of the overlying soils may be experienced (especially for deeper excavations). Should this occur during the slurry placement, the area must be removed and recast. Additionally, should caving become extensive, it may be necessary to substantially widen excavations to avoid soil intrusion into the concrete slurry. This may result in the use of

additional slurry quantities significantly in excess of preconstruction budget estimates. Again, foundations placed upon lean concrete which is placed upon the natural medium dense to very dense natural granular soils may be designed for a net allowable bearing pressure of 5,000 psf.

Where conventional over-excavation of the existing fill soils and buried organic soils, and replacement with structural fill is not considered feasible due to the significant depths and potential difficulties with groundwater and possible contaminated soils, alternative foundation systems such as grade beams supported by drilled piers or a rammed aggregate pier supported foundation such as a Geopier® system can be considered. Where these alternative systems are being considered, PSI can offer additional recommendations when requested.

The footings must be supported by suitable bearing soils prepared in accordance with the Site Preparation section and that have been observed and tested in the field by a representative of a qualified geotechnical engineer. A method for evaluating the acceptability of the natural soils would involve hand auger and static cone penetrometer testing below the footing bearing level. Each isolated footing should include at least 1 test probe. Test probes should be performed every 20 linear feet in continuous footings.

Minimum dimensions of 24 inches for continuous footings and 30 inches for any column footings should be used in foundation design to minimize the possibility of a local bearing capacity failure, even if the allowable bearing pressure recommended herein is not fully utilized.

Exterior footings and footings in unheated areas should be located at a depth of at least 48 inches below the final exterior grade to provide adequate frost protection. If the building is to be constructed during the winter months or if footings will likely be subjected to freezing temperatures after foundation construction, then the footings and concrete should be adequately protected from freezing.

After opening, PSI recommends that the soils at foundation bearing elevation in the footing excavations be observed and tested by a representative of a qualified geotechnical engineer prior to concrete placement, to evaluate the suitability and uniformity of the bearing materials for support of the design foundation loads. Once the support soils are observed and tested, the concrete should be placed as quickly as possible to avoid exposure of the footing bottoms to wetting and drying. Surface run-off water should be drained away from the excavations and not be allowed to pond. The foundation concrete should be placed during the same day the excavation is made. If it is required that footing excavations be left open for more than one day, they should be protected to reduce evaporation or entry of moisture.

In general, the performance of the foundation system on this site is dependent on the various factors discussed herein. The excavation, preparation, and concreting of foundations must be monitored and tested by a representative of a qualified geotechnical engineer.

Floor Slab Recommendations

In general, the floor slabs of the proposed buildings can be supported upon the existing fill soils and/or newly placed compacted engineered fill, where the existing fill is not underlain by buried topsoil, topsoil fill, or natural organic soils (or does not include areas of organic fill), and provided the subgrade is prepared as outlined in the Site Preparation section.

However, it must be recognized that the fill soils encountered within the approximate southeastern half of the apartment/parking structure building at B-4, B-5, B-12, TP-1, TP-7, and TP-8 were underlain by buried topsoil, topsoil fill, or natural organic fibrous silt to depths ranging from about 8 to 10 feet (EL. 21 to EL. 20). Organic soils have the potential to exhibit significant compressibility due to existing and future loading and can also display settlement due to decomposition of the organic materials over time. As such, these soils are not recommended for support of the floor slab. As one option, these soils could be removed in their entirety and replaced with properly placed and compacted structural fill. However, removal of these materials is not likely to be economically feasible due to the depths of removal that would be necessary. Other alternatives would be to design the floor slabs underlain by organic soils (southeastern half of the apartment/parking structure buildings) as structural slabs supported by the foundation system. Additionally, the floor slab areas where the buried organics are present can be reinforced with Geopiers®, where Geopiers® are being considered for support of the foundations. Additional recommendations regarding Geopiers® can be provided when requested.

Based on the existing fill soils consisting of silty sand and lean clay, PSI recommends that a subgrade modulus (k) of 125 pounds per cubic inch (pci) be used for design considerations based on a 12-inch square plate load test. However, depending on how the slab loads are applied, the value will have to be geometrically standard. The value should be adjusted for larger areas using the following expression for cohesive and cohesionless soil:

Modulus of Subgrade Reaction, $k_s = (\frac{k}{B})$ for cohesive soil and

$k_s = k\,(\frac{B+1}{2B})^2$ for cohesionless soil

where: k_s = coefficient of vertical subgrade reaction for loaded area,
k = coefficient of vertical subgrade reaction for 144 square inch area
B = width of area loaded, in feet

Where the existing buried organics and fill are removed and replaced with new structural fill, a different modulus may be necessary in this area depending upon the materials used as backfill. Also, where the slab is reinforced with rammed aggregate piers, a modified modulus may also be necessary in this area. PSI recommends that a minimum four-inch thick free draining granular mat be placed beneath the floor slabs to enhance drainage. Polyethylene sheeting should be placed to act as a vapor retarder where the floor will be

in contact with moisture sensitive equipment or products such as tile, wood, carpet, etc., as directed by the design engineer. The decision to locate the vapor retarder in direct contact with the slab or beneath the layer of granular fill should be made by the design engineer after considering the moisture sensitivity of subsequent floor finishes, anticipated project conditions and the potential effects of slab curling and cracking. The proper use of a vapor retarder may not completely prevent moisture beneath or on top of slabs. The floor slabs should have an adequate number of joints to reduce cracking resulting from differential movement and shrinkage.

The floor slabs must be suitably reinforced to make them as rigid as necessary, and proper joints must be provided at the junction of slab and the foundation system so that a small amount of independent movement can occur without causing damage. Large floor areas must be provided with joints at frequent intervals (maximum spacing of 30 times the slab thickness, per ACI) to compensate for concrete volume changes (shrinkage). Where the slabs will be supporting live loads, such as from moving vehicles, joints must be keyed or dowelled to permit proper load transfer. It is recommended that appropriate construction methods and curing procedures be used to minimize shrinkage and curling of the floor slabs.

Prior to constructing the floor slabs, the exposed subgrade must be prepared utilizing the subgrade preparation (including the proof compaction and proof rolling procedures) described previously in the Site Preparation section of this report. It must be recognized that the high clay content soils are highly sensitive to increases in moisture and construction disturbance. It will therefore be necessary to maintain these materials in a relatively dry condition to allow for proper subgrade preparation. It is recommended that proof rolling operations be monitored by a representative of the geotechnical engineer to ensure that a firm, suitable subgrade is present prior to placement of new fills, or to construction of floor slabs and pavements.

Exterior/Unheated Area Slabs

Entry slabs, sidewalks, aprons, and other slabs in exterior or unheated areas will likely bear upon clayey and silty soils. Such materials are frost susceptible and poorly drained. Slabs placed directly upon such soils are subject to heaving and subsequent settlement due to freeze/thaw cycles. This can result in cracking, misalignment, and other related effects (especially at joints). Where encountered in exterior/unheated area slabs, it is recommended that consideration be given to limited undercutting of the frost susceptible materials to a depth of 1 to 2 feet below the slabs, and replacement with well graded, properly placed and compacted granular soils with limited fines. A properly designed underdrain system connected to the municipal sewer (if permissible) or directed to on-site storm water management devices should also be incorporated to reduce the potential effects of freeze/thaw cycles.

Seismic Site Class

The 2015 International Building Code requires a site class for the calculation of earthquake design forces. This class is a function of soils type (i.e. depth of soil and strata types). Based on the estimated density of the natural nonorganic soils observed within the boring locations, **Site Class "C"** is recommended.

Pavement Recommendations

It is understood that paved drive lanes and parking lots may be included in the development. PSI anticipates the subgrade soils within the pavement areas to consist of existing fill comprised silty sand or lean clay, or newly placed and compacted engineered fill. PSI recommends that the subgrade soils for the pavements be prepared in accordance with the Site Preparation section of this report, including proof compacting and proof rolling.

Recognizing that complete removal and replacement of the existing fill and any underlying buried organic soil will not likely be economically feasible within pavement areas on this site, these materials can be left in place for support, provided they are properly prepared as outlined in this report and some inherent risk of construction upon these soils is accepted. This risk includes acceptance of reduced pavement performance, the need for some increased pavement maintenance, and a possible reduced pavement service life.

The existing soils have been assigned an estimated visual/manual classification of A-6 by the AASHTO soil classification system. These soils are generally rated as poor for pavement subgrade support based on their high shrink-swell potential, high frost susceptibility, poor drainage, and their potential to soften when exposed to moisture. They have a frost index of F-3, a Wisconsin design group index of about 14, and a soil support value (SSV) of about 4.0. In order to use these values, all new fill used to raise low areas must have pavement support characteristics that are equal to or better than these existing soils

The following subgrade parameters are recommended for pavement design considerations based upon the presence of at least some areas of lean clay soils and their anticipated subgrade support conditions:

AASHTO Soil Classification	Material	SSV	DGI	Subgrade Reaction Modulus, k (pci)	Resilient Modulus, M_R (psi)	CBR	Frost Index
A-6	II-Poorly Sorted	4.0	14	125	2,800	3	F-3

During construction, the surficial subgrade soils can become wet, softened, and disturbed from rainfall and construction equipment. Therefore, prior to placing the pavement base materials, the subgrade must be recompacted and proof rolled. Particular attention should be given to high traffic areas that have become rutted and areas of backfilled trenches. Localized wet, soft, or unstable areas can be undercut to such depths determined

necessary in the field to reach stable materials, and the area backfilled with crushed stone (possibly in conjunction with a geotextile fabric where necessary), such as 1.25 inch traffic bond (Section 305 of the State of Wisconsin Standard Specifications). Preparation of the pavement subgrade must be performed as outlined in the Site Preparation section of this report.

The granular base course should consist of well-graded crushed stone meeting the requirements from Section 305 of the State of Wisconsin Standard Specifications for Construction for a 1.25-inch dense graded base. The granular base course material should be placed and compacted to a minimum of 95 percent of the maximum density as determined by ASTM D698 (standard Proctor) and within +/-3 percent of the optimum moisture content value. Also, a representative of a qualified geotechnical engineer must test the base course material prior to, and during, placement.

Asphaltic binder and surface courses should meet the requirements from Section 460 of the State of Wisconsin Standard Specifications for Construction. Asphaltic courses should be placed and compacted to the minimum required density contained within section 460 of the Standard Specifications. An adequate number of in-place density tests should be performed during construction to document the placement and compaction of the asphalt.

The pavements should be sloped to provide positive surface drainage. Water should not be allowed to pond on or adjacent to the pavement as this could saturate the subgrade and cause premature pavement deterioration. The granular base course should be protected from water inflow along drainage paths. Additionally, the granular base course should extend beyond the edges of the pavement in low areas to allow any water that enters the base course stone a path for exit.

The paved areas are recommended to be constructed with attention to final grades to facilitate drainage. Construction of the subgrade and pavements should be in accordance with the project specifications.

PSI recommends that subsurface drains be installed. If placed properly, subsurface drains will greatly reduce the amount of trapped water under the pavement surfaces. Trapped water leads to subgrade degradation and increases pavement heave during winter months. It is recommended that underdrains be placed within the subgrade, just below the granular base. Minimally, these drains should be placed in low spots in the pavement, at the toe of slopes that are draining toward pavement surfaces, undercuts that have been filled with granular fill, and as finger drains. At a minimum, finger drains should consist of installing 3 to 4 drain tiles extending radially outward, 20 feet from each interior catch basin. In addition, drain tiles should extend along curb lines, 20 feet up the slope from curb inlets. The drain tile should be directly connected to the storm sewer manholes or catch basins. The drain tile should consist of 4-inch diameter perforated PVC pipe placed beneath the base layer, extending at least 8 inches into the subgrade. The pipe should be surrounded by 1-inch size clean stone, with the pipe and stone being wrapped with a geotextile filter fabric to reduce the potential of soils from migrating into

and obstructing the pipe. It is also recommended that roof drains be connected to the storm water collection system to minimize the potential for this water to enter the base and subgrade. Additionally, the drain tile should be installed with a positive slope (minimum ½ to 1 percent) throughout the length of the tile.

Periodic pavement maintenance is required to keep a pavement, under normal traffic and environmental conditions, as near as possible to its constructed condition. Maintenance is necessary to reduce the effects of pavement stress caused by changes in temperature and moisture, repetitive traffic loadings, and movement of the subgrade soils. As pavement distress is observed, it should be repaired as quickly as possible. Unrepaired areas will generally lead to more severe and widespread distress, and eventually, pavement disintegration. Therefore, periodic maintenance consisting of crack sealing, seal coating every 3 to 5 years, and other necessary repairs at least annually, will be required to obtain the design service life.

CONSTRUCTION CONSIDERATIONS

PSI should be retained to provide observation and testing of construction activities involved in the foundation, earthwork, and related activities of this project. PSI will not accept any responsibility for any conditions that deviated from those described in this report, nor for the performance of the foundation or pavement if we are not engaged to also provide construction observation and testing for this project.

Moisture Sensitive Soils/Weather-Related Concerns

The soils encountered at this site are expected to be sensitive to disturbances caused by construction traffic and changes in moisture content. Increases in the moisture content of the soil can cause significant reduction in the soil strength and support capabilities. In addition, soils that become wet may be slow to dry and thus significantly retard the progress of grading and compaction activities. It will, therefore, be advantageous to perform earthwork and foundation construction activities during dry weather.

Water should not be allowed to collect in the foundation excavation, on floor slab or pavement areas, or on prepared subgrades during or after construction. Areas should be sloped to facilitate removal of collected rainwater, groundwater, or surface runoff. Positive site drainage should be provided to reduce infiltration of surface water around the perimeter of buildings, beneath floor slabs, and within pavement areas. The grades should be sloped away from buildings and surface drainage should be collected and discharged such that water is not permitted to infiltrate the backfill and floor slab areas of the building.

Drainage and Groundwater Concerns

Groundwater levels observed within the borings generally ranged between about EL. 24.5

to EL. 18. Based upon an estimated finished floor elevation of EL. 34 feet, the groundwater level observed is not considered to be an issue with the slab-on-grade construction proposed and shallow utilities. However, where over-excavation is performed in the area of foundation or floor slab subgrade to remove existing fill and buried organic soils, these excavations will likely encroach upon or extend below the groundwater level. Where over-excavations encroach upon or extend only several inches below the groundwater, conventional dewatering with a filtered pump and sumps may be sufficient to control the water. However, where excavations extend more than several inches below the groundwater, dewatering with a series of sumps or well-points along with high capacity pumps may be necessary to maintain the water level at least two feet beneath the over-excavation depth to maintain stability. The contractor must determine the site water levels and means and methods for appropriately dewatering excavations prior to bidding and construction.

Fluctuations in the groundwater level should be anticipated throughout the year depending on variations in climatological conditions and other factors not apparent at the time the borings were performed. The possibility of groundwater level fluctuation should be considered when developing the design and construction plans for the project.

Excavations

It is mandated that excavations, whether they be for utility trenches, basement excavations or footing excavations, be constructed in accordance with current Occupational Safety and Health Administration (OSHA) guidelines to protect workers and others during construction. PSI recommends that these regulations be strictly enforced; otherwise, workers could be in danger and the owner(s) and the contractor(s) could be liable for substantial penalties.

Auger refusal was encountered within all the borings except B-15 and B-16 at depths of about 9.5 to 26.5 feet (EL. 26.5 to EL. 9.5). In addition, generally very dense conditions were encountered with increasing depth. Although it is anticipated that foundation excavations and shallow utility excavations will generally remain above these refusal depths, specialized excavation techniques, and/or blasting may be necessary where planned invert and elevations are below refusal depths. It is recommended that additional exploration with backhoe excavated test pits be performed in any areas where it is anticipated that the refusal depths may be present above planned development grades, in order to better evaluate the depth, type, and excavatability of the refusal materials. Also, difficult digging may be experienced with increasing depth due to the general dense nature of the natural soils and the possible presence of cobbles and boulders. Longer excavation times should be expected.

Additionally, concrete rubble, cobbles, and boulders were encountered within the existing fill. Based on the test pits performed, concrete rubble approximately 18 to 24 inches wide was present within some of the building areas, and cobbles/boulders were present throughout the fill materials. At least some difficulty is anticipated with excavations as well as any drilling necessary for foundations, especially where the concrete rubble fill is in a

dense to very dense condition.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractor's "responsible person", as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations.

PSI is providing this information solely as a service to our client. PSI does not assume responsibility for construction site safety or the contractor's or other parties' compliance with local, state, and federal safety or other regulations.

Utility Trenching and Backfilling

In general, the on-site soils can be used for support of utility lines. However, some undercutting of softened, unstable, organic, or otherwise unsuitable soils, in conjunction with the placement of crushed stone or other suitable granular backfill may be necessary (especially within existing fill or organic soils) to establish a stable working mat and/or bearing subgrade. Some difficulty with the stability of utility trenches should be expected due to the presence of fill, especially in the presence of water. The use of sloping, shoring, bracing, or trench boxes will likely be required. Utility construction should be performed in accordance with "The Standard Specifications for Sewer and Water Line Construction" for the State of Wisconsin.

Excavation for utility trenches shall be performed in accordance with OSHA regulations as stated in 29 CFR Part 1926. It should be noted that utility trench excavations have the potential to degrade the properties of the adjacent fill materials. Utility trench walls that are allowed to move laterally can lead to reduced bearing capacity and increased settlement of adjacent structural elements and overlying slabs.

Backfill for utility trenches is as important as the original subgrade preparation or engineered fill placed to support either a foundation or slab. Therefore, it is imperative that the backfill for utility trenches be placed to meet the project specifications for the engineered fill of this project. Unless otherwise specified, the backfill for the utility trenches should be placed in 4 to 6-inch loose lifts and compacted to a minimum of 95 percent of the maximum dry density achieved by the standard Proctor test. The backfill soil should be moisture conditioned to be within 3± percent of the optimum moisture content as determined by the standard Proctor test. Up to 4 inches of bedding material placed directly under the pipes or conduits placed in the utility trench can be compacted to the 90 percent compaction criteria with respect to the standard Proctor.

Compaction testing should be performed for every 200 cubic yards of backfill placed or each lift within 200 linear feet of trench, whichever is less. Backfill of utility trenches should not be performed with water standing in the trench. If granular material is used for

the backfill of the utility trench, the granular material should have a gradation that will filter protect the backfill material from the adjacent soils. If this gradation is not available, a geosynthetic non-woven filter fabric should be used to reduce the potential for the migration of fines into the backfill material. Granular backfill material shall be compacted to meet the above compaction criteria.

GEOTECHNICAL RISK

The concept of risk is an important aspect of the geotechnical evaluation. The primary reason for this is that the analytical methods used to develop geotechnical recommendations do not comprise an exact science. The analytical tools which geotechnical engineers use are generally empirical and must be used in conjunction with engineering judgment and experience. Therefore, the solutions and recommendations presented in the geotechnical evaluation should not be considered risk-free and, more importantly, are not a guarantee that the interaction between the soils and the proposed structure will perform as planned. The engineering recommendations presented in the preceding section constitutes PSI's professional estimate of those measures that are necessary for the proposed structure to perform according to the proposed design based on the information generated and referenced during this evaluation, and PSI's experience in working with these conditions.

REPORT LIMITATIONS

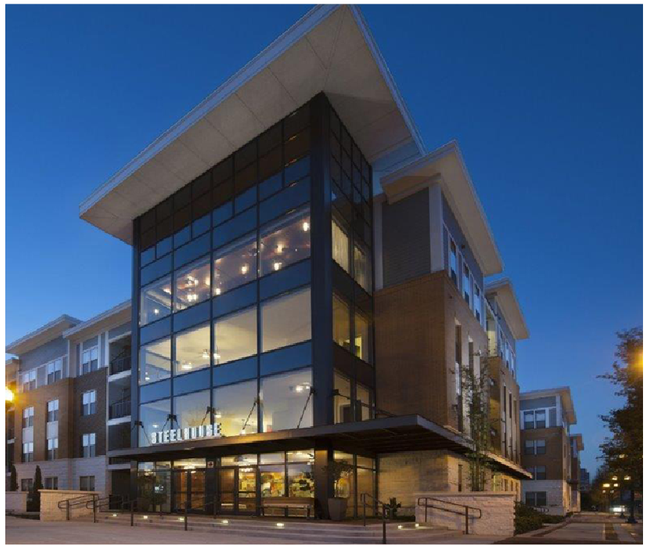
PSI's recommendations are based on the available subsurface information obtained by PSI and design details furnished by others. If there are any revisions to the plans for this project or if deviations from the subsurface conditions noted in this report are encountered during construction, PSI must be notified immediately to determine if changes in the recommendations are required. If PSI is not retained to perform these functions, PSI will not be responsible for the impact of those conditions on the project.

PSI warrants that the findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area. No other warranties are implied or expressed.

After the plans and specifications are complete, PSI must be retained and provided the opportunity to review the final design plans and specifications to check that our engineering recommendations have been properly incorporated into the design documents. At this time, it may be necessary to submit supplementary recommendations. This report has been prepared for the exclusive use by Campbell Capital Group for the Proposed Apartment/Parking Structure and Restaurant Development, to be located in Waukesha, Wisconsin.

APPENDIX

TEST LOCATION PLAN
LOG OF BORINGS AND TEST PITS
GENERAL NOTES



* Sample Corner / Lobby Treatment
Illustrative

Test Location Plan
Proposed Apartment/Parking Structure and Restaurant
South Corner of E. St. Paul Avenue and N. Barstow Street
Waukesha, WI
PSI Project No. 00522340
***Developed from site plan provided by client**

intertek psi

Project Data:

Residential Building
4 Story Residential: 180 units
Units, 760 s.f. Average

7,000sf Amenity
3,500sf Retail

51 on-street parking spaces

5.5 Level Parking Garage
60 spaces per level
Total Spaces: 320 spaces (1.6 ratio)

2 Story Brew Pub
30,000 sf
40 surface parking spaces

1 Density Study - Above Podium
Scale: 1" = 100'

N

BORING B-01

DATE STARTED:	4/4/19	**DRILL COMPANY:**	Groundbreaking Exploration, Inc.
DATE COMPLETED:	4/4/19	**DRILLER:** Jonathan	**LOGGED BY:** Jason
COMPLETION DEPTH	17.5 ft	**DRILL RIG:**	CME 55
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	35 ft	**SAMPLING METHOD:**	2-in SS
LATITUDE:	43.0132°	**HAMMER TYPE:**	Automatic
LONGITUDE:	-88.2314°	**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	BB

REMARKS:

Water

While Drilling	13.5 feet
Upon Completion	Not Obsvd
Delay	N/A

BORING LOCATION:
Apartment Bldg West

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	0					Topsoil Fill, Dark Brown Silty Sand, with Root Matter, Moist (6"± Thick)	OL				
				1	12	Fill, Brown Silty Sand and Gravel, with Sandy Lean Clay Pockets, Moist	FILL	9-18-19 N=37	5	×	
30	5			2	12	Possible Fill, Brown Silty Sand and Gravel, Very Moist	P FILL	5-7-6 N=13	7	×	
				3	12			5-5-16 N=21	8	×	
25	10			4	3	Light Brown Silty Fine Sand and Gravel, Moist to Wet	SM	16-25-17 N=42	6	×	
				5	12			19-19-16 N=35	7	×	
20	15					End of Boring at 17.5' Due to Auger Refusal on Possible Cobbles, Boulders, or Bedrock Cave-In at 15'					

intertek psi

Professional Service Industries, Inc.
821 Corporate Court, Suite 100
Waukesha, WI 53189
Telephone: (262) 521-2125

PROJECT NO.: 00522340
PROJECT: Proposed Apartments and Brewery
LOCATION: East St. Paul Avenue
Waukesha, WI

The stratification lines represent approximate boundaries. The transition may be gradual.

BORING B-02

DATE STARTED:	4/4/19	**DRILL COMPANY:**	Groundbreaking Exploration, Inc.
DATE COMPLETED:	4/4/19	**DRILLER:** Jonathan	**LOGGED BY:** Jason
COMPLETION DEPTH	26.5 ft	**DRILL RIG:**	CME 55
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	36 ft	**SAMPLING METHOD:**	2-in SS
LATITUDE:	43.0132°	**HAMMER TYPE:**	Automatic
LONGITUDE:	-88.2314°	**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	BB

REMARKS:

Water

While Drilling	12 feet
Upon Completion	Not Obsvd
Delay	N/A

BORING LOCATION:
Parking Structure West

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
35	0					Topsoil Fill, Dark Brown Silty Sand, with Root Matter, Moist (6"± Thick)	OL				
				1	16	Fill, Gray and Brown Silty Sand and Gravel, with Sandy Silt and Sandy Clay Pockets, Moist		16-25-23 N=48	4	×	
				2	16		FILL	10-12-13 N=25	6	×	
30	5			3	18			22-25-31 N=56	3	× >>	
				4	12	Light Brown to Brown Silty Sand and Gravel, with Lean Clay Seams, Moist to Wet		26-22-21 N=43	4	×	
25	10										
				5	6			15-19-12 N=31			
20	15						SM				
				6	6			25-25-16 N=41	9	×	
15	20										
				7	10			15-25-50/1"	11	× >>	
10	25					End of Boring at 26.5' Due to Auger Refusal on Possible Cobbles, Boulders, or Bedrock Cave-In at 15' Boring offset 10' southwest due to tree					

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LOCATION: East St. Paul Avenue
Waukesha, WI

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BORING B-03

DATE STARTED:	4/4/19	**DRILL COMPANY:**	Groundbreaking Exploration, Inc.
DATE COMPLETED:	4/4/19	**DRILLER:** Jonathan	**LOGGED BY:** Jason
COMPLETION DEPTH	19.5 ft	**DRILL RIG:**	CME 55
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	30 ft	**SAMPLING METHOD:**	2-in SS
LATITUDE:	43.0132°	**HAMMER TYPE:**	Automatic
LONGITUDE:	-88.2314°	**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	BB

REMARKS:

Water

While Drilling	8.5 feet
Upon Completion	Not Obsvd
Delay	N/A

BORING LOCATION:
Apartment Bldg Center

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	0					Asphalt (5"± Thick)	ASPH				
						Aggregate Base, Brown Sand and Gravel, Moist (7"± Thick)	BASE				
				1	3	Fill, Dark Brown Silty Sand and Gravel, with Asphalt Pieces, Moist	FILL	7-7-8 N=15	4	× ◎	
						Brown Silty Sand and Gravel, with Lean Clay and Silt Seams, with Dark Gray Staining Below 18.5', Moist to Wet					
25	5			2	3			20-46-15 N=61	4	× >>◎	
				3	12			16-16-14 N=30	4	× ◎	
										▽	
				4	10			13-10-10 N=20	11	× ◎	
20	10						SM				
				5	12			10-11-10 N=21	8	× ◎	
15	15										
				6	10			16-50/3"	14	× >>◎	
						End of Boring at 19.5' Due to Auger Refusal on Possible Cobbles, Boulders, or Bedrock					
						Cave-In at 10'					

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PROJECT NO.: 00522340
PROJECT: Proposed Apartments and Brewery
LOCATION: East St. Paul Avenue
Waukesha, WI

The stratification lines represent approximate boundaries. The transition may be gradual.

BORING B-04

DATE STARTED:	4/4/19	**DRILL COMPANY:**	Groundbreaking Exploration, Inc.
DATE COMPLETED:	4/4/19	**DRILLER:** Jonathan	**LOGGED BY:** Jason
COMPLETION DEPTH	16.0 ft	**DRILL RIG:**	CME 55
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	29 ft	**SAMPLING METHOD:**	2-in SS
LATITUDE:	43.0132°	**HAMMER TYPE:**	Automatic
LONGITUDE:	-88.2314°	**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	BB

REMARKS:

Water

While Drilling	8.5	feet
Upon Completion	10	feet
Delay	N/A	

BORING LOCATION: Apartment Bldg South

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	0					Asphalt (4"± Thick)	ASPH				
						Aggregate Base, Brown Sand and Gravel, Moist (8"± Thick)	BASE				
				1	6	Fill, Brown and Dark Brown Sandy Silty Clay/Lean Clay, with Gravel, Trace Brick and Concrete Pieces, Very Moist	FILL	4-5-3 N=8	18		
25				2	16	Fill, Brown Lean Clay, Trace Sand and Gravel, Very Moist	FILL	2-2-2 N=4	27		Q_r = 0.7 tsf
	5			3	18	Possible Buried Topsoil, Dark Gray Lean Clay, with Root Matter, Very Moist	OL	2-2-4 N=6	45		Organic Content = 5.1%
						Brown Silty Sand and Gravel, Wet					
20				4	12			19-16-14 N=30	11		
	10						SM				
15				5	3			21-29-50/3"		>>◎	
	15					End of Boring at 16' Due to Auger Refusal on Possible Cobbles, Boulders, or Bedrock					
						Cave-In at 10.5'					

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PROJECT NO.: 00522340
PROJECT: Proposed Apartments and Brewery
LOCATION: East St. Paul Avenue, Waukesha, WI

The stratification lines represent approximate boundaries. The transition may be gradual.

BORING B-05

DATE STARTED:	4/2/19	**DRILL COMPANY:**	Groundbreaking Exploration, Inc.
DATE COMPLETED:	4/2/19	**DRILLER:** Jonathan	**LOGGED BY:** Jason
COMPLETION DEPTH	19.0 ft	**DRILL RIG:**	CME 55
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	30 ft	**SAMPLING METHOD:**	2-in SS
LATITUDE:	43.0132°	**HAMMER TYPE:**	Automatic
LONGITUDE:	-88.2314°	**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	BB

REMARKS:

Water

While Drilling	12	feet
Upon Completion	9	feet
Delay	N/A	

BORING LOCATION:
Parking Structure South

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
	0					Topsoil Fill, Dark Brown Silty Sand, with Root Matter, Moist (4"± Thick)	OL			
						Fill, Brown Sand and Silty Sand, Trace to with Gravel , Moist	FILL			
				1	12			10-15-13 N=28	5	
						Fill, Brown, Gray, and Black Silty Sand and Gravel, with Crushed Concrete, Wood Pieces and Sandy Silt Pockets, Moist to Very Moist	FILL			
				2	6			5-6-7 N=13	7	
25	5									
						Fill, Black Sandy Silty Clay, with Vegetative Fibers and Gravel, Very Moist	FILL			
				3	6			2-2-7 N=9	29	Organic Content = 9.1%
						Fill, Gray and Dark Gray Silty Sand and Gravel, Very Moist	FILL			
				4	12			11-14-11 N=25	6	
20	10									
						Brown Silty Sand and Gravel, Wet	SM			
				5	18			34-20-17 N=37	11	
15	15									
				6	0			50/5"		>>
						End of Boring at 19' Due to Auger Refusal on Possible Cobbles, Boulders, or Bedrock				
						Cave-In at 10'				

STANDARD PENETRATION TEST DATA
N in blows/ft ◎
× Moisture ◪ PL ✚ LL
0 25 50
STRENGTH, tsf
▲ Qu ✳ Qp
0 2.0 4.0

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PROJECT NO.: 00522340
PROJECT: Proposed Apartments and Brewery
LOCATION: East St. Paul Avenue
Waukesha, WI

The stratification lines represent approximate boundaries. The transition may be gradual.

BORING B-06

DATE STARTED:	4/4/19	**DRILL COMPANY:**	Groundbreaking Exploration, Inc.
DATE COMPLETED:	4/4/19	**DRILLER:** Jonathan	**LOGGED BY:** Jason
COMPLETION DEPTH	9.5 ft	**DRILL RIG:**	CME 55
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	36 ft	**SAMPLING METHOD:**	2-in SS
LATITUDE:	43.0132°	**HAMMER TYPE:**	Automatic
LONGITUDE:	-88.2314°	**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	BB

REMARKS:

Water		
	While Drilling	Not Obsvd
	Upon Completion	Not Obsvd
	Delay	N/A

BORING LOCATION:
Parking Structure North

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	0					Topsoil Fill, Dark Brown Silty Sand, with Root Matter, Moist (6"± Thick)	OL				
35				1	6	Fill, Brown and Gray Silty Sand and Gravel, with Dark Brown Lean Clay and Silt Pockets, Moist		6-7-10 N=17	20		
				2	16		FILL	10-11-20 N=31	12		
	5										
30				3	16			11-16-20 N=36	4		
				4	6	Brown Silty Sand and Gravel, with Silt Seams, Moist	SM	50/1"	3		
						End of Boring at 9.5' Due to Auger Refusal on Possible Cobbles, Boulders, or Bedrock Cave-In at 6'					

Professional Service Industries, Inc.
821 Corporate Court, Suite 100
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Telephone: (262) 521-2125

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PROJECT: Proposed Apartments and Brewery
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Waukesha, WI

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BORING B-07

DATE STARTED:	4/2/19	**DRILL COMPANY:**	Groundbreaking Exploration, Inc.
DATE COMPLETED:	4/2/19	**DRILLER:** Jonathan	**LOGGED BY:** Jason
COMPLETION DEPTH	21.5 ft	**DRILL RIG:**	CME 55
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	31 ft	**SAMPLING METHOD:**	2-in SS
LATITUDE:	43.0132°	**HAMMER TYPE:**	Automatic
LONGITUDE:	-88.2314°	**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	BB

REMARKS:

Water

While Drilling	8	feet
Upon Completion	8	feet
Delay	N/A	

BORING LOCATION:
Parking Structure W Center

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ / STRENGTH, tsf	Additional Remarks
30	0					Topsoil Fill, Dark Brown Silty Sand, with Root Matter (5"± Thick)	OL				
				1	6	Fill, Brown and Dark Brown Silty Sand and Gravel, with Sandy Lean Clay Pockets, Very Moist	FILL	6-9-7 N=16	13		
				2	10	Brown Sand and Gravel, Trace to with Silt, with Sandy Silt Seams, Moist	SP-SM	11-21-13 N=34	4		
25	5			3	12			16-16-36 N=52	6		
				4	6	Brown Silty Sand and Gravel, Wet	SM	13-13-10 N=23	10		
20	10										
				5	18	Black Silty Sand and Gravel, Wet (Possible Petroleum-Type Odor)	SM	15-16-17 N=33	9		
15	15										
				6	16	Light Gray and Light Brown Silty Sand and Gravel, Wet	SM	21-39-36 N=75	12		
10	20					End of Boring at 21.5' Due to Auger Refusal on Possible Cobbles, Boulders, or Bedrock Cave-In at 10'					

STANDARD PENETRATION TEST DATA
N in blows/ft ◎
× Moisture ◪ PL ✚ LL
0 25 50
STRENGTH, tsf
▲ Qu ✳ Qp
0 2.0 4.0

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Waukesha, WI

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BORING B-08

DATE STARTED:	4/2/19	**DRILL COMPANY:**	Groundbreaking Exploration, Inc.
DATE COMPLETED:	4/2/19	**DRILLER:** Jonathan	**LOGGED BY:** Jason
COMPLETION DEPTH	23.0 ft	**DRILL RIG:**	CME 55
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	33 ft	**SAMPLING METHOD:**	2-in SS
LATITUDE:	43.0132°	**HAMMER TYPE:**	Automatic
LONGITUDE:	-88.2314°	**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	BB

REMARKS:

Water

While Drilling	12 feet
Upon Completion	10 feet
Delay	N/A

BORING LOCATION:
Parking Structure E Center

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	0					Topsoil Fill, Dark Brown Silty Sand, with Root Matter, Very Moist (12"± Thick)	OL				
				1	12	Fill, Brown Sandy Silty Clay, with Gravel, Very Moist	FILL	3-4-3 N=7	18		
30						Fill, Brown Silty Sand and Gravel, with Concrete Pieces, Very Moist					
	5			2	3		FILL	4-2-1 N=3	7		
						Brown Sandy Silt and Gravel, Moist					
				3	16		ML	10-16-14 N=30	6		
25						Brown Silty Sand and Gravel, Moist					
				4	16		SM	14-13-13 N=26	5		
	10										
20						Dark Gray and Black Silty Sand and Gravel, Wet (Possible Faint Petroleum-Type Odor)					
				5	12		SM	25-25-15 N=40	9		
	15										
15						Gray Silty Sand and Gravel, Wet					
				6	16		SM	28-16-14 N=30	8		
	20										
10						End of Boring at 23' Due to Auger Refusal on Possible Cobbles, Boulders, or Bedrock					
						Cave-In at 10.5'					

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LOCATION: East St. Paul Avenue
Waukesha, WI

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BORING B-09

DATE STARTED:	4/2/19	**DRILL COMPANY:**	Groundbreaking Exploration, Inc.
DATE COMPLETED:	4/2/19	**DRILLER:** Jonathan	**LOGGED BY:** Jason
COMPLETION DEPTH	17.5 ft	**DRILL RIG:**	CME 55
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	30 ft	**SAMPLING METHOD:**	2-in SS
LATITUDE:	43.0132°	**HAMMER TYPE:**	Automatic
LONGITUDE:	-88.2314°	**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	BB

REMARKS:

Water

While Drilling	12 feet
Upon Completion	10 feet
Delay	N/A

BORING LOCATION:
Parking Structure East

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	0					Topsoil Fill, Dark Brown Sandy Clay, with Root Matter, Very Moist (8"± Thick)	OL				
				1	12	Fill, Brown Silty Sand and Gravel, with Sandy Lean Clay Pockets, Trace Crushed Concrete, Very Moist	FILL	4-4-3 N=7	11		
				2	10	Fill, Black Sandy Silt and Gravel, with Crushed Concrete, Very Moist (Possible Coal Cinders and Foundry Slag)	FILL	2-1-2 N=3	13		
25	5			3	6	Possible Buried Topsoil, Black Silty Clay, with Vegetative Fibers, Very Moist	OL	2-2-2 N=4	62	>>	Organic Content = 10.1%
						Dark Brown Silt, with Vegetative Fibers, Very Moist	OL				
				4	18	Gray Silty Sand and Gravel, Wet		1-13-24 N=37	89	>>	
20	10						SM				
				5	12			16-21-18 N=39	7		
15	15										
						End of Boring at 17.5' Due to Auger Refusal on Possible Cobbles, Boulders, or Bedrock Cave-In at 11'					

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Waukesha, WI

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BORING B-10

DATE STARTED:	4/3/19	**DRILL COMPANY:**	Groundbreaking Exploration, Inc.
DATE COMPLETED:	4/3/19	**DRILLER:** Jonathan	**LOGGED BY:** Jason
COMPLETION DEPTH	16.0 ft	**DRILL RIG:**	CME 55
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	32 ft	**SAMPLING METHOD:**	2-in SS
LATITUDE:	43.0132°	**HAMMER TYPE:**	Automatic
LONGITUDE:	-88.2314°	**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	BB

REMARKS:

Water

While Drilling	12 feet
Upon Completion	10 feet
Delay	N/A

BORING LOCATION:
Brewery/Restaurant Northwest

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	0					Topsoil Fill, Dark Brown Silty Sand, with Root Matter, Moist (12"± Thick)	OL				
30				1	12	Fill, Brown and Dark Brown Lean Clay, with Sand, Gravel, Crushed Concrete, and Brick, Trace Root Matter, Very Moist	FILL	6-14-7 N=21	25		
	5			2	12			2-2-3 N=5	24		
25				3	10	Light Brown to Brown Lean Clay, Trace Sand, Very Moist	CL	2-4-9 N=13	27		
	10			4	10	Brown Silty Sand, Trace Gravel, Moist	SM	10-13-7 N=20	7		
20						Brown Silty Sand and Gravel, with Gray Lean Clay Seams, Wet	SM				
	15			5	16			5-7-9 N=16	10		
						End of Boring at 16' Due to Auger Refusal on Possible Cobbles, Boulders, or Bedrock Cave-In at 10.5' Boring offset 15' southwest due to overhead electric					

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LOCATION: East St. Paul Avenue
Waukesha, WI

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BORING B-11

DATE STARTED:	4/3/19	**DRILL COMPANY:**	Groundbreaking Exploration, Inc.
DATE COMPLETED:	4/3/19	**DRILLER:** Jonathan	**LOGGED BY:** Jason
COMPLETION DEPTH	18.5 ft	**DRILL RIG:**	CME 55
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	32 ft	**SAMPLING METHOD:**	2-in SS
LATITUDE:	43.0132°	**HAMMER TYPE:**	Automatic
LONGITUDE:	-88.2314°	**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	BB

REMARKS:

Water

While Drilling	8.5	feet
Upon Completion	9	feet
Delay	N/A	

BORING LOCATION:
Brewery/Restaurant Northeast

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	0					Topsoil Fill, Dark Brown and Black Silty Sand, with Silty Clay Pockets, Gravel, and Root Matter, Very Moist (12"± Thick)	OL				
30				1	18	Fill, Brown Silty Sand and Gravel, Trace Clay, Very Moist	FILL	6-9-6 N=15	8	× ◎	
				2	16	Fill, Brown Sandy Lean Clay, with Silty Sand and Gravel Pockets, Very Moist		9-4-5 N=9	17	× ✳ ◎	
25	5			3	0		FILL	50/3"		>>◎	
				4	12	Brown Lean Clay with Sand Pockets, Wet	CL	4-3-3 N=6	20	✳ × ◎	
20	10										
				5	16	Brown Silty Sand and Gravel, Wet	SM	15-13-16 N=29	10	× ◎	
15	15										
						End of Boring at 18.5' Due to Auger Refusal on Possible Cobbles, Boulders, or Bedrock Cave-In at 10' Boring offset 20' south due to overhead electric					

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LOCATION: East St. Paul Avenue, Waukesha, WI

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BORING B-12

DATE STARTED:	4/3/19	**DRILL COMPANY:**	Groundbreaking Exploration, Inc.
DATE COMPLETED:	4/3/19	**DRILLER:** Jonathan	**LOGGED BY:** Jason
COMPLETION DEPTH	18.5 ft	**DRILL RIG:**	CME 55
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	32 ft	**SAMPLING METHOD:**	2-in SS
LATITUDE:	43.0132°	**HAMMER TYPE:**	Automatic
LONGITUDE:	-88.2314°	**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	BB

REMARKS:

Water

While Drilling	8.5	feet
Upon Completion	9.5	feet
Delay	N/A	

BORING LOCATION:
Brewery/Restaurant Center

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	0					Topsoil Fill, Dark Brown and Brown Silty Sand and Lean Clay, with Root Matter, Very Moist (12"± Thick)	OL				
30				1	18	Fill, Dark Gray and Brown Silty Clay, Moist	FILL	5-3-5 N=8	19		
						Fill, Dark Gray Lean Clay, Trace Sand and Gravel, Very Moist	FILL	4-4-3 N=7	22		
	5			2							
25				3	18	Brown Silty Clay with Gray Mottling, with Silt Seams, Trace Sand and Gravel, Moist	CL-ML	5-5-5 N=10	16		>>✳ Q_r = 4.3 tsf
						Brown Silty Sand and Gravel, Trace Clay, Wet					
				4	16 ▼			19-8-12 N=20	8		
	10										
20							SM				
				5	10			25-19-19 N=38	8		
	15										
15						End of Boring at 18.5' Due to Auger Refusal on Possible Cobbles, Boulders, or Bedrock Cave-In at 10.5'					

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Waukesha, WI

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BORING B-13

DATE STARTED:	4/3/19	**DRILL COMPANY:**	Groundbreaking Exploration, Inc.
DATE COMPLETED:	4/3/19	**DRILLER:** Jonathan	**LOGGED BY:** Jason
COMPLETION DEPTH	19.5 ft	**DRILL RIG:**	CME 55
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	32 ft	**SAMPLING METHOD:**	2-in SS
LATITUDE:	43.0132°	**HAMMER TYPE:**	Automatic
LONGITUDE:	-88.2314°	**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	BB

REMARKS:

Water

While Drilling	8	feet
Upon Completion	10	feet
Delay	N/A	

BORING LOCATION:
Brewery/Restaurant Southwest

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	0					Topsoil Fill, Dark Brown Silty Sand, with Root Matter, Moist (6"± Thick)	OL				
30				1	2	Fill, Brown and Dark Brown Silty Sand and Gravel, with Root Matter and Plastic, Moist	FILL	14-50/4"		>>◎	
	5			2	16	Fill, Black Sandy Lean Clay, with Gravel, Very Moist (Possible Foundry Materials)	FILL	2-3-2 N=5	23	×	
25				3	6	Fill, Dark Brown Sandy Lean Clay, with Gravel, Brick, and Concrete, Very Moist	FILL	2-1-2 N=3	25	◎ ×	
	10			4	6	Brown Silty Sand and Gravel, with Lean Clay Seams, Wet		6-7-8 N=15	12	× ◎	
20							SM				
	15			5	16			27-33-21 N=54	7	×	>>◎
15				6	6			14-20-50/3"	8	×	>>◎
						End of Boring at 19.5' Due to Auger Refusal on Probable Cobbles and Boulders Cave-In at 10.5'					

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Waukesha, WI

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BORING B-14

DATE STARTED:	4/3/19	**DRILL COMPANY:**	Groundbreaking Exploration, Inc.
DATE COMPLETED:	4/3/19	**DRILLER:** Jonathan	**LOGGED BY:** Jason
COMPLETION DEPTH	18.0 ft	**DRILL RIG:**	CME 55
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	33 ft	**SAMPLING METHOD:**	2-in SS
LATITUDE:	43.0132°	**HAMMER TYPE:**	Automatic
LONGITUDE:	-88.2314°	**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	BB

REMARKS:

Water

While Drilling	8.5 feet
Upon Completion	10 feet
Delay	N/A

BORING LOCATION:
Brewery/Restaurant Southeast

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	0					Topsoil Fill, Dark Brown Silty Sand, with Silty Clay and Root Matter, Moist (12"± Thick)	OL				
				1	16	Fill, Brown and Gray Silty Sand and Gravel, with Crushed Concrete and Lean Clay Pockets, Moist	FILL	2-4-6 N=10	8		
30											
				2	10	Fill, Brown, Dark Brown, and Black Sandy Lean Clay, with Gravel, Very Moist	FILL	4-2-2 N=4	18		
	5										
				3	12			6-4-7 N=11	23		
25											
				4	16	Brown Silty Fine Sand with Gravel, Wet	SM	4-8-11 N=19	13		
	10										
20						Gray Silty Sand and Gravel, Wet					
				5	3		SM	50/3"	8	>>	
	15										
15						End of Boring at 18' Due to Auger Refusal on Possible Cobbles, Boulders, or Bedrock Cave-In at 10.5'					

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BORING B-15

DATE STARTED:	4/2/19	**DRILL COMPANY:**	Groundbreaking Exploration, Inc.
DATE COMPLETED:	4/2/19	**DRILLER:** Jonathan	**LOGGED BY:** Jason
COMPLETION DEPTH	15.0 ft	**DRILL RIG:**	CME 55
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	30 ft	**SAMPLING METHOD:**	2-in SS
LATITUDE:	43.0132°	**HAMMER TYPE:**	Automatic
LONGITUDE:	-88.2314°	**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	BB

REMARKS:

Water

While Drilling	12	feet
Upon Completion	9	feet
Delay	N/A	

BORING LOCATION: Pavement

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	0					Asphalt (4"± Thick)	ASPH				
						Aggregate Base, Light Brown Sand and Gravel, Moist (8"± Thick)	BASE				
				1	12	Fill, Black Silty Sand, with Slag and Brick, Very Moist (Possible Foundry Sand)	FILL	3-4-3 N=7	18		
						Possible Buried Topsoil, Black Silty Clay, with Root Matter, Very Moist					
				2	12		OL	2-2-1 N=3	37		Organic Content = 16.6%
25	5										
				3	18	Brown Silty Sand and Gravel, with Coarse Sand Seams, Very Moist to Wet		3-5-6 N=11	20		
				4	12			19-16-7 N=23	9		
20	10						SM				
				5	1			50/1"		>>◎	
15	15					End of Boring at 15'					
						Cave-In at 10'					

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PROJECT: Proposed Apartments and Brewery
LOCATION: East St. Paul Avenue, Waukesha, WI

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BORING B-16

DATE STARTED:	4/3/19	**DRILL COMPANY:**	Groundbreaking Exploration, Inc.
DATE COMPLETED:	4/3/19	**DRILLER:** Jonathan	**LOGGED BY:** Jason
COMPLETION DEPTH	15.0 ft	**DRILL RIG:**	CME 55
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	31 ft	**SAMPLING METHOD:**	2-in SS
LATITUDE:	43.0132°	**HAMMER TYPE:**	Automatic
LONGITUDE:	-88.2314°	**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	BB

REMARKS:

Water

While Drilling	12	feet
Upon Completion	9	feet
Delay	N/A	

BORING LOCATION: Pavement

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	0					Asphalt (3"± Thick)	ASPH				
30						Aggregate Base, Brown Sand and Gravel, Moist (9"± Thick)	BASE				
				1	6	Fill, Brown and Gray Crushed Concrete and Brick, Very Moist to Moist	FILL	31-50/3"	6	× >>◎	
				2	12	Possible Buried Topsoil, Black and Brown Lean Clay, Trace Root Matter, Very Moist	OL	4-2-2 N=4	34	◎ ×	
	5										
25				3	18	Dark Gray Lean Clay, with Root Matter, Very Moist	OL	1-2-2 N=4	84	◎ ✳ >>×	
				4	6	Dark Brown Silt, with Vegetative Fibers, Very Moist	OL	5-2-5 N=7	51	◎ >>×	
	10										
20						Gray Silty Sand and Gravel, Wet	SM				
				5	1			50/3"		>>◎	
	15					End of Boring at 15'					
						Cave-In at 11'					

intertek psi

Professional Service Industries, Inc.
821 Corporate Court, Suite 100
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Telephone: (262) 521-2125

PROJECT NO.: 00522340
PROJECT: Proposed Apartments and Brewery
LOCATION: East St. Paul Avenue, Waukesha, WI

The stratification lines represent approximate boundaries. The transition may be gradual.

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LOG OF TP-01

PSI Job No.: 00522340-TP
Project: Proposed Apartments and Brewery
Location: East St. Paul Avenue
Waukesha, WI

Excavation Method: Mini Excavator
Sampling Method: Bucket
DCP Type:
Boring Location: Adjacent to B-9 - Parking Structure East

WATER LEVELS

While Drilling	Not Obsvd
Upon Completion	Not Obsvd
Delay	N/A

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	Dynamic Cone (DCP) Blows per -inch	Moisture, %	DYNAMIC CONE PENETRATION TEST DATA Blows per -inch ◎ (0 / 15 / 30); Moisture × (0 / 25 / 50); PL ◪; LL ✚; STRENGTH, tsf ▲ Qu ✳ Qp (0 / 2.0 / 4.0)	Additional Remarks
	0					**Surface Elev.:** 30 ft					
						Topsoil Fill (8"± Thick)	OL				
	1					Fill, Brown Silty Sand and Gravel, with Sandy Lean Clay Pockets and Concrete Pieces (up to about 24" wide), Very Moist	FILL				
28	2										
	3					Fill, Black Silty Sand and Gravel, with Possible Coal Cinders, Posible Foundry Slag, and Concrete Pieces, Very Moist					
26	4										
	5						FILL				
24	6										
	7					Possible Buried Topsoil, Black Silty Clay, with Vegetative Fibers, Very Moist	OL				>>◎ Organic Content = 17.6%
22	8					Brown Organic Fibrous Silt, Very Moist					
	9						OL				>>◎ Organic Content = 23.9%
20	10					Gray Silty Sand and Gravel, with Cobbles and Boulders, Very Moist	SM				
						End of Test Pit at 10.5' Due to Difficult Excavation in Cobbles and Boulders					

Completion Depth: 10.5 ft
Date Boring Started: 5/9/19
Date Boring Completed: 5/9/19
Logged By: BB
Excavation Contractor: R&W

Sample Types:
Shelby Tube
Dynamic Cone (DCP)
Grab Sample

Latitude: 43.0132°
Longitude: -88.2314°
Excavation Equipment:
Remarks:

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LOG OF TP-02

PSI Job No.: 00522340-TP
Project: Proposed Apartments and Brewery
Location: East St. Paul Avenue
Waukesha, WI

Excavation Method: Mini Excavator
Sampling Method: Bucket
DCP Type:
Boring Location: Adjacent to B-5 - Parking Structure South

WATER LEVELS

While Drilling	Not Obsvd
Upon Completion	Not Obsvd
Delay	N/A

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	Dynamic Cone (DCP) Blows per -inch	Moisture, %	DYNAMIC CONE PENETRATION TEST DATA Blows per -inch ◎ 0 15 30; Moisture ✕ PL ◪ LL ✚ 0 25 50; STRENGTH, tsf ▲ Qu ✳ Qp 0 2.0 4.0	Additional Remarks
	0					**Surface Elev.:** 30 ft					
						Topsoil Fill (4"± Thick)	OL				
						Fill, Brown, Gray, and Black Silty Sand/Sand and Gravel, with Concrete Slab Pieces (up to about 24" wide), Bricks, Cobbles, and Boulders, Very Moist					
	1										
28	2										
	3										
26	4						FILL				
	5										
24	6										
	7										
22	8										
	9					Fill, Gray Silty Sand and Gravel with Cobbles and Boulders, Very Moist	FILL				
						End of Test Pit at 9' Due to Difficult Excavation in Cobbles and Boulders					

Completion Depth: 9.0 ft
Date Boring Started: 5/9/19
Date Boring Completed: 5/9/19
Logged By: BB
Excavation Contractor: R&W

Sample Types:
Shelby Tube
Dynamic Cone (DCP)
Grab Sample

Latitude: 43.0132°
Longitude: -88.2314°
Excavation Equipment:
Remarks:

The stratification lines represent approximate boundaries. The transition may be gradual.

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LOG OF TP-03

PSI Job No.: 00522340-TP
Project: Proposed Apartments and Brewery
Location: East St. Paul Avenue
Waukesha, WI

Excavation Method: Mini Excavator
Sampling Method: Bucket
DCP Type:
Boring Location: Adjacent to B-6 - Parking Structure North

WATER LEVELS

While Drilling	Not Obsvd
Upon Completion	Not Obsvd
Delay	N/A

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	Dynamic Cone (DCP) Blows per -inch	Moisture, %	DYNAMIC CONE PENETRATION TEST DATA Blows per -inch ◎ 0 15 30; Moisture, PL, LL 0 25 50; STRENGTH, tsf Qu, Qp 0 2.0 4.0	Additional Remarks
	0					**Surface Elev.:** 36 ft Topsoil Fill (6"± Thick)	OL				
	1					Fill, Brown and Gray Silty Sand and Gravel, with Concrete Pieces (up to about 18" wide), Cobbles, and Boulders, Very Moist					
34	2										
	3										
32	4						FILL				
	5										
30	6										
	7					End of Test Pit at 7' Due to Difficult Excavation in Cobbles and Boulders					

Completion Depth: 7.0 ft
Date Boring Started: 5/9/19
Date Boring Completed: 5/9/19
Logged By: BB
Excavation Contractor: R&W

Sample Types:
Shelby Tube
Dynamic Cone (DCP)
Grab Sample

Latitude: 43.0132°
Longitude: -88.2314°
Excavation Equipment:
Remarks:

The stratification lines represent approximate boundaries. The transition may be gradual.

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LOG OF TP-04

PSI Job No.: 00522340-TP
Project: Proposed Apartments and Brewery
Location: East St. Paul Avenue
Waukesha, WI

Excavation Method: Mini Excavator
Sampling Method: Bucket
DCP Type:
Boring Location: Adjacent to B-10 - Brewery/Restaurant NW

WATER LEVELS

While Drilling	Not Obsvd
Upon Completion	Not Obsvd
Delay	N/A

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	Dynamic Cone (DCP) Blows per -inch	Moisture, %	DYNAMIC CONE PENETRATION TEST DATA Blows per -inch ◎ (0 / 15 / 30); Moisture ✕ PL ◪ LL ✚ (0 / 25 / 50); STRENGTH, tsf ▲ Qu ✳ Qp (0 / 2.0 / 4.0)	Additional Remarks
	0					**Surface Elev.:** 32 ft					
						Topsoil Fill (12"± Thick)	OL				
	1					Fill, Brown, Dark Brown, and Gray Lean Clay, with Sand, Gravel, Brick, Concrete Pieces (up to about 18" in diameter), Cobbles, and Boulders, Very Moist					
30	2										
	3										
28	4						FILL				
	5										
26	6										
	7					Light Brown, Brown, and Gray Mottled Lean Clay, Very Moist	CL				
24	8					End of Test Pit at 8' Due to Difficult Excavation in Cobbles and Boulders					

Completion Depth: 8.0 ft
Date Boring Started: 5/9/19
Date Boring Completed: 5/9/19
Logged By: BB
Excavation Contractor: R&W

Sample Types:
Shelby Tube
Dynamic Cone (DCP)
Grab Sample

Latitude: 43.0132°
Longitude: -88.2314°
Excavation Equipment:
Remarks:

The stratification lines represent approximate boundaries. The transition may be gradual.

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LOG OF TP-05

PSI Job No.: 00522340-TP
Project: Proposed Apartments and Brewery
Location: East St. Paul Avenue
Waukesha, WI

Excavation Method: Mini Excavator
Sampling Method: Bucket
DCP Type:
Boring Location: Adjacent to B-11 - Brewery/Restaurant NE

WATER LEVELS

While Drilling	Not Obsvd
Upon Completion	Not Obsvd
Delay	N/A

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	Dynamic Cone (DCP) Blows per -inch	Moisture, %	DYNAMIC CONE PENETRATION TEST DATA Blows per -inch ◎ 0 15 30; Moisture ✕ PL ◪ LL ✚ 0 25 50; STRENGTH, tsf ▲ Qu ✳ Qp 0 2.0 4.0	Additional Remarks
	0					**Surface Elev.:** 32 ft Topsoil Fill (12"± Thick)	OL				
	1					Fill, Brown Silty Sand and Gravel, Very Moist	FILL				
30	2					Fill, Brown Silty Sand and Gravel, with Sandy Lean Clay, Cobbles, and Boulders, Very Moist					
	3										
28	4						FILL				
	5										
26	6					End of Test Pit at 6' Due to Difficult Excavation in Cobbles and Boulders					

Completion Depth: 6.0 ft
Date Boring Started: 5/9/19
Date Boring Completed: 5/9/19
Logged By: BB
Excavation Contractor: R&W

Sample Types:
Shelby Tube
Dynamic Cone (DCP)
Grab Sample

Latitude: 43.0132°
Longitude: -88.2314°
Excavation Equipment:
Remarks:

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LOG OF TP-06

PSI Job No.: 00522340-TP
Project: Proposed Apartments and Brewery
Location: East St. Paul Avenue
Waukesha, WI

Excavation Method: Mini Excavator
Sampling Method: Bucket
DCP Type:
Boring Location: Parking Structure

WATER LEVELS

While Drilling	Not Obsvd
Upon Completion	Not Obsvd
Delay	N/A

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	Dynamic Cone (DCP) Blows per -inch	Moisture, %	DYNAMIC CONE PENETRATION TEST DATA Blows per -inch ◎ 0 15 30; Moisture ✕ PL ◪ LL ✚ 0 25 50; STRENGTH, tsf ▲ Qu ✳ Qp 0 2.0 4.0	Additional Remarks
	0					**Surface Elev.:** 31 ft Topsoil Fill (6"± Thick)	OL				
30	1					Fill, Light Brown Silty Sand and Gravel, Moist	FILL				
	2					Fill, Black Possible Coal Cinders, with Brick and Possible Foundry Slag, Very Moist					
28	3										
	4						FILL				
26	5										
	6										
						Brown Lean Clay, Very Moist					
24	7						CL				
						Light Brown Silty Sand and Gravel with Cobbles and Boulders	SM				
	8					End of Test Pit at 8' Due to Difficult Excavation in Cobbles and Boulders					

Completion Depth: 8.0 ft
Date Boring Started: 5/9/19
Date Boring Completed: 5/9/19
Logged By: BB
Excavation Contractor: R&W

Sample Types:
Shelby Tube
Dynamic Cone (DCP)
Grab Sample

Latitude: 43.0132°
Longitude: -88.2314°
Excavation Equipment:
Remarks:

The stratification lines represent approximate boundaries. The transition may be gradual.

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LOG OF TP-07

PSI Job No.: 00522340-TP
Project: Proposed Apartments and Brewery
Location: East St. Paul Avenue
Waukesha, WI

Excavation Method: Mini Excavator
Sampling Method: Bucket
DCP Type:
Boring Location: Parking Structure

WATER LEVELS

While Drilling	Not Obsvd
Upon Completion	Not Obsvd
Delay	N/A

Elevation (feet)	Depth, (feet)	Material Description	USCS Classification	Moisture, %	Additional Remarks
	0	**Surface Elev.:** 30 ft			
	0	Topsoil Fill (6"± Thick)	OL		
	1	Fill, Light Brown Silty Sand and Gravel, with Cobbles and Boulders, Moist	FILL		
28	2				
	3	Fill, Gray and Black Silty Sand and Gravel, with Cobbles and Boulders, Very Moist	FILL		
26	4				
	5				
24	6	Fill, Black Lean Clay, with Root Matter and Intermixed Brown Lean Clay, Very Moist	FILL	45	Organic Content = 12.7
	7				
22	8				
	9	Gray Silty Sand and Gravel, with Cobbles and Boulders	SM		
		End of Test Pit at 9.5' Due to Difficult Excavation in Cobbles and Boulders			

DYNAMIC CONE PENETRATION TEST DATA
Blows per -inch ◎ (0, 15, 30)
Moisture ✕ (0, 25, 50) PL LL
STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)

Completion Depth:	9.5 ft
Date Boring Started:	5/9/19
Date Boring Completed:	5/9/19
Logged By:	BB
Excavation Contractor:	R&W

Sample Types:
Shelby Tube
Dynamic Cone (DCP)
Grab Sample

Latitude: 43.0132°
Longitude: -88.2314°
Excavation Equipment:
Remarks:

The stratification lines represent approximate boundaries. The transition may be gradual.

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LOG OF TP-08

PSI Job No.: 00522340-TP
Project: Proposed Apartments and Brewery
Location: East St. Paul Avenue
Waukesha, WI

Excavation Method: Mini Excavator
Sampling Method: Bucket
DCP Type:
Boring Location: Parking Structure

WATER LEVELS

While Drilling	Not Obsvd
Upon Completion	Not Obsvd
Delay	N/A

Elevation (feet)	Depth, (feet)	Material Description	USCS Classification	Moisture, %	Additional Remarks
	0	**Surface Elev.:** 30 ft			
	0	Topsoil Fill (6"± Thick)	OL		
	1	Fill, Light Brown Silty Sand and Gravel, Very Moist	FILL		
28	2	Fill, Black Possible Coal Cinders and Possible Foundry Slag, Very Moist			
	3				
26	4		FILL		
	5				
24	6	Possible Buried Topsoil, Black Lean Clay, with Root Matter, Very Moist			
	7		OL	48	>>◎ Organic Content = 10.3%
22	8	Brown Organic Fibrous Silt, Very Moist			
	9		OL	134	>>⊗ Organic Content = 32.7%
20	10	Gray Silty Sand and Gravel, with Cobbles and Boulders, Very Moist	SM		
		End of Test Pit at 10' Due to Difficult Excavation in Cobbles and Boulders			

DYNAMIC CONE PENETRATION TEST DATA
Blows per -inch ◎ (0, 15, 30)
Moisture (×) PL LL (0, 25, 50)
STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)

Completion Depth: 10.0 ft
Date Boring Started: 5/9/19
Date Boring Completed: 5/9/19
Logged By: BB
Excavation Contractor: R&W

Sample Types:
Shelby Tube
Dynamic Cone (DCP)
Grab Sample

Latitude: 43.0132°
Longitude: -88.2314°
Excavation Equipment:
Remarks:

The stratification lines represent approximate boundaries. The transition may be gradual.

GENERAL NOTES

SAMPLE IDENTIFICATION

The Unified Soil Classification System (USCS), AASHTO 1988 and ASTM designations D2487 and D-2488 are used to identify the encountered materials unless otherwise noted. Coarse-grained soils are defined as having more than 50% of their dry weight retained on a #200 sieve (0.075mm); they are described as: boulders, cobbles, gravel or sand. Fine-grained soils have less than 50% of their dry weight retained on a #200 sieve; they are defined as silts or clay depending on their Atterberg Limit attributes. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size.

DRILLING AND SAMPLING SYMBOLS

SFA: Solid Flight Auger - typically 4" diameter flights, except where noted.
HSA: Hollow Stem Auger - typically 3¼" or 4¼ I.D. openings, except where noted.
M.R.: Mud Rotary - Uses a rotary head with Bentonite or Polymer Slurry
R.C.: Diamond Bit Core Sampler
H.A.: Hand Auger
P.A.: Power Auger - Handheld motorized auger

SS: Split-Spoon - 1 3/8" I.D., 2" O.D., except where noted.
ST: Shelby Tube - 3" O.D., except where noted.
RC: Rock Core
TC: Texas Cone
BS: Bulk Sample
PM: Pressuremeter
CPT-U: Cone Penetrometer Testing with Pore-Pressure Readings

SOIL PROPERTY SYMBOLS

N: Standard "N" penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2-inch O.D. Split-Spoon.
N_{60}: A "N" penetration value corrected to an equivalent 60% hammer energy transfer efficiency (ETR)
Q_u: Unconfined compressive strength, TSF
Q_p: Pocket penetrometer value, unconfined compressive strength, TSF
w%: Moisture/water content, %
LL: Liquid Limit, %
PL: Plastic Limit, %
PI: Plasticity Index = (LL-PL),%
DD: Dry unit weight, pcf
▼,▽,▼ Apparent groundwater level at time noted

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Relative Density	N - Blows/foot
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	50 - 80
Extremely Dense	80+

ANGULARITY OF COARSE-GRAINED PARTICLES

Description	Criteria
Angular:	Particles have sharp edges and relatively plane sides with unpolished surfaces
Subangular:	Particles are similar to angular description, but have rounded edges
Subrounded:	Particles have nearly plane sides, but have well-rounded corners and edges
Rounded:	Particles have smoothly curved sides and no edges

GRAIN-SIZE TERMINOLOGY

Component	Size Range
Boulders:	Over 300 mm (>12 in.)
Cobbles:	75 mm to 300 mm (3 in. to 12 in.)
Coarse-Grained Gravel:	19 mm to 75 mm (¾ in. to 3 in.)
Fine-Grained Gravel:	4.75 mm to 19 mm (No.4 to ¾ in.)
Coarse-Grained Sand:	2 mm to 4.75 mm (No.10 to No.4)
Medium-Grained Sand:	0.42 mm to 2 mm (No.40 to No.10)
Fine-Grained Sand:	0.075 mm to 0.42 mm (No. 200 to No.40)
Silt:	0.005 mm to 0.075 mm
Clay:	<0.005 mm

PARTICLE SHAPE

Description	Criteria
Flat:	Particles with width/thickness ratio > 3
Elongated:	Particles with length/width ratio > 3
Flat & Elongated:	Particles meet criteria for both flat and elongated

RELATIVE PROPORTIONS OF FINES

Descriptive Term	% Dry Weight
Trace:	< 5%
With:	5% to 12%
Modifier:	>12%

GENERAL NOTES

(Continued)

CONSISTENCY OF FINE-GRAINED SOILS

Q_U - TSF	N - Blows/foot	Consistency
0 - 0.25	0 - 2	Very Soft
0.25 - 0.50	2 - 4	Soft
0.50 - 1.00	4 - 8	Firm (Medium Stiff)
1.00 - 2.00	8 - 15	Stiff
2.00 - 4.00	15 - 30	Very Stiff
4.00 - 8.00	30 - 50	Hard
8.00+	50+	Very Hard

MOISTURE CONDITION DESCRIPTION

Description	Criteria
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

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term	% Dry Weight
Trace:	< 15%
With:	15% to 30%
Modifier:	>30%

STRUCTURE DESCRIPTION

Description	Criteria
Stratified:	Alternating layers of varying material or color with layers at least ¼-inch (6 mm) thick
Laminated:	Alternating layers of varying material or color with layers less than ¼-inch (6 mm) thick
Fissured:	Breaks along definite planes of fracture with little resistance to fracturing
Slickensided:	Fracture planes appear polished or glossy, sometimes striated
Blocky:	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
Lensed:	Inclusion of small pockets of different soils
Layer:	Inclusion greater than 3 inches thick (75 mm)
Seam:	Inclusion 1/8-inch to 3 inches (3 to 75 mm) thick extending through the sample
Parting:	Inclusion less than 1/8-inch (3 mm) thick

SCALE OF RELATIVE ROCK HARDNESS

Q_U - TSF	Consistency
2.5 - 10	Extremely Soft
10 - 50	Very Soft
50 - 250	Soft
250 - 525	Medium Hard
525 - 1,050	Moderately Hard
1,050 - 2,600	Hard
>2,600	Very Hard

ROCK BEDDING THICKNESSES

Description	Criteria
Very Thick Bedded	Greater than 3-foot (>1.0 m)
Thick Bedded	1-foot to 3-foot (0.3 m to 1.0 m)
Medium Bedded	4-inch to 1-foot (0.1 m to 0.3 m)
Thin Bedded	1¼-inch to 4-inch (30 mm to 100 mm)
Very Thin Bedded	½-inch to 1¼-inch (10 mm to 30 mm)
Thickly Laminated	1/8-inch to ½-inch (3 mm to 10 mm)
Thinly Laminated	1/8-inch or less "paper thin" (<3 mm)

ROCK VOIDS

Voids	Void Diameter
Pit	<6 mm (<0.25 in)
Vug	6 mm to 50 mm (0.25 in to 2 in)
Cavity	50 mm to 600 mm (2 in to 24 in)
Cave	>600 mm (>24 in)

GRAIN-SIZED TERMINOLOGY

(Typically Sedimentary Rock)

Component	Size Range
Very Coarse Grained	>4.76 mm
Coarse Grained	2.0 mm - 4.76 mm
Medium Grained	0.42 mm - 2.0 mm
Fine Grained	0.075 mm - 0.42 mm
Very Fine Grained	<0.075 mm

ROCK QUALITY DESCRIPTION

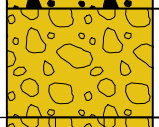
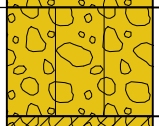
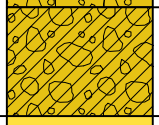
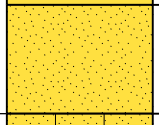
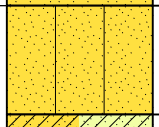
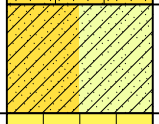
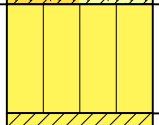
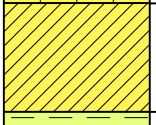
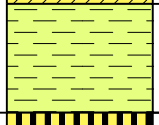
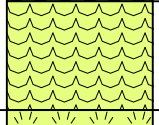
Rock Mass Description	RQD Value
Excellent	90 -100
Good	75 - 90
Fair	50 - 75
Poor	25 -50
Very Poor	Less than 25

DEGREE OF WEATHERING

Slightly Weathered:	Rock generally fresh, joints stained and discoloration extends into rock up to 25 mm (1 in), open joints may contain clay, core rings under hammer impact.
Weathered:	Rock mass is decomposed 50% or less, significant portions of the rock show discoloration and weathering effects, cores cannot be broken by hand or scraped by knife.
Highly Weathered:	Rock mass is more than 50% decomposed, complete discoloration of rock fabric, core may be extremely broken and gives clunk sound when struck by hammer, may be shaved with a knife.

SOIL CLASSIFICATION CHART

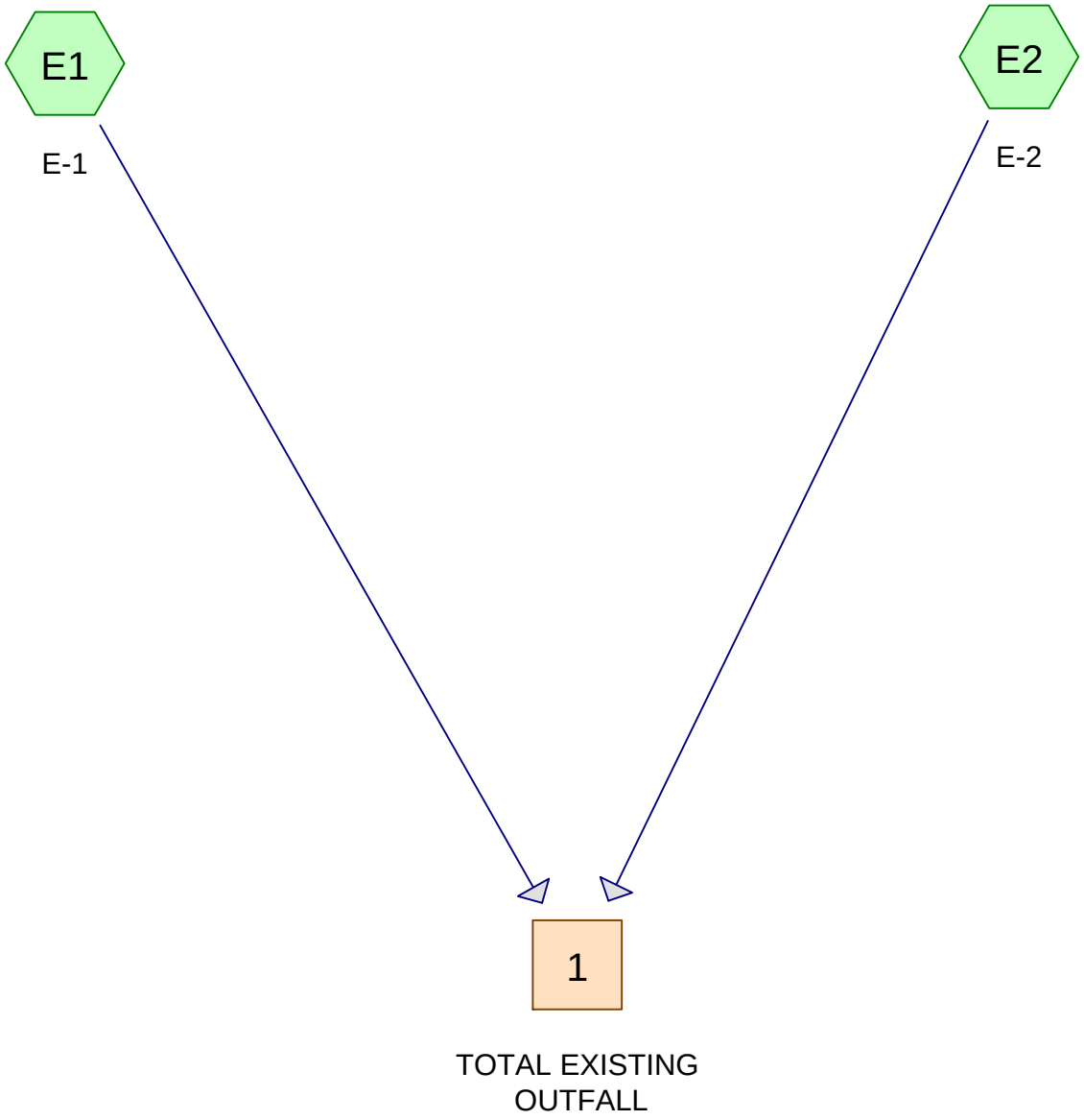
NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

intertek psi

Storm Water Quantity Calculations - Peak Discharge

Existing Conditions Hydrographs



Subcat Reach Pond Link

Routing Diagram for 3170302 Existing
Prepared by Microsoft, Printed 5/9/2019

Summary for Subcatchment E1: E-1

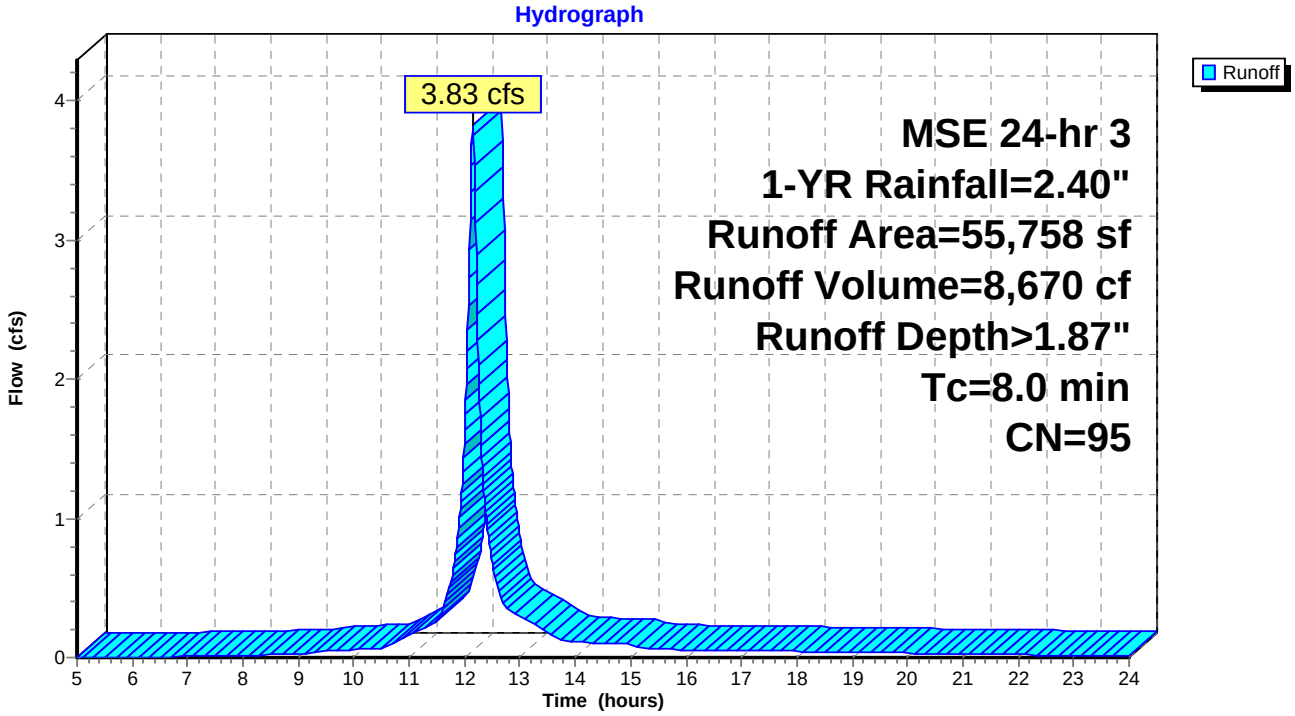
Runoff = 3.83 cfs @ 12.15 hrs, Volume= 8,670 cf, Depth> 1.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 1-YR Rainfall=2.40"

Area (sf)	CN	Description
8,356	80	>75% Grass cover, Good, HSG D
47,402	98	Paved parking, HSG D
55,758	95	Weighted Average
8,356		14.99% Pervious Area
47,402		85.01% Impervious Area

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

Subcatchment E1: E-1



Summary for Subcatchment E2: E-2

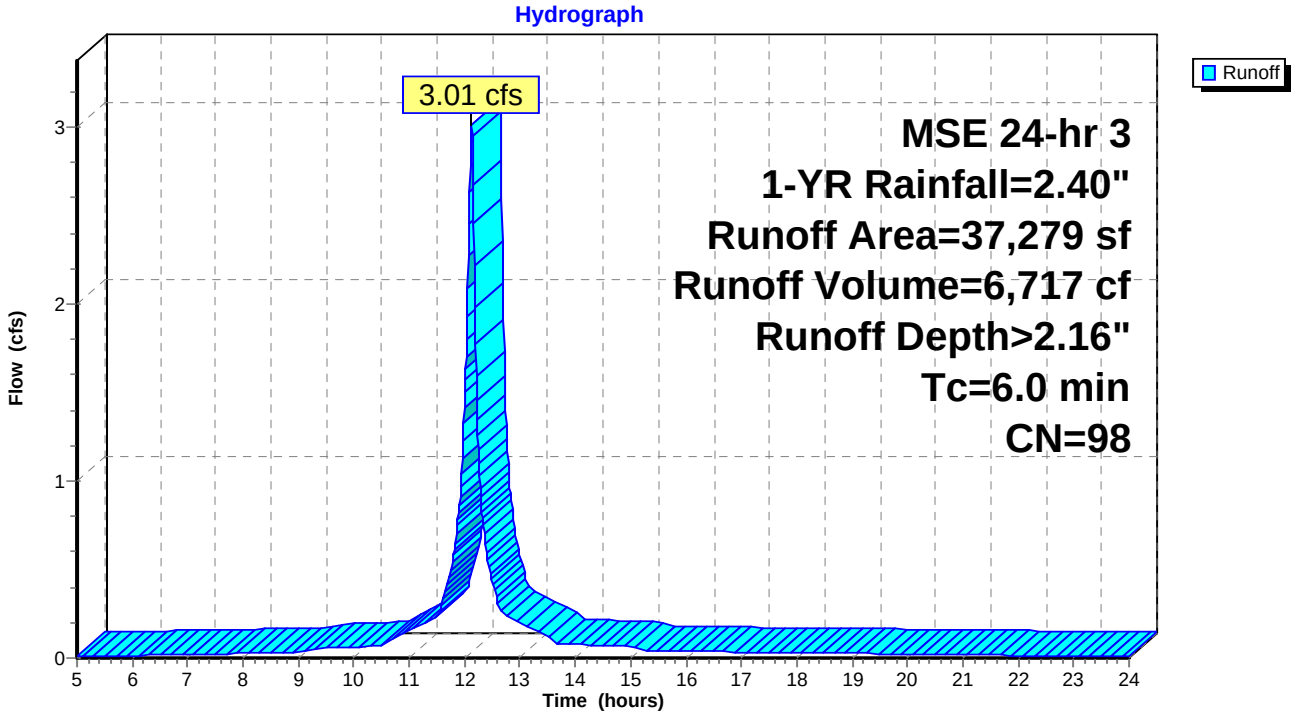
Runoff = 3.01 cfs @ 12.13 hrs, Volume= 6,717 cf, Depth> 2.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 1-YR Rainfall=2.40"

Area (sf)	CN	Description
13,814	98	Paved parking, HSG D
23,465	98	Roofs, HSG D
37,279	98	Weighted Average
37,279		100.00% Impervious Area

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

Subcatchment E2: E-2

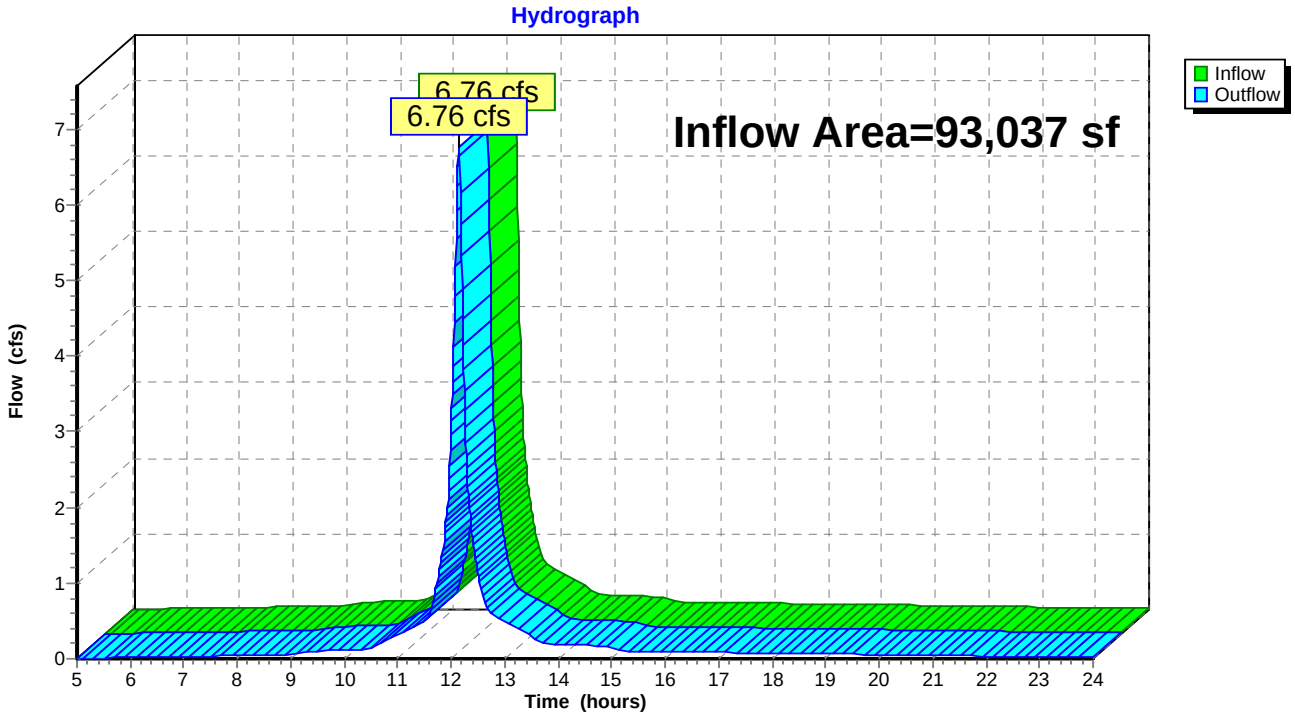


Summary for Reach 1: TOTAL EXISTING OUTFALL

Inflow Area = 93,037 sf, 91.02% Impervious, Inflow Depth > 1.98" for 1-YR event
Inflow = 6.76 cfs @ 12.14 hrs, Volume= 15,387 cf
Outflow = 6.76 cfs @ 12.14 hrs, Volume= 15,387 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs

Reach 1: TOTAL EXISTING OUTFALL



Summary for Subcatchment E1: E-1

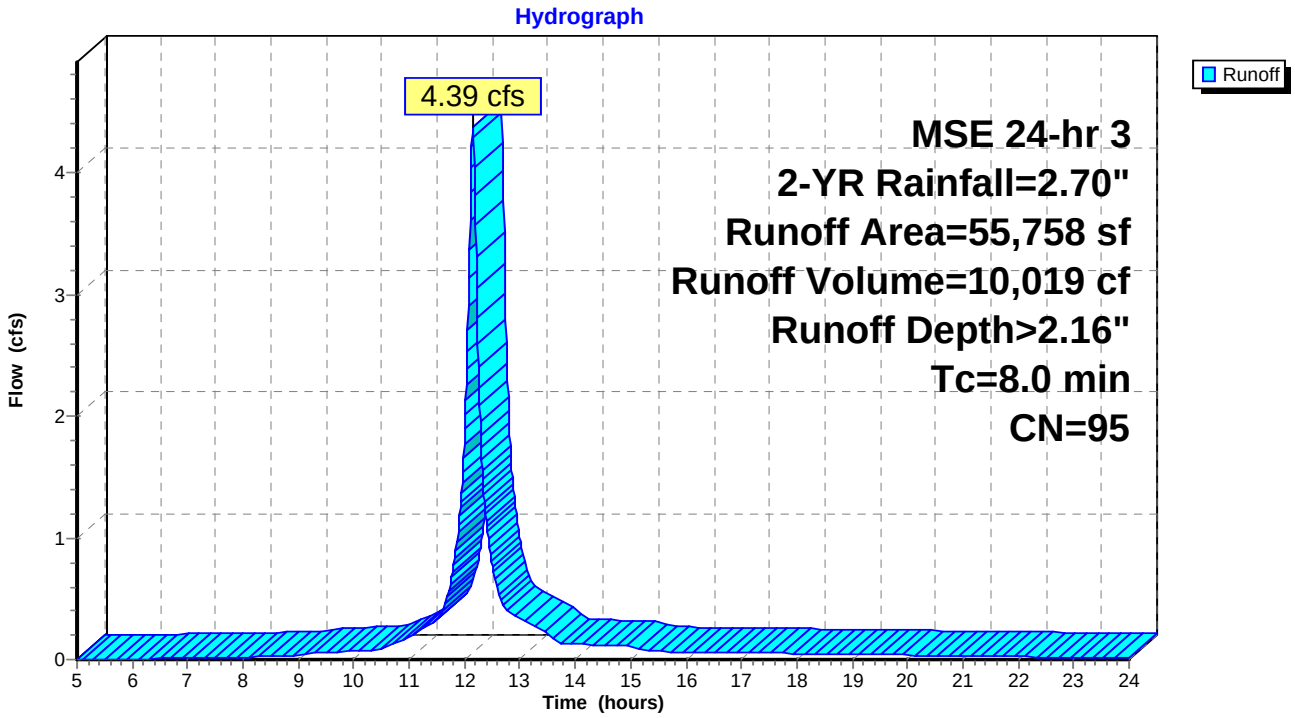
Runoff = 4.39 cfs @ 12.15 hrs, Volume= 10,019 cf, Depth> 2.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-YR Rainfall=2.70"

Area (sf)	CN	Description
8,356	80	>75% Grass cover, Good, HSG D
47,402	98	Paved parking, HSG D
55,758	95	Weighted Average
8,356		14.99% Pervious Area
47,402		85.01% Impervious Area

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

Subcatchment E1: E-1



Summary for Subcatchment E2: E-2

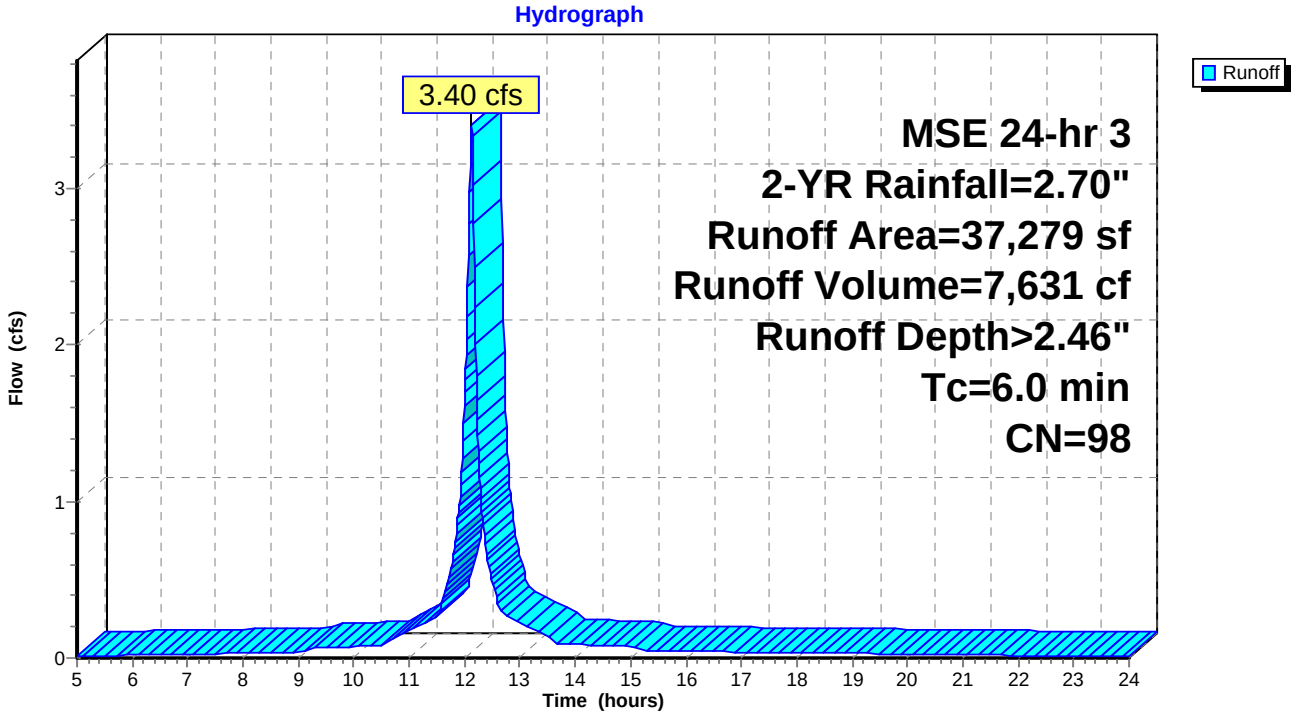
Runoff = 3.40 cfs @ 12.13 hrs, Volume= 7,631 cf, Depth> 2.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-YR Rainfall=2.70"

Area (sf)	CN	Description
13,814	98	Paved parking, HSG D
23,465	98	Roofs, HSG D
37,279	98	Weighted Average
37,279		100.00% Impervious Area

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

Subcatchment E2: E-2

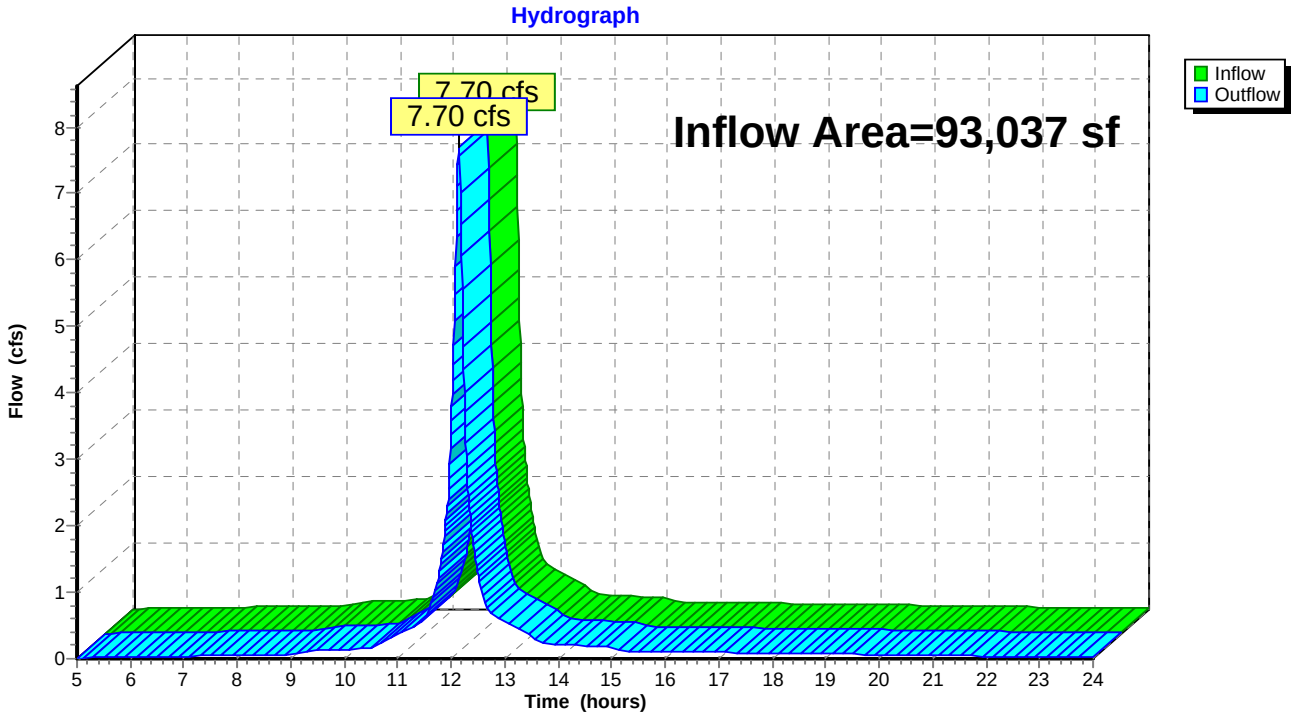


Summary for Reach 1: TOTAL EXISTING OUTFALL

Inflow Area = 93,037 sf, 91.02% Impervious, Inflow Depth > 2.28" for 2-YR event
Inflow = 7.70 cfs @ 12.14 hrs, Volume= 17,651 cf
Outflow = 7.70 cfs @ 12.14 hrs, Volume= 17,651 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs

Reach 1: TOTAL EXISTING OUTFALL



Summary for Subcatchment E1: E-1

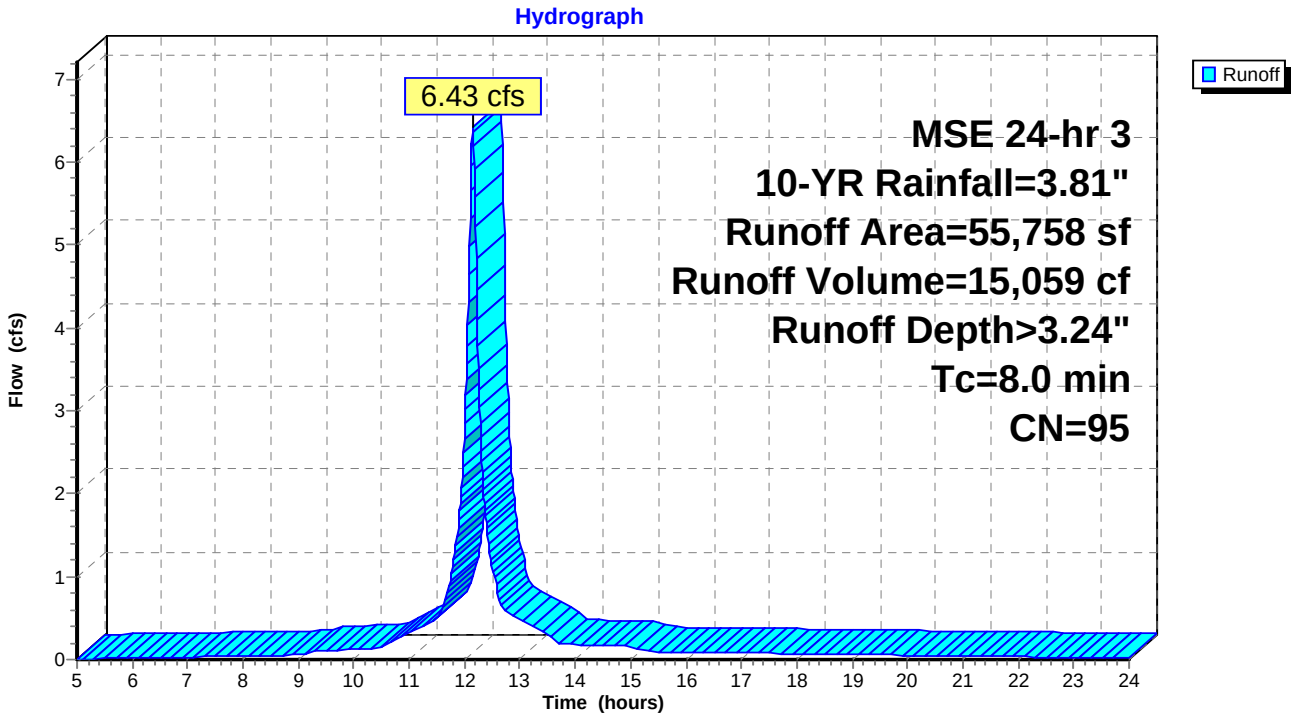
Runoff = 6.43 cfs @ 12.15 hrs, Volume= 15,059 cf, Depth> 3.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-YR Rainfall=3.81"

Area (sf)	CN	Description
8,356	80	>75% Grass cover, Good, HSG D
47,402	98	Paved parking, HSG D
55,758	95	Weighted Average
8,356		14.99% Pervious Area
47,402		85.01% Impervious Area

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

Subcatchment E1: E-1



Summary for Subcatchment E2: E-2

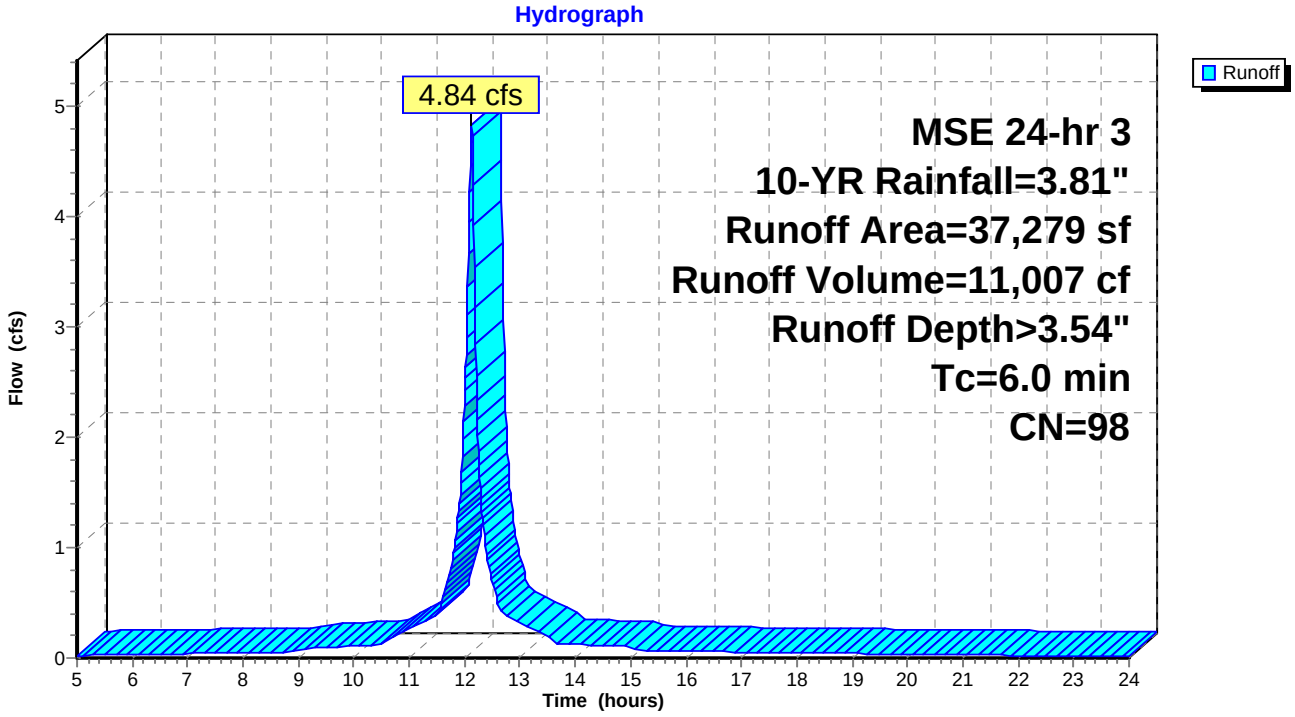
Runoff = 4.84 cfs @ 12.13 hrs, Volume= 11,007 cf, Depth> 3.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-YR Rainfall=3.81"

Area (sf)	CN	Description
13,814	98	Paved parking, HSG D
23,465	98	Roofs, HSG D
37,279	98	Weighted Average
37,279		100.00% Impervious Area

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

Subcatchment E2: E-2

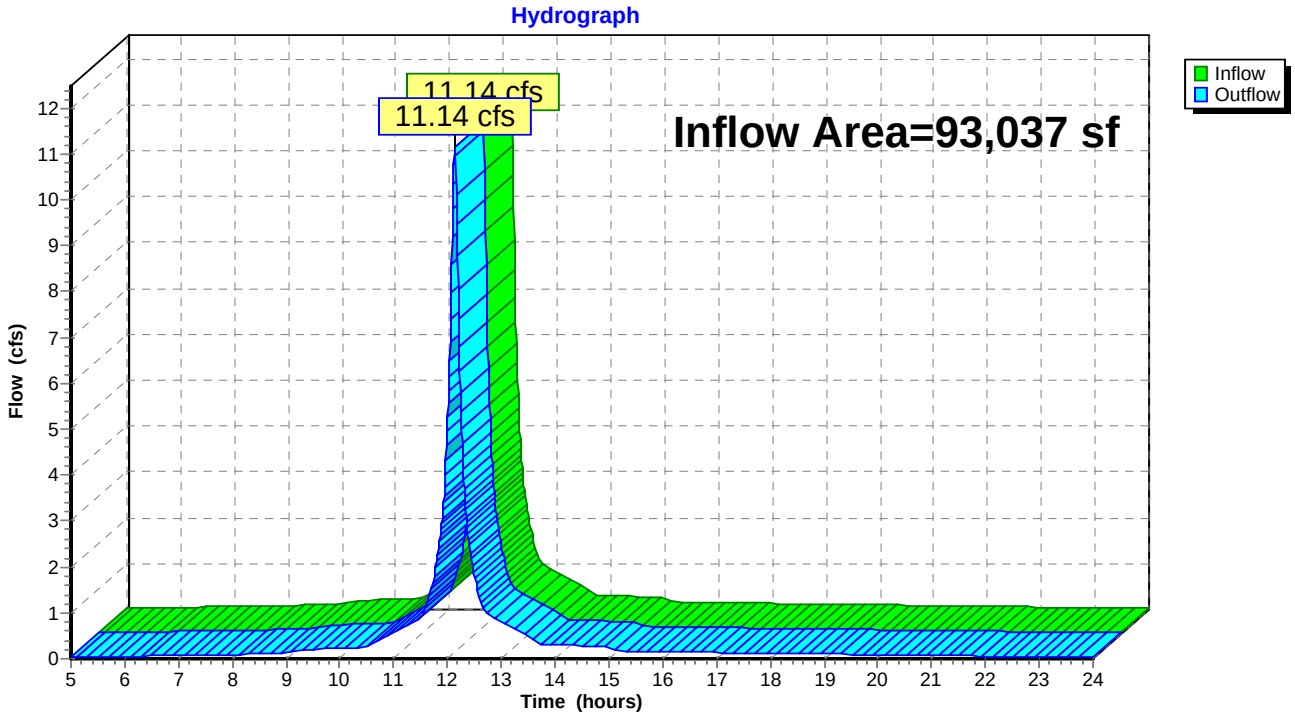


Summary for Reach 1: TOTAL EXISTING OUTFALL

Inflow Area = 93,037 sf, 91.02% Impervious, Inflow Depth > 3.36" for 10-YR event
Inflow = 11.14 cfs @ 12.14 hrs, Volume= 26,066 cf
Outflow = 11.14 cfs @ 12.14 hrs, Volume= 26,066 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs

Reach 1: TOTAL EXISTING OUTFALL



Summary for Subcatchment E1: E-1

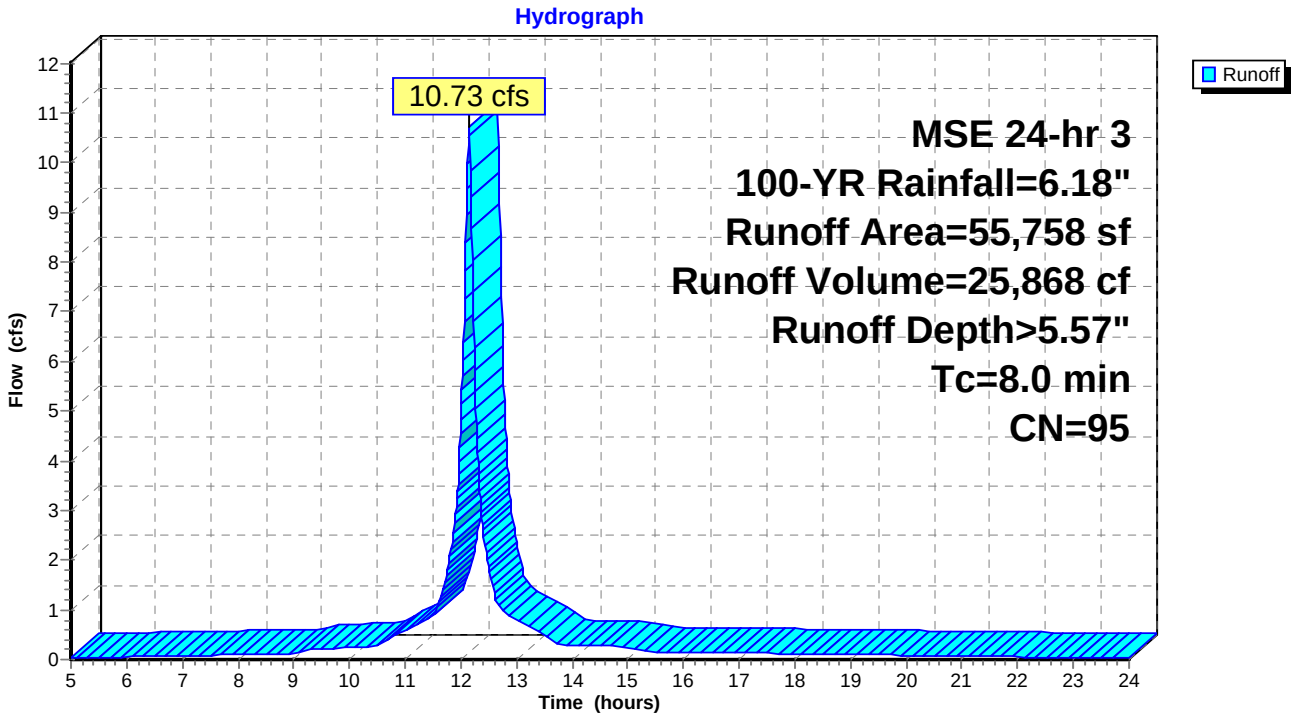
Runoff = 10.73 cfs @ 12.15 hrs, Volume= 25,868 cf, Depth> 5.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-YR Rainfall=6.18"

Area (sf)	CN	Description
8,356	80	>75% Grass cover, Good, HSG D
47,402	98	Paved parking, HSG D
55,758	95	Weighted Average
8,356		14.99% Pervious Area
47,402		85.01% Impervious Area

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

Subcatchment E1: E-1



Summary for Subcatchment E2: E-2

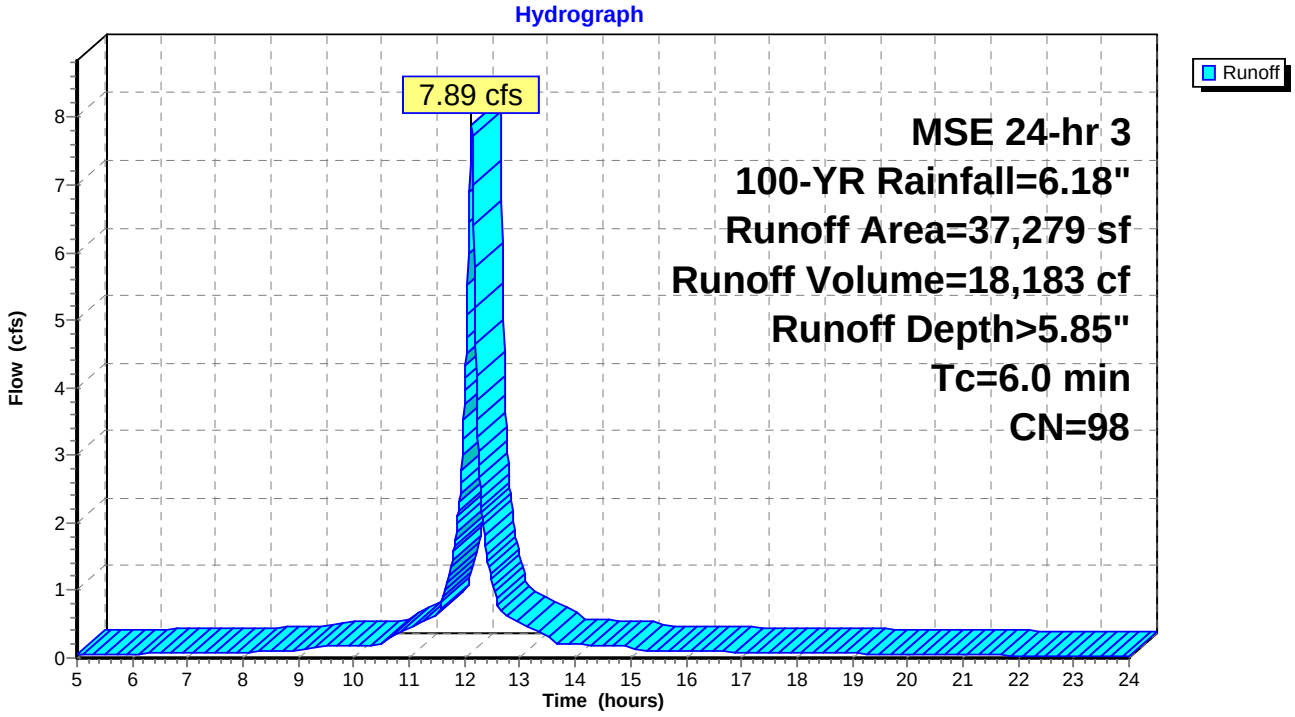
Runoff = 7.89 cfs @ 12.13 hrs, Volume= 18,183 cf, Depth> 5.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-YR Rainfall=6.18"

Area (sf)	CN	Description
13,814	98	Paved parking, HSG D
23,465	98	Roofs, HSG D
37,279	98	Weighted Average
37,279		100.00% Impervious Area

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

Subcatchment E2: E-2

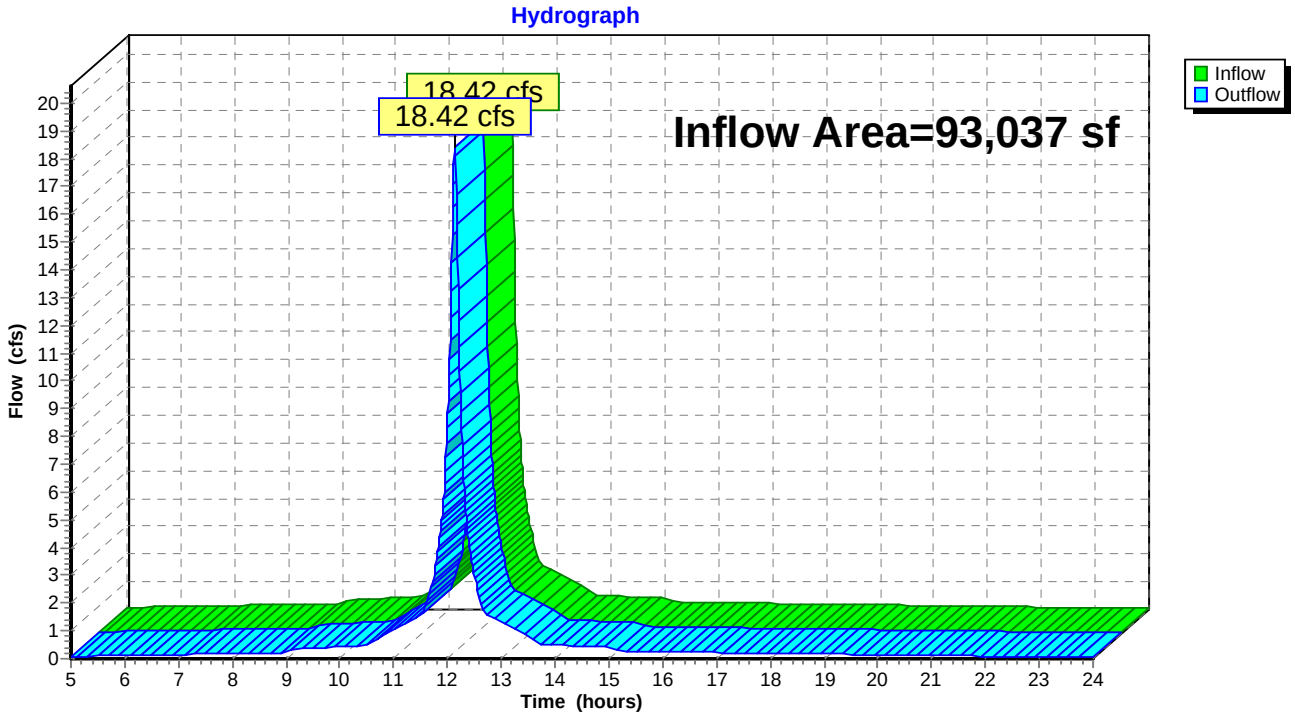


Summary for Reach 1: TOTAL EXISTING OUTFALL

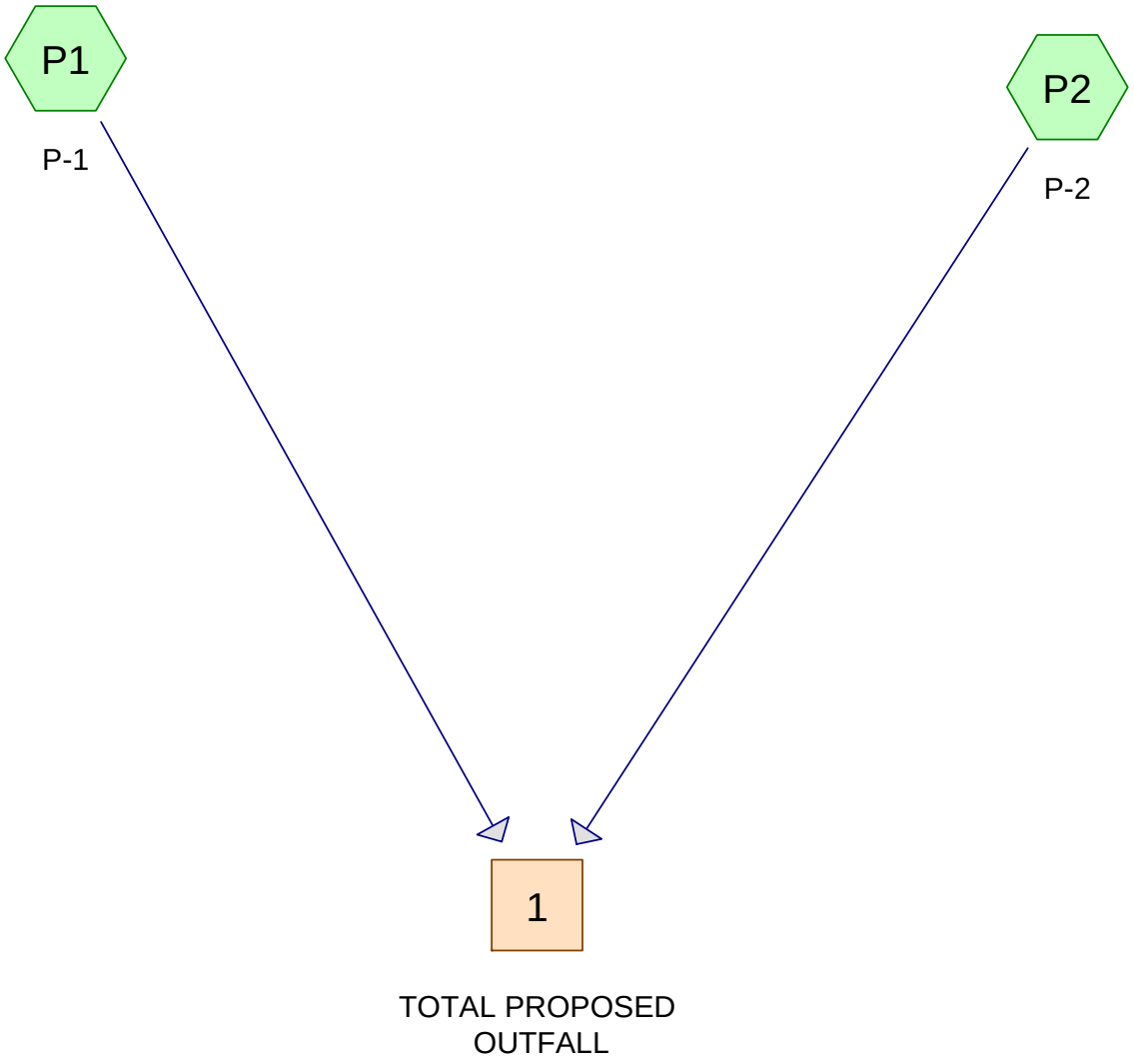
Inflow Area = 93,037 sf, 91.02% Impervious, Inflow Depth > 5.68" for 100-YR event
Inflow = 18.42 cfs @ 12.14 hrs, Volume= 44,051 cf
Outflow = 18.42 cfs @ 12.14 hrs, Volume= 44,051 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs

Reach 1: TOTAL EXISTING OUTFALL



Proposed Conditions Hydrographs
(Before Detention)



Subcat Reach Pond Link

Routing Diagram for 3170302 Proposed No Det
Prepared by Microsoft, Printed 7/24/2019

Summary for Subcatchment P1: P-1

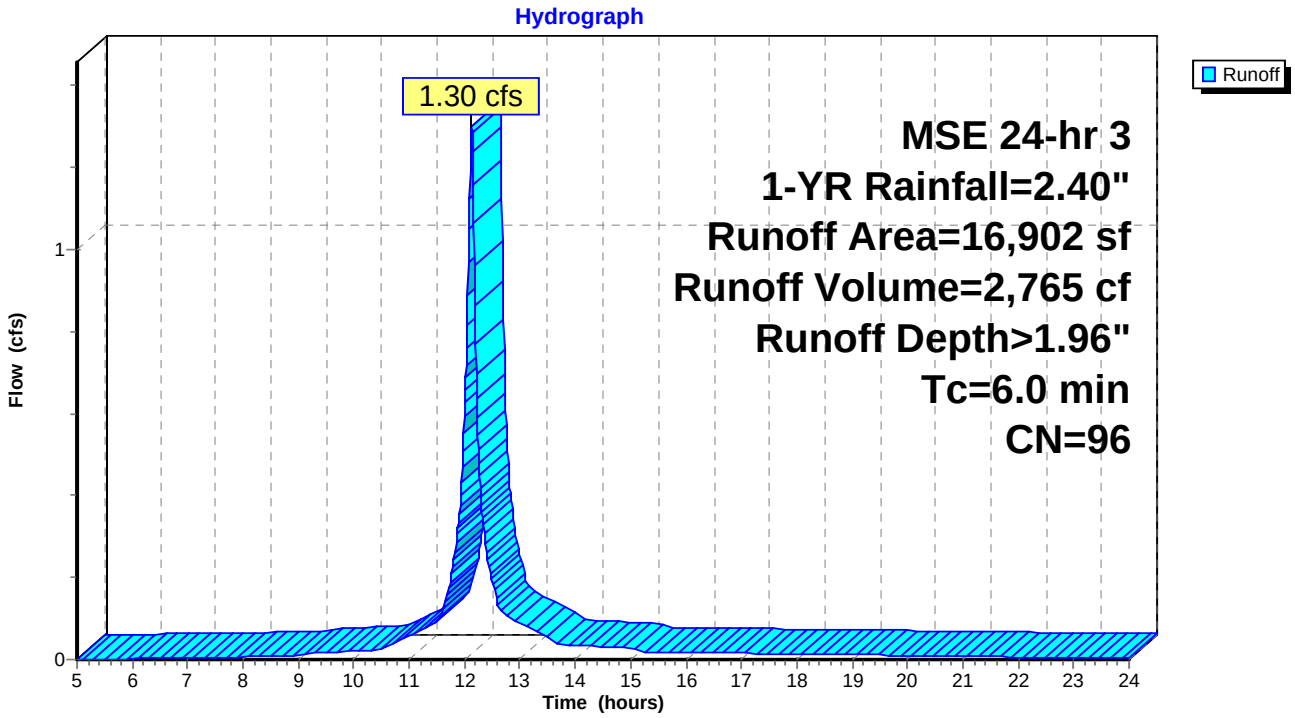
Runoff = 1.30 cfs @ 12.13 hrs, Volume= 2,765 cf, Depth> 1.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 1-YR Rainfall=2.40"

Area (sf)	CN	Description
1,917	80	>75% Grass cover, Good, HSG D
14,985	98	Paved parking, HSG D
16,902	96	Weighted Average
1,917		11.34% Pervious Area
14,985		88.66% Impervious Area

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

Subcatchment P1: P-1



Summary for Subcatchment P2: P-2

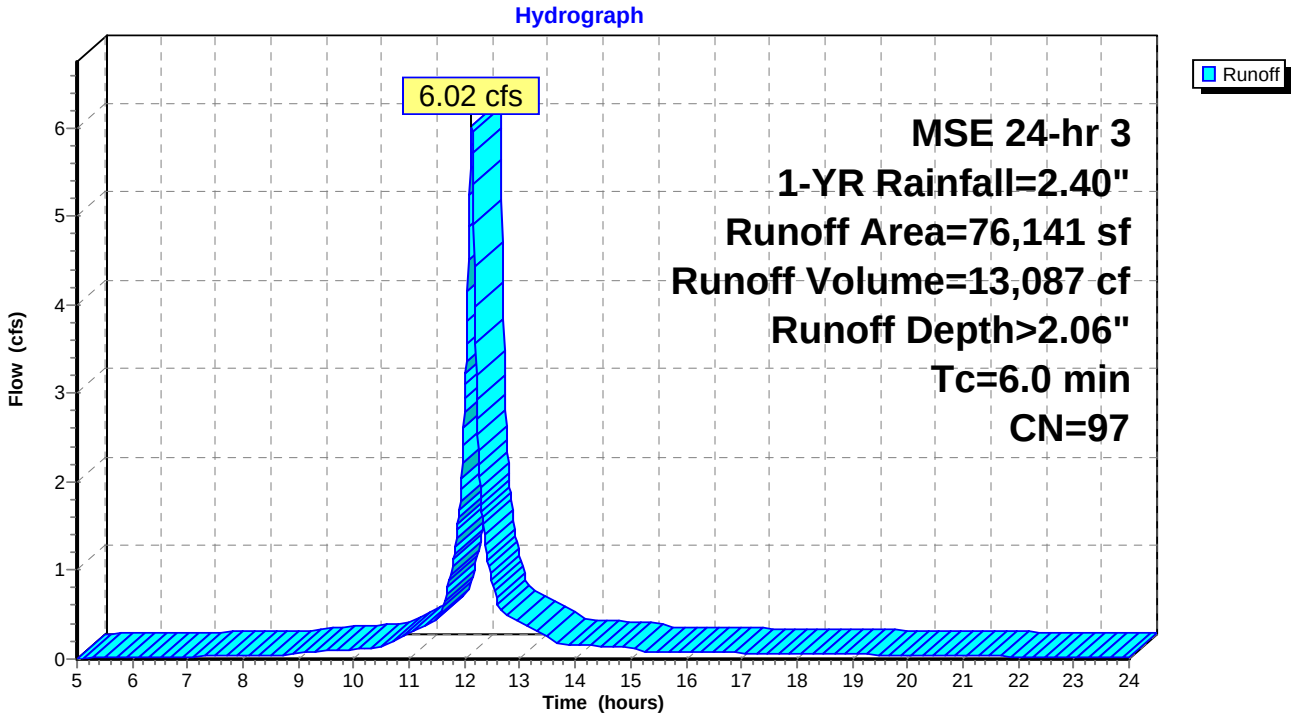
Runoff = 6.02 cfs @ 12.13 hrs, Volume= 13,087 cf, Depth> 2.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 1-YR Rainfall=2.40"

Area (sf)	CN	Description
4,809	80	>75% Grass cover, Good, HSG D
7,342	98	Paved parking, HSG D
63,990	98	Roofs, HSG D
76,141	97	Weighted Average
4,809		6.32% Pervious Area
71,332		93.68% Impervious Area

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

Subcatchment P2: P-2

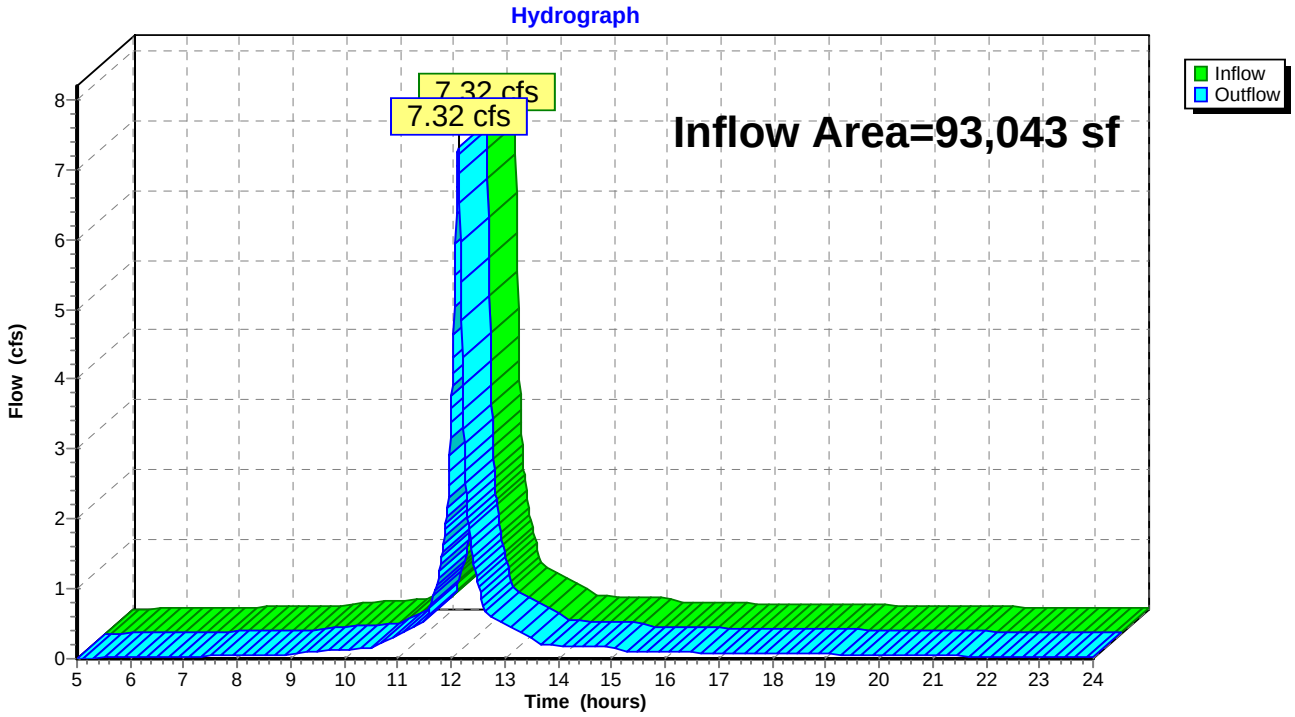


Summary for Reach 1: TOTAL PROPOSED OUTFALL

Inflow Area = 93,043 sf, 92.77% Impervious, Inflow Depth > 2.04" for 1-YR event
Inflow = 7.32 cfs @ 12.13 hrs, Volume= 15,852 cf
Outflow = 7.32 cfs @ 12.13 hrs, Volume= 15,852 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs

Reach 1: TOTAL PROPOSED OUTFALL



Summary for Subcatchment P1: P-1

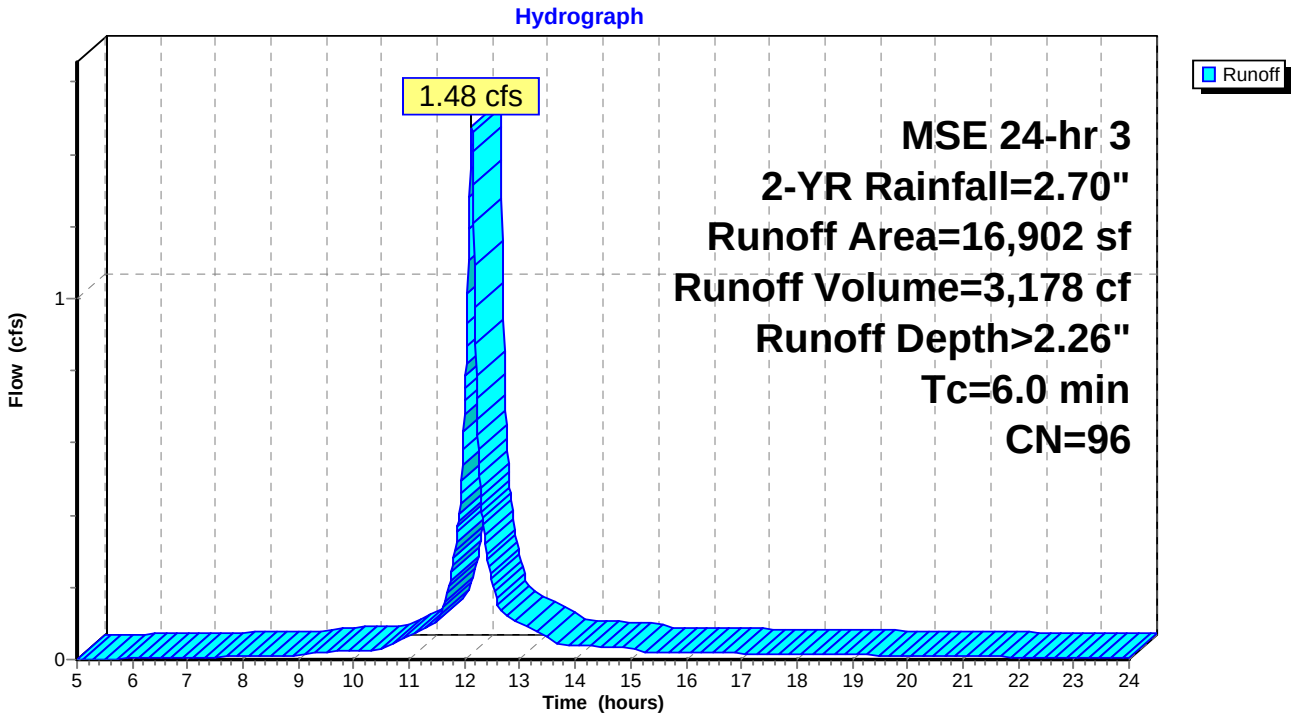
Runoff = 1.48 cfs @ 12.13 hrs, Volume= 3,178 cf, Depth> 2.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-YR Rainfall=2.70"

Area (sf)	CN	Description
1,917	80	>75% Grass cover, Good, HSG D
14,985	98	Paved parking, HSG D
16,902	96	Weighted Average
1,917		11.34% Pervious Area
14,985		88.66% Impervious Area

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

Subcatchment P1: P-1



Summary for Subcatchment P2: P-2

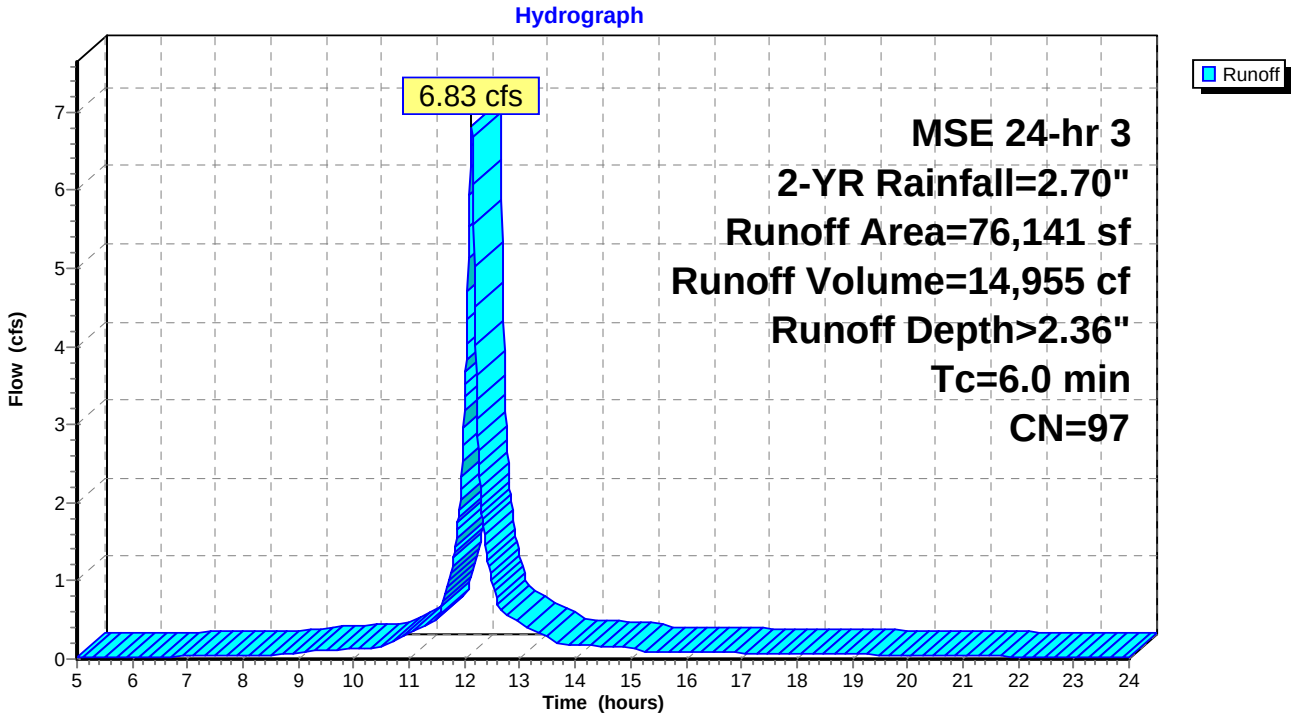
Runoff = 6.83 cfs @ 12.13 hrs, Volume= 14,955 cf, Depth> 2.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-YR Rainfall=2.70"

Area (sf)	CN	Description
4,809	80	>75% Grass cover, Good, HSG D
7,342	98	Paved parking, HSG D
63,990	98	Roofs, HSG D
76,141	97	Weighted Average
4,809		6.32% Pervious Area
71,332		93.68% Impervious Area

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

Subcatchment P2: P-2

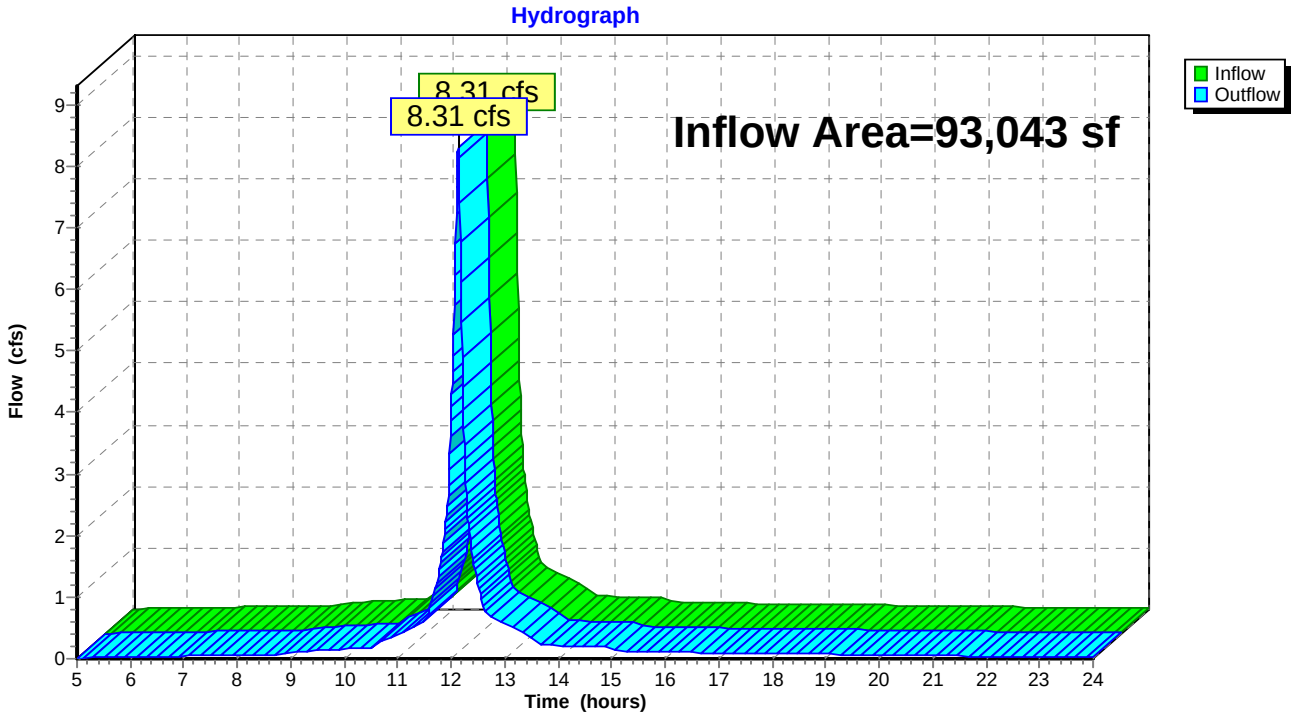


Summary for Reach 1: TOTAL PROPOSED OUTFALL

Inflow Area = 93,043 sf, 92.77% Impervious, Inflow Depth > 2.34" for 2-YR event
Inflow = 8.31 cfs @ 12.13 hrs, Volume= 18,132 cf
Outflow = 8.31 cfs @ 12.13 hrs, Volume= 18,132 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs

Reach 1: TOTAL PROPOSED OUTFALL



Summary for Subcatchment P1: P-1

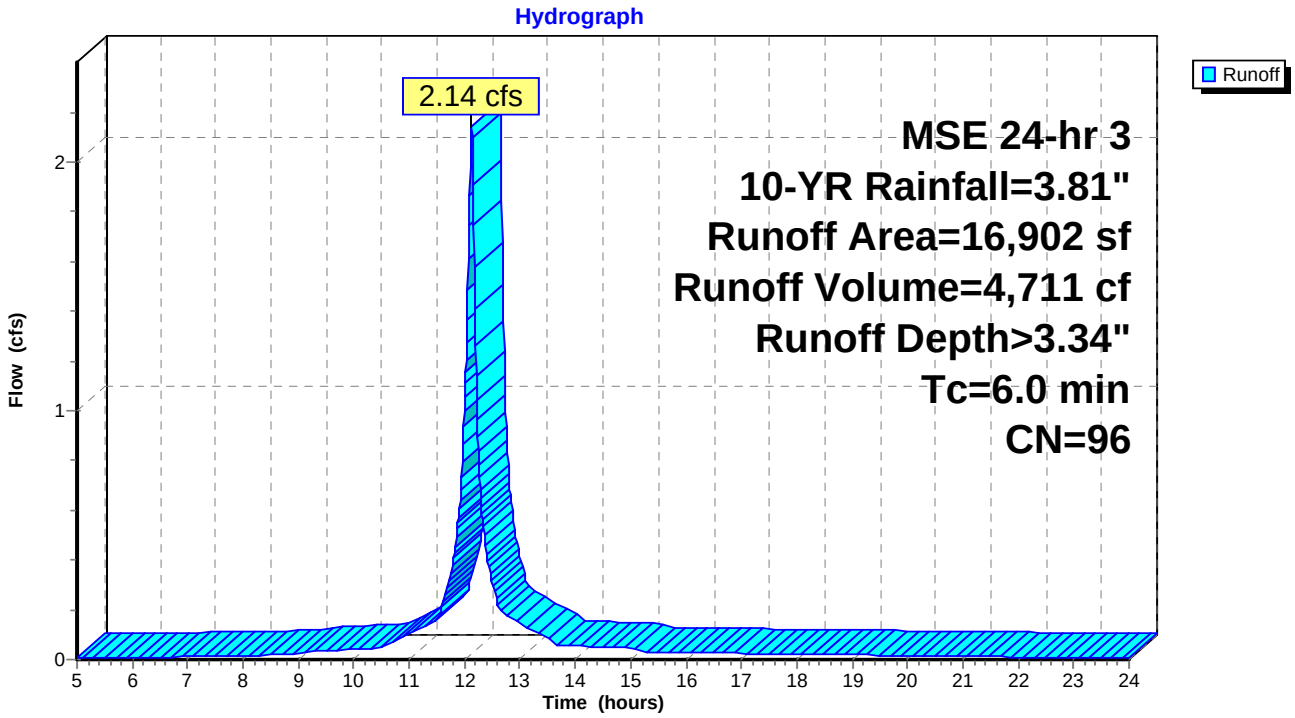
Runoff = 2.14 cfs @ 12.13 hrs, Volume= 4,711 cf, Depth> 3.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-YR Rainfall=3.81"

Area (sf)	CN	Description
1,917	80	>75% Grass cover, Good, HSG D
14,985	98	Paved parking, HSG D
16,902	96	Weighted Average
1,917		11.34% Pervious Area
14,985		88.66% Impervious Area

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

Subcatchment P1: P-1



Summary for Subcatchment P2: P-2

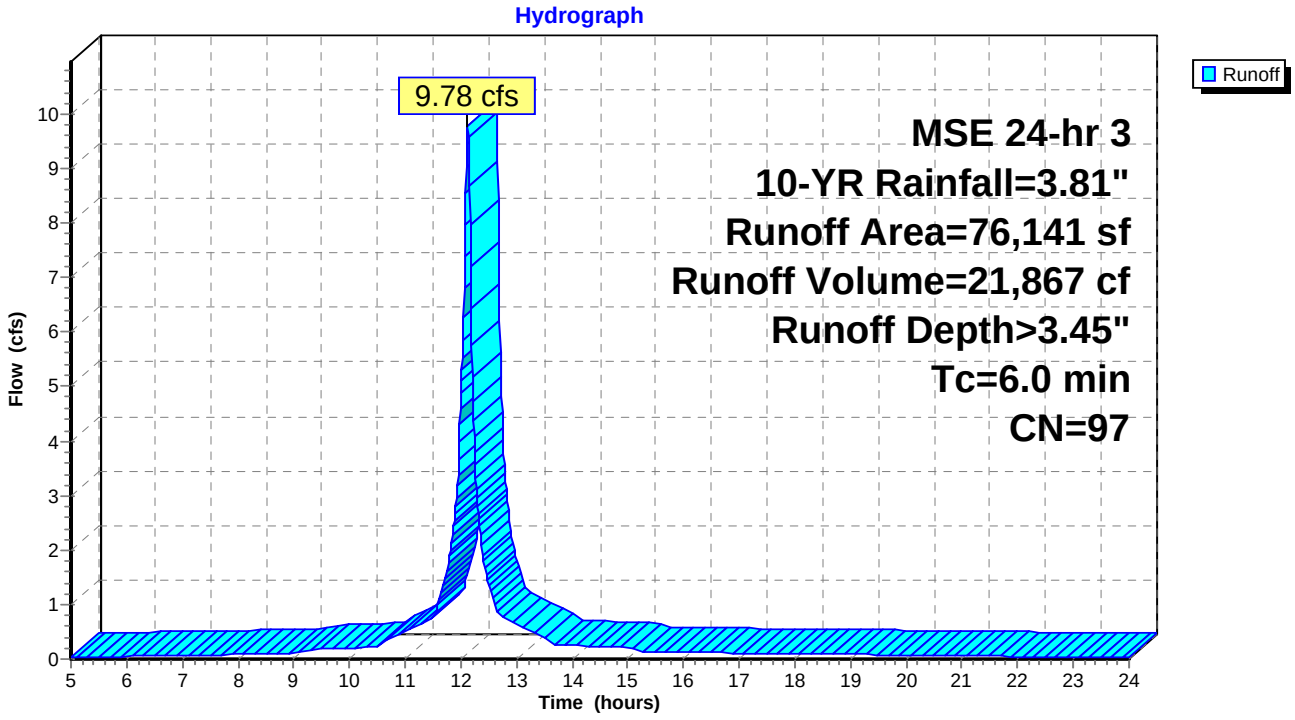
Runoff = 9.78 cfs @ 12.13 hrs, Volume= 21,867 cf, Depth> 3.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-YR Rainfall=3.81"

Area (sf)	CN	Description
4,809	80	>75% Grass cover, Good, HSG D
7,342	98	Paved parking, HSG D
63,990	98	Roofs, HSG D
76,141	97	Weighted Average
4,809		6.32% Pervious Area
71,332		93.68% Impervious Area

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

Subcatchment P2: P-2

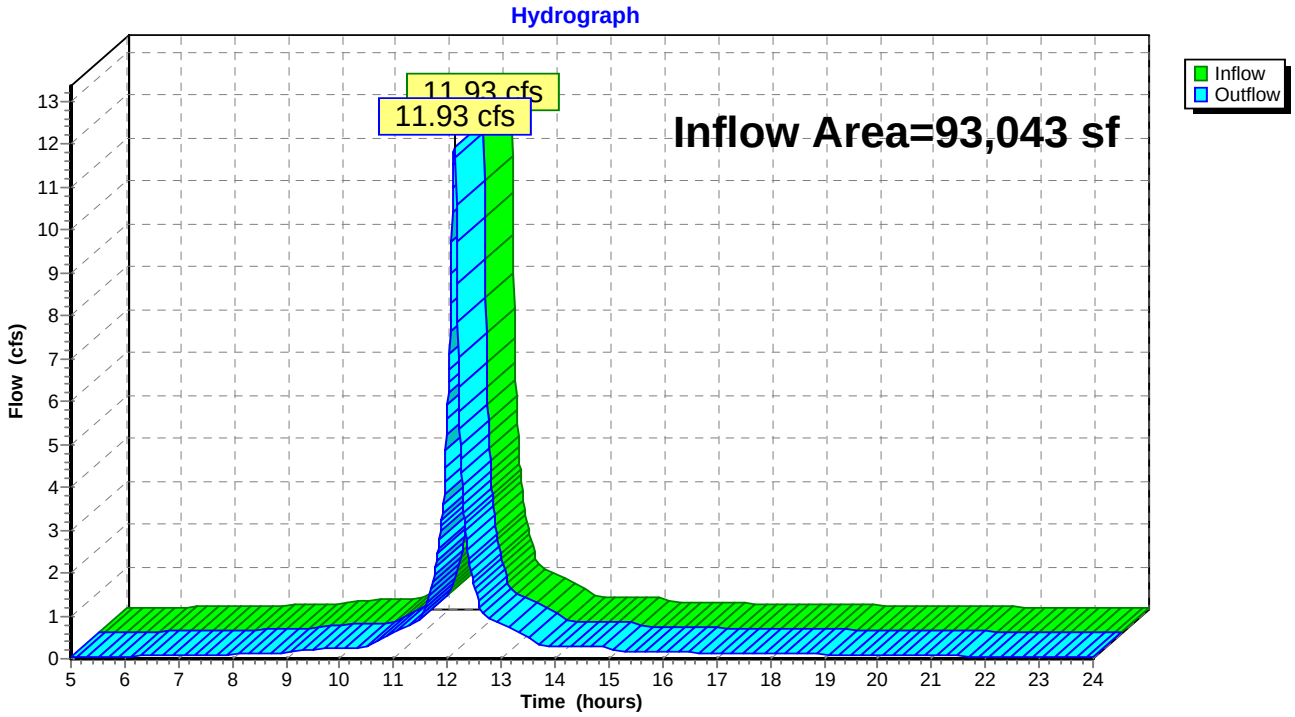


Summary for Reach 1: TOTAL PROPOSED OUTFALL

Inflow Area = 93,043 sf, 92.77% Impervious, Inflow Depth > 3.43" for 10-YR event
Inflow = 11.93 cfs @ 12.13 hrs, Volume= 26,578 cf
Outflow = 11.93 cfs @ 12.13 hrs, Volume= 26,578 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs

Reach 1: TOTAL PROPOSED OUTFALL



Summary for Subcatchment P1: P-1

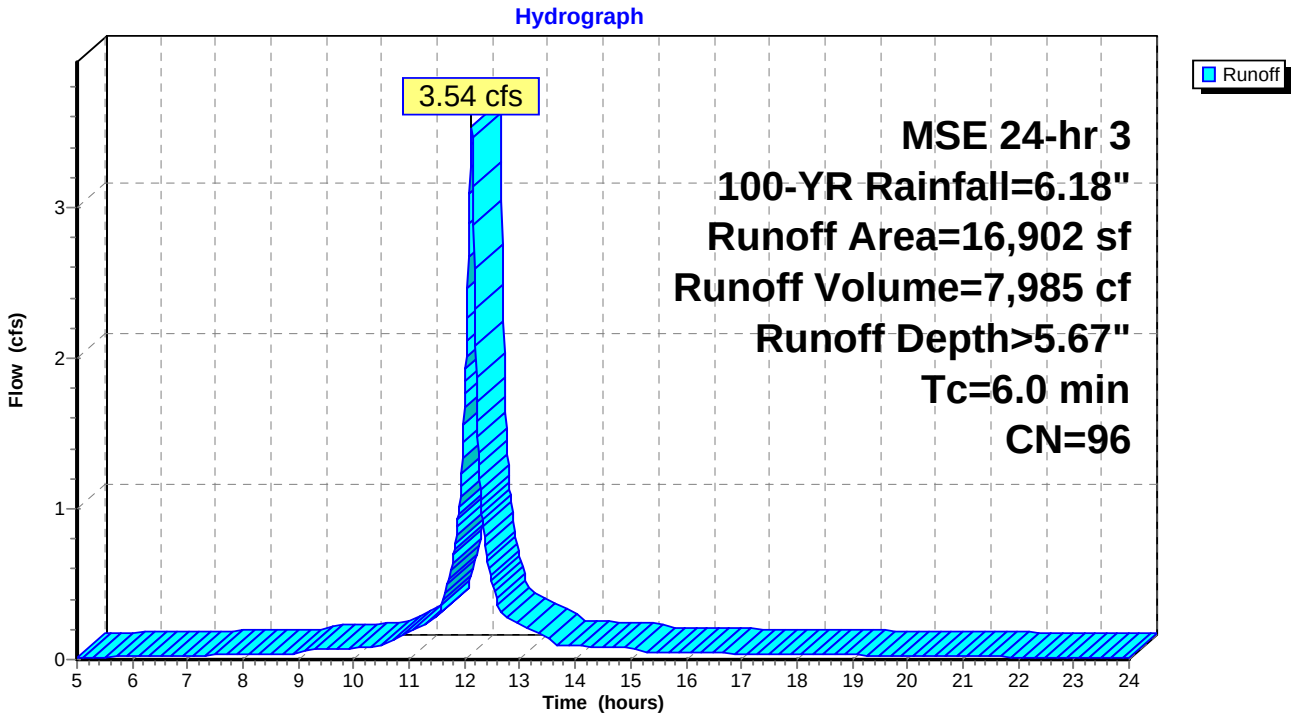
Runoff = 3.54 cfs @ 12.13 hrs, Volume= 7,985 cf, Depth> 5.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-YR Rainfall=6.18"

Area (sf)	CN	Description
1,917	80	>75% Grass cover, Good, HSG D
14,985	98	Paved parking, HSG D
16,902	96	Weighted Average
1,917		11.34% Pervious Area
14,985		88.66% Impervious Area

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

Subcatchment P1: P-1



Summary for Subcatchment P2: P-2

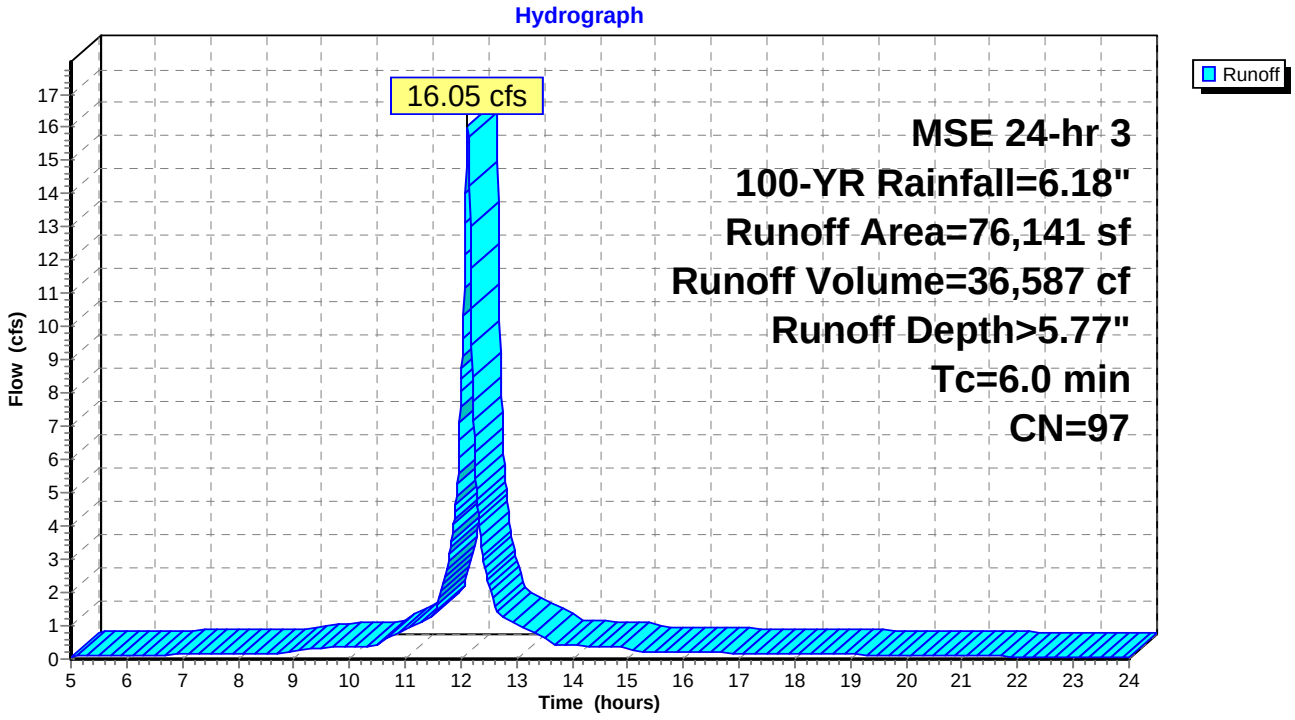
Runoff = 16.05 cfs @ 12.13 hrs, Volume= 36,587 cf, Depth> 5.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-YR Rainfall=6.18"

Area (sf)	CN	Description
4,809	80	>75% Grass cover, Good, HSG D
7,342	98	Paved parking, HSG D
63,990	98	Roofs, HSG D
76,141	97	Weighted Average
4,809		6.32% Pervious Area
71,332		93.68% Impervious Area

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

Subcatchment P2: P-2

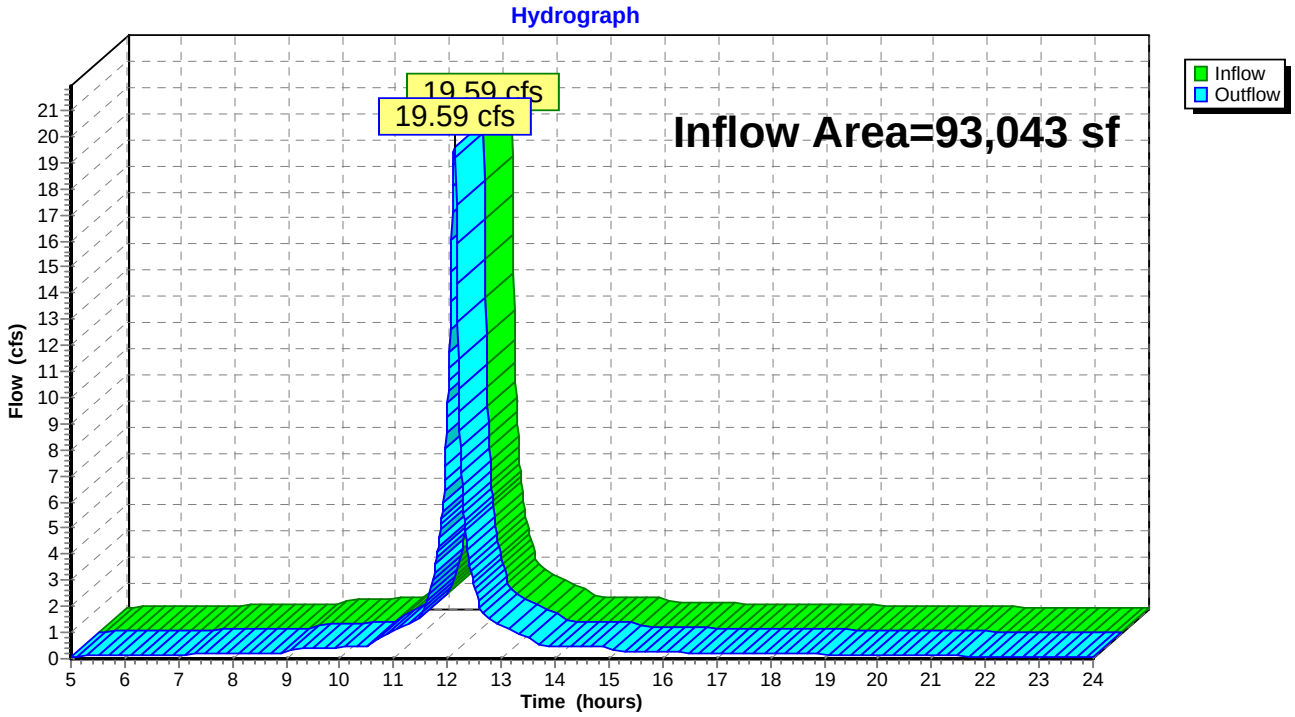


Summary for Reach 1: TOTAL PROPOSED OUTFALL

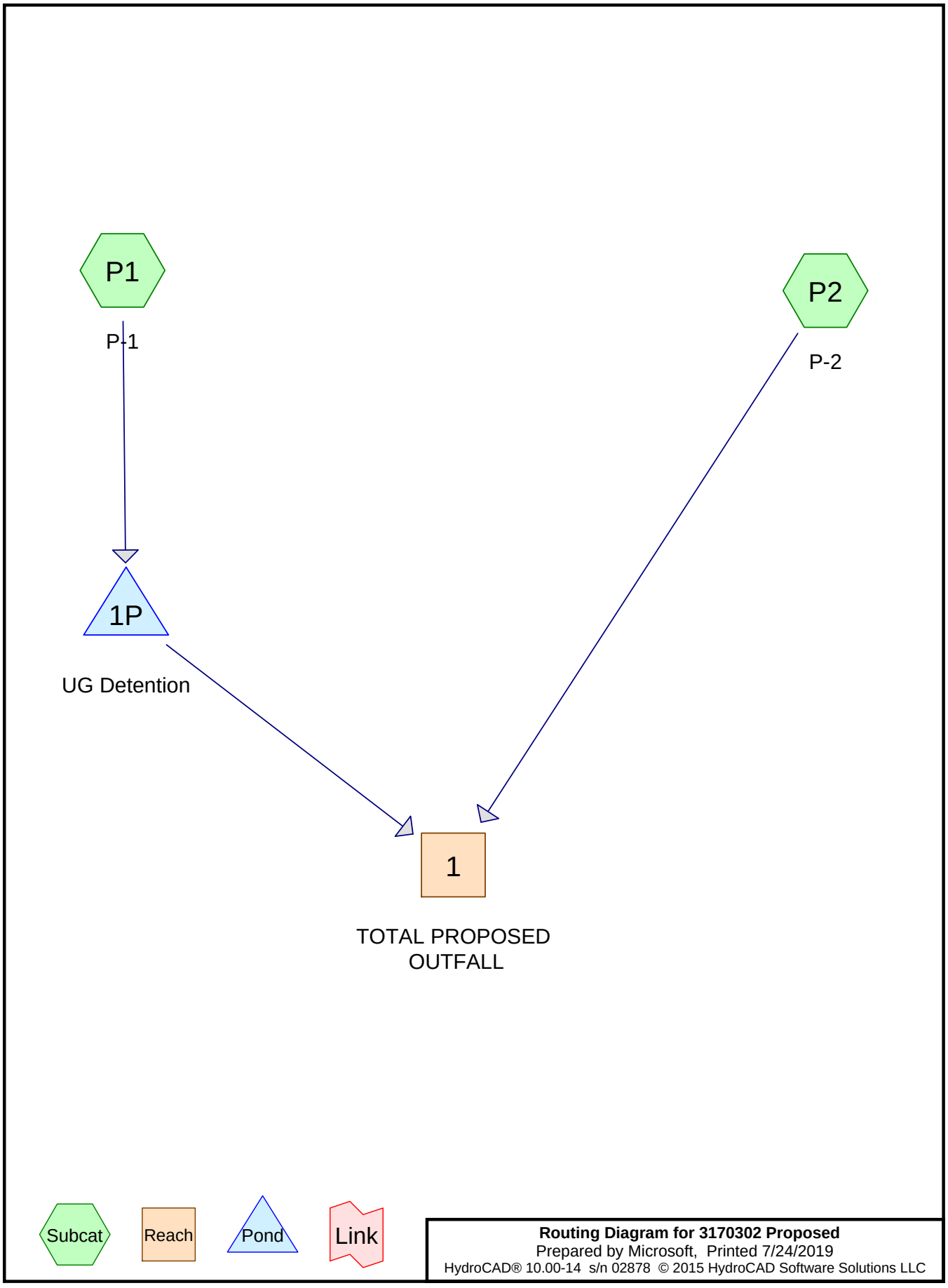
Inflow Area = 93,043 sf, 92.77% Impervious, Inflow Depth > 5.75" for 100-YR event
Inflow = 19.59 cfs @ 12.13 hrs, Volume= 44,573 cf
Outflow = 19.59 cfs @ 12.13 hrs, Volume= 44,573 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs

Reach 1: TOTAL PROPOSED OUTFALL



Proposed Conditions Hydrographs
(After Detention)



Routing Diagram for 3170302 Proposed
Prepared by Microsoft, Printed 7/24/2019

Summary for Subcatchment P1: P-1

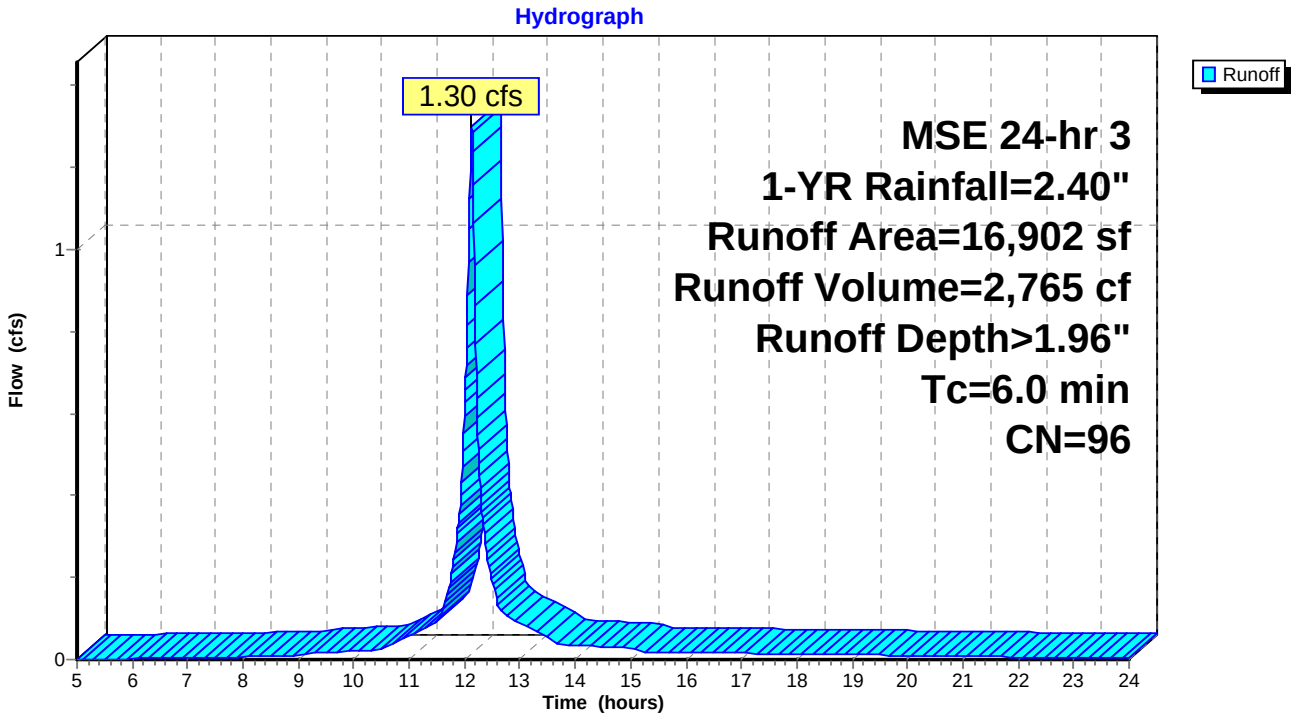
Runoff = 1.30 cfs @ 12.13 hrs, Volume= 2,765 cf, Depth> 1.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 1-YR Rainfall=2.40"

Area (sf)	CN	Description
1,917	80	>75% Grass cover, Good, HSG D
14,985	98	Paved parking, HSG D
16,902	96	Weighted Average
1,917		11.34% Pervious Area
14,985		88.66% Impervious Area

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

Subcatchment P1: P-1



Summary for Subcatchment P2: P-2

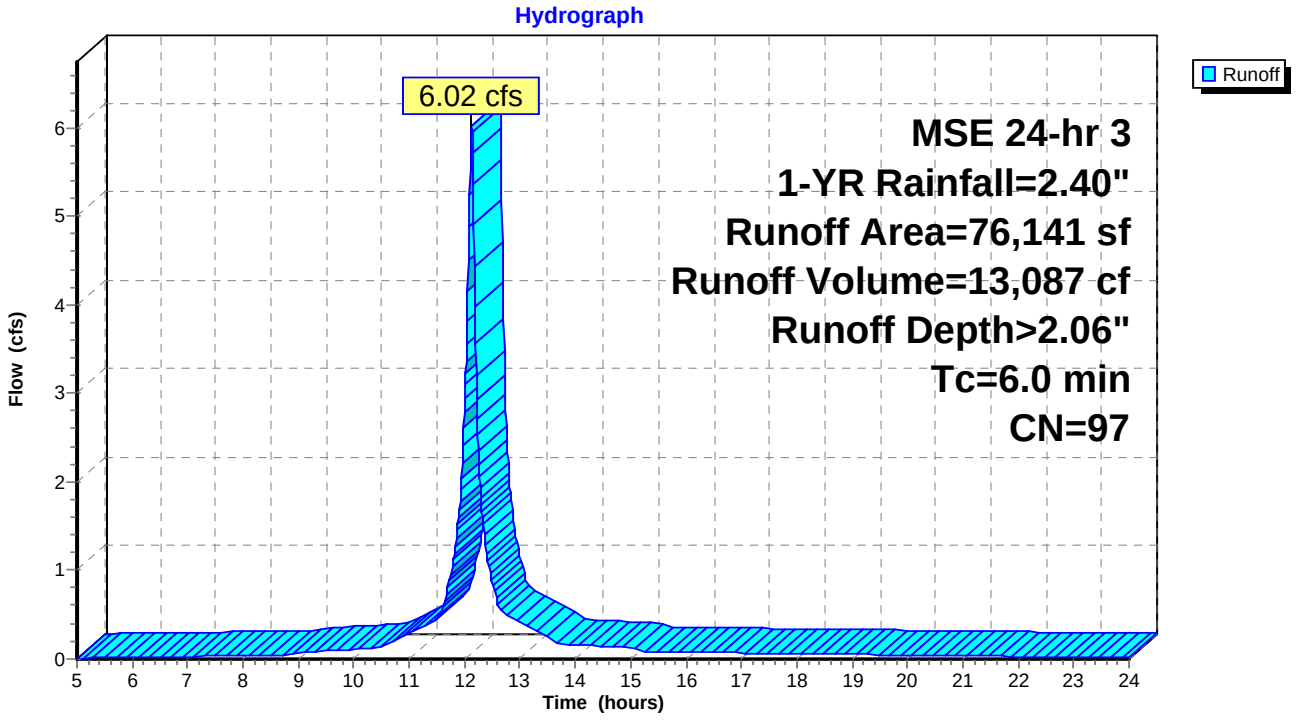
Runoff = 6.02 cfs @ 12.13 hrs, Volume= 13,087 cf, Depth> 2.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 1-YR Rainfall=2.40"

Area (sf)	CN	Description
4,809	80	>75% Grass cover, Good, HSG D
7,342	98	Paved parking, HSG D
63,990	98	Roofs, HSG D
76,141	97	Weighted Average
4,809		6.32% Pervious Area
71,332		93.68% Impervious Area

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

Subcatchment P2: P-2

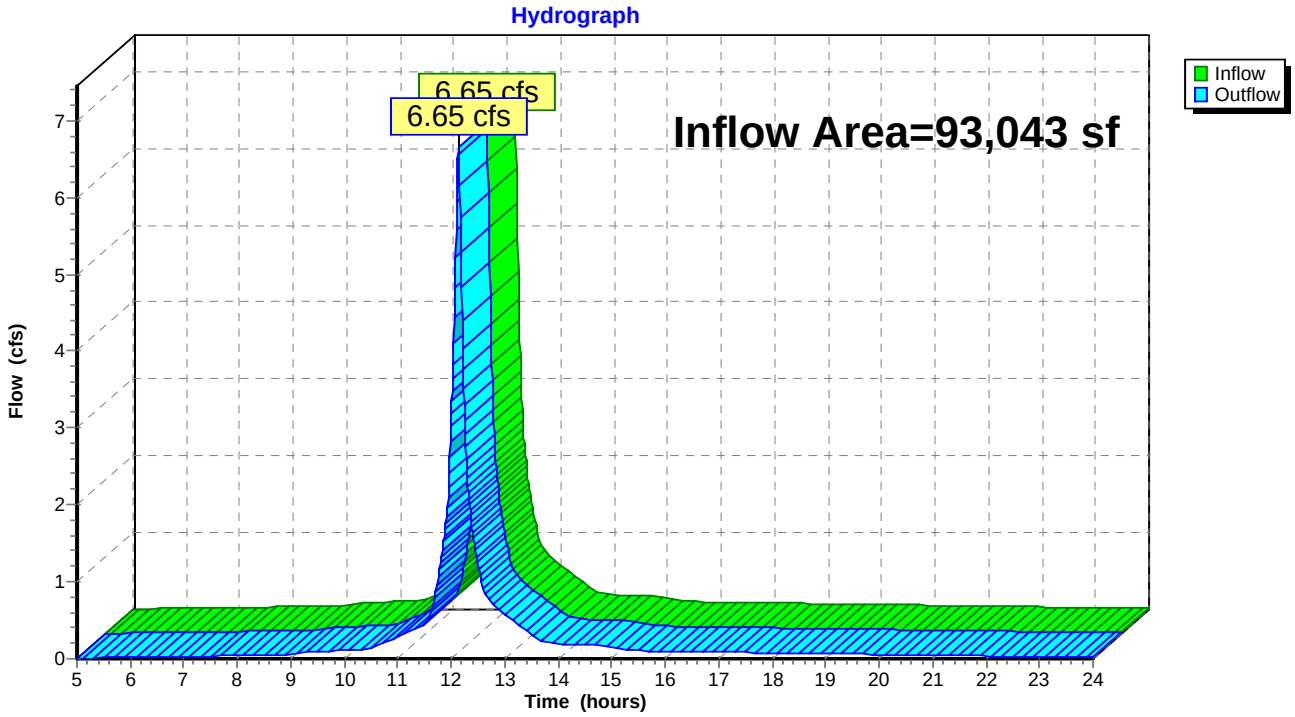


Summary for Reach 1: TOTAL PROPOSED OUTFALL

Inflow Area = 93,043 sf, 92.77% Impervious, Inflow Depth > 1.99" for 1-YR event
Inflow = 6.65 cfs @ 12.13 hrs, Volume= 15,439 cf
Outflow = 6.65 cfs @ 12.13 hrs, Volume= 15,439 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs

Reach 1: TOTAL PROPOSED OUTFALL



Summary for Pond 1P: UG Detention

Inflow Area = 16,902 sf, 88.66% Impervious, Inflow Depth > 1.96" for 1-YR event
Inflow = 1.30 cfs @ 12.13 hrs, Volume= 2,765 cf
Outflow = 0.85 cfs @ 12.19 hrs, Volume= 2,352 cf, Atten= 34%, Lag= 3.7 min
Primary = 0.85 cfs @ 12.19 hrs, Volume= 2,352 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs
Starting Elev= 24.00' Surf.Area= 513 sf Storage= 1,052 cf
Peak Elev= 25.95' @ 12.19 hrs Surf.Area= 493 sf Storage= 2,061 cf (1,009 cf above start)

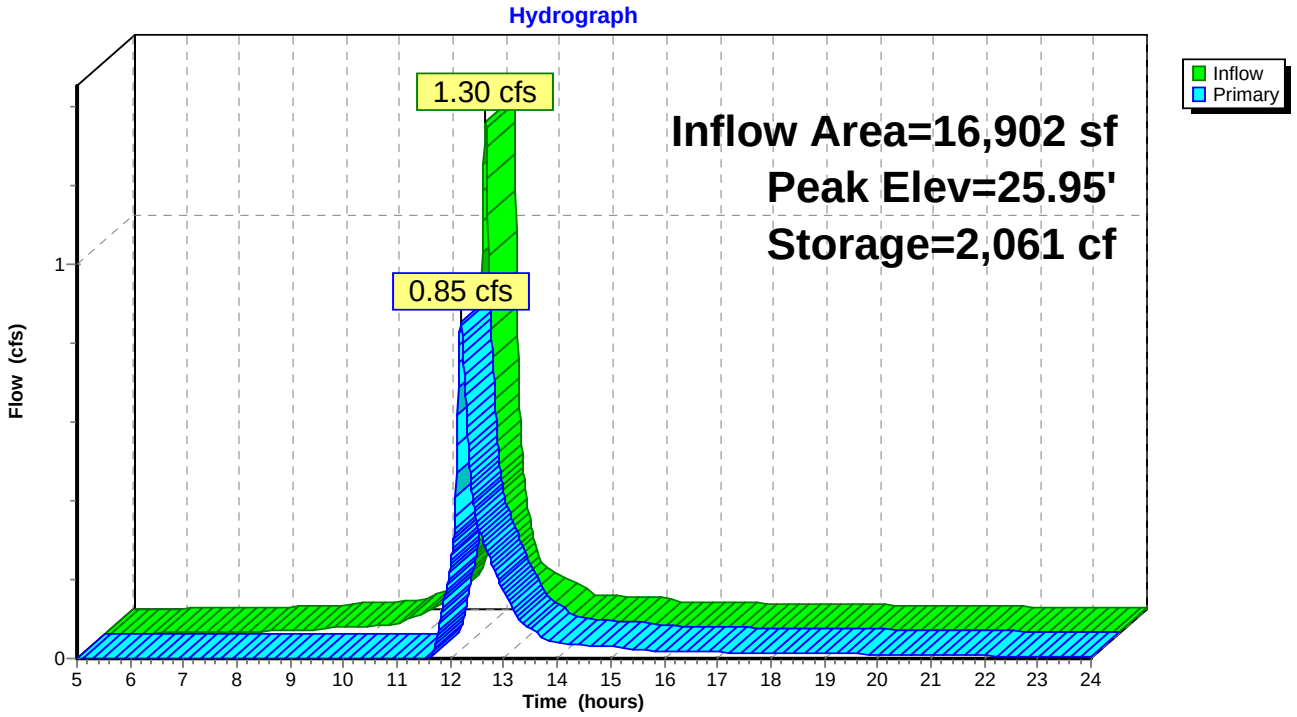
Plug-Flow detention time= 194.5 min calculated for 1,299 cf (47% of inflow)
Center-of-Mass det. time= 43.3 min (814.8 - 771.5)

Volume	Invert	Avail.Storage	Storage Description
#1	21.25'	2,886 cf	**84.0" Round UG Detenttion** L= 75.0'

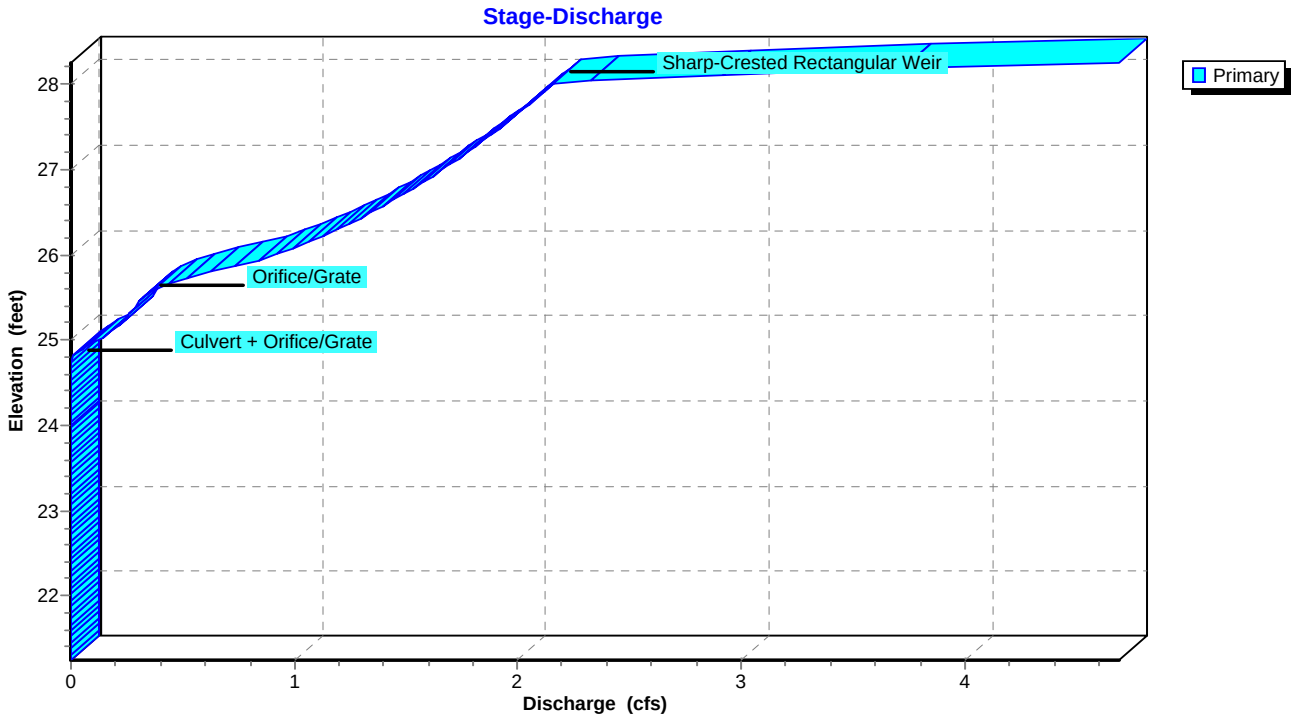
Device	Routing	Invert	Outlet Devices
#1	Primary	24.75'	**15.0" Round Culvert** L= 37.6' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 24.75' / 24.67' S= 0.0021 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf
#2	Device 1	24.75'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	25.50'	**6.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	28.00'	**6.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.85 cfs @ 12.19 hrs HW=25.95' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.85 cfs of 3.60 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.43 cfs @ 4.90 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.43 cfs @ 2.29 fps)
  └─**4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

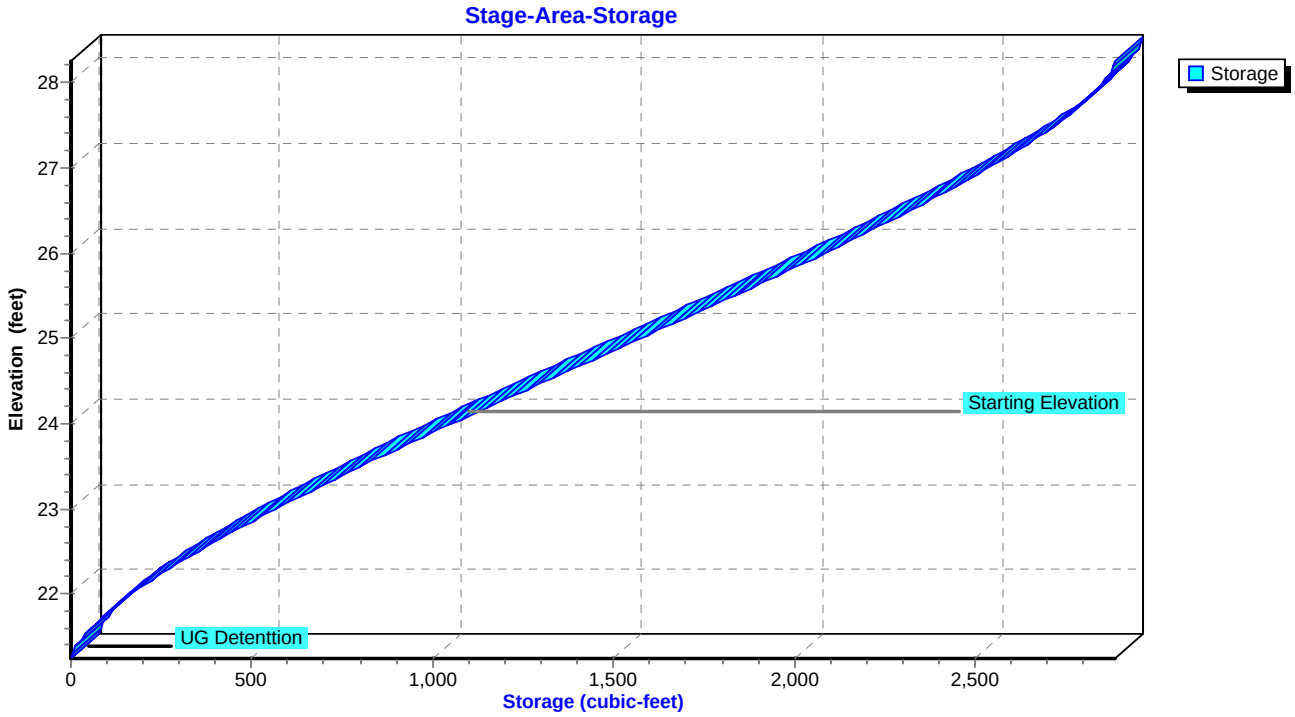
Pond 1P: UG Detention



Pond 1P: UG Detention



Pond 1P: UG Detention



Summary for Subcatchment P1: P-1

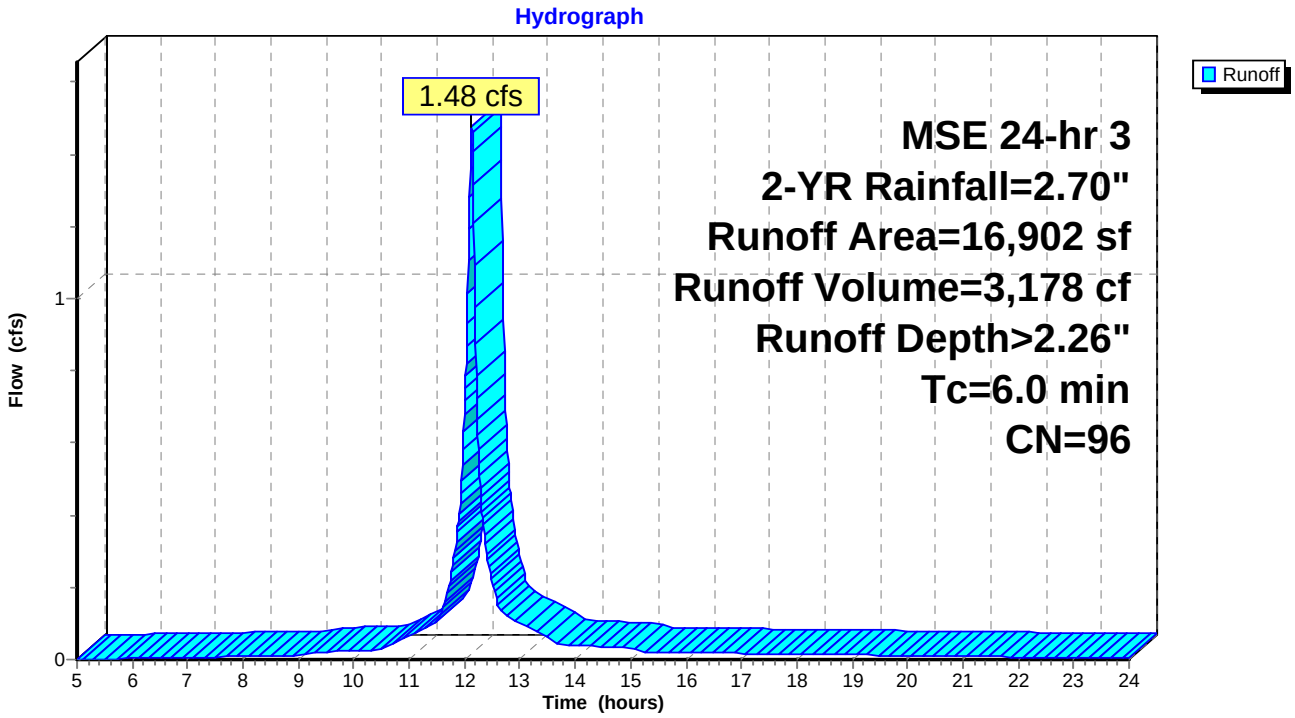
Runoff = 1.48 cfs @ 12.13 hrs, Volume= 3,178 cf, Depth> 2.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-YR Rainfall=2.70"

Area (sf)	CN	Description
1,917	80	>75% Grass cover, Good, HSG D
14,985	98	Paved parking, HSG D
16,902	96	Weighted Average
1,917		11.34% Pervious Area
14,985		88.66% Impervious Area

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

Subcatchment P1: P-1



Summary for Subcatchment P2: P-2

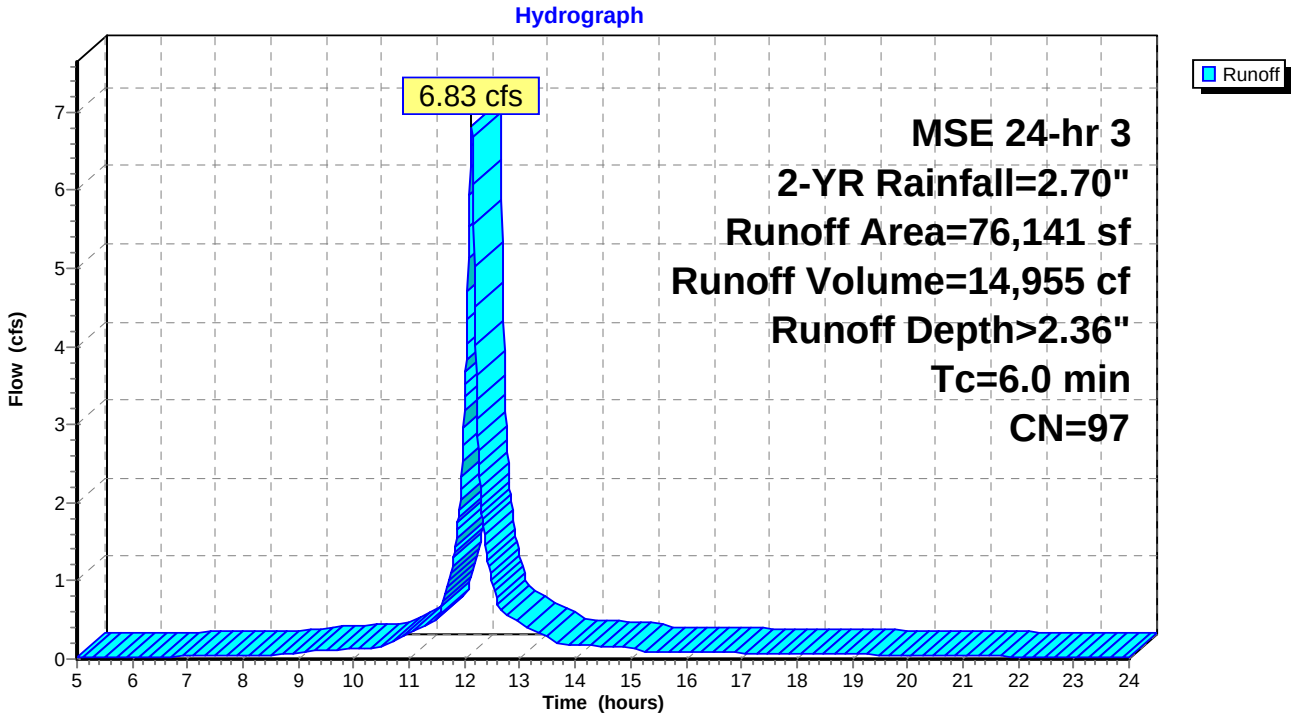
Runoff = 6.83 cfs @ 12.13 hrs, Volume= 14,955 cf, Depth> 2.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-YR Rainfall=2.70"

Area (sf)	CN	Description
4,809	80	>75% Grass cover, Good, HSG D
7,342	98	Paved parking, HSG D
63,990	98	Roofs, HSG D
76,141	97	Weighted Average
4,809		6.32% Pervious Area
71,332		93.68% Impervious Area

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

Subcatchment P2: P-2

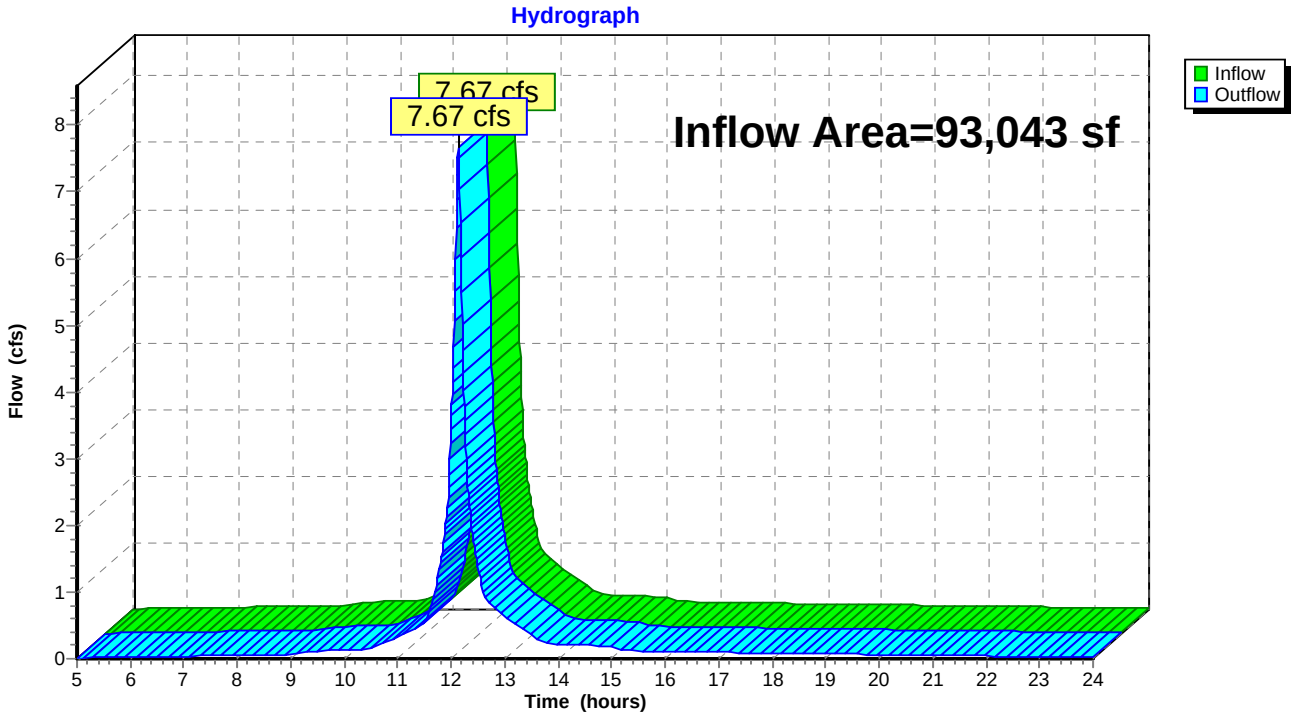


Summary for Reach 1: TOTAL PROPOSED OUTFALL

Inflow Area = 93,043 sf, 92.77% Impervious, Inflow Depth > 2.29" for 2-YR event
Inflow = 7.67 cfs @ 12.13 hrs, Volume= 17,718 cf
Outflow = 7.67 cfs @ 12.13 hrs, Volume= 17,718 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs

Reach 1: TOTAL PROPOSED OUTFALL



Summary for Pond 1P: UG Detention

Inflow Area = 16,902 sf, 88.66% Impervious, Inflow Depth > 2.26" for 2-YR event
Inflow = 1.48 cfs @ 12.13 hrs, Volume= 3,178 cf
Outflow = 1.00 cfs @ 12.19 hrs, Volume= 2,764 cf, Atten= 32%, Lag= 3.5 min
Primary = 1.00 cfs @ 12.19 hrs, Volume= 2,764 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs
Starting Elev= 24.00' Surf.Area= 513 sf Storage= 1,052 cf
Peak Elev= 26.09' @ 12.19 hrs Surf.Area= 485 sf Storage= 2,127 cf (1,075 cf above start)

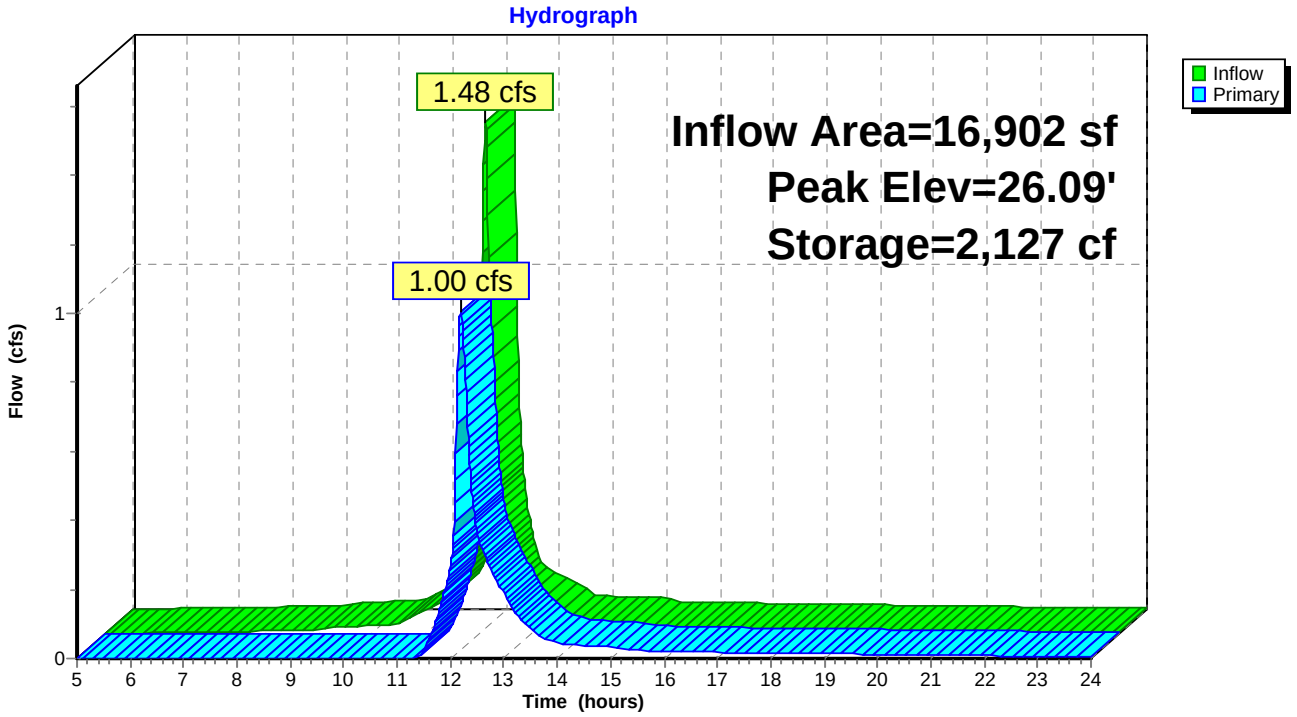
Plug-Flow detention time= 171.9 min calculated for 1,711 cf (54% of inflow)
Center-of-Mass det. time= 41.3 min (810.2 - 768.9)

Volume	Invert	Avail.Storage	Storage Description
#1	21.25'	2,886 cf	**84.0" Round UG Detenttion** L= 75.0'

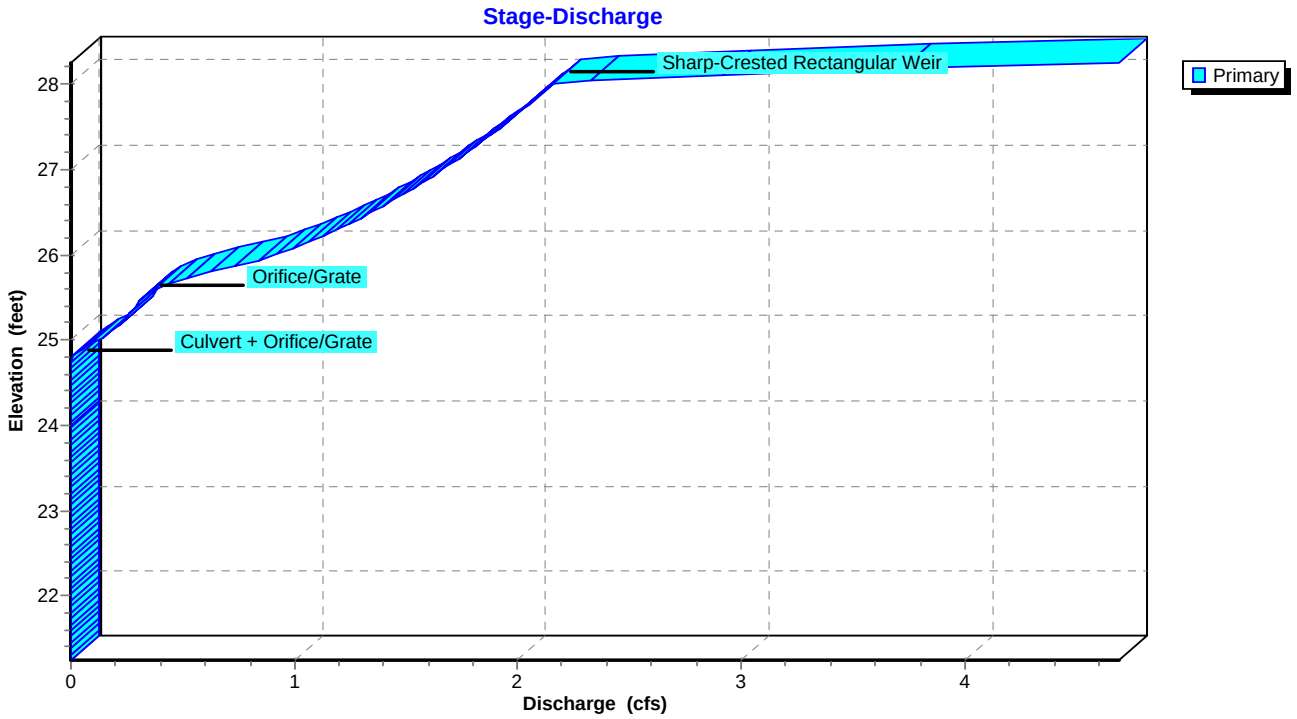
Device	Routing	Invert	Outlet Devices
#1	Primary	24.75'	**15.0" Round Culvert** L= 37.6' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 24.75' / 24.67' S= 0.0021 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf
#2	Device 1	24.75'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	25.50'	**6.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	28.00'	**6.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=1.00 cfs @ 12.19 hrs HW=26.09' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 1.00 cfs of 4.20 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.45 cfs @ 5.20 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.55 cfs @ 2.79 fps)
  └─**4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

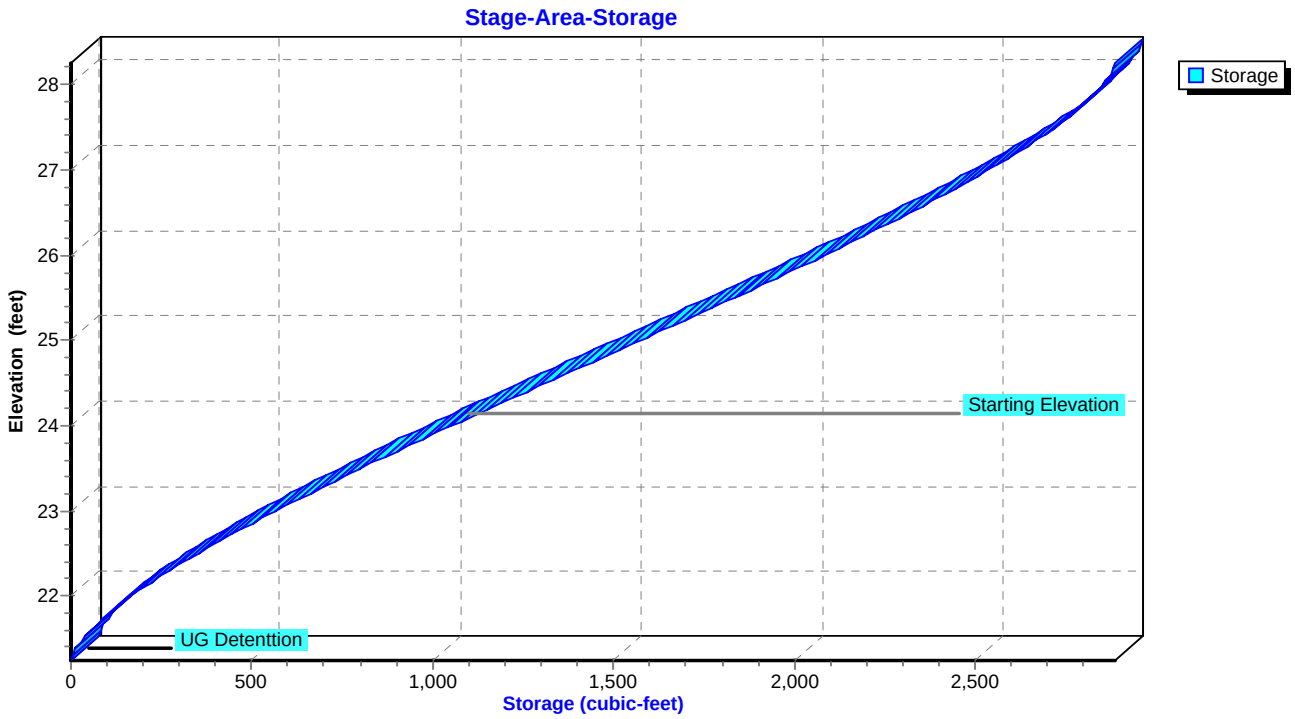
Pond 1P: UG Detention



Pond 1P: UG Detention



Pond 1P: UG Detention



Summary for Subcatchment P1: P-1

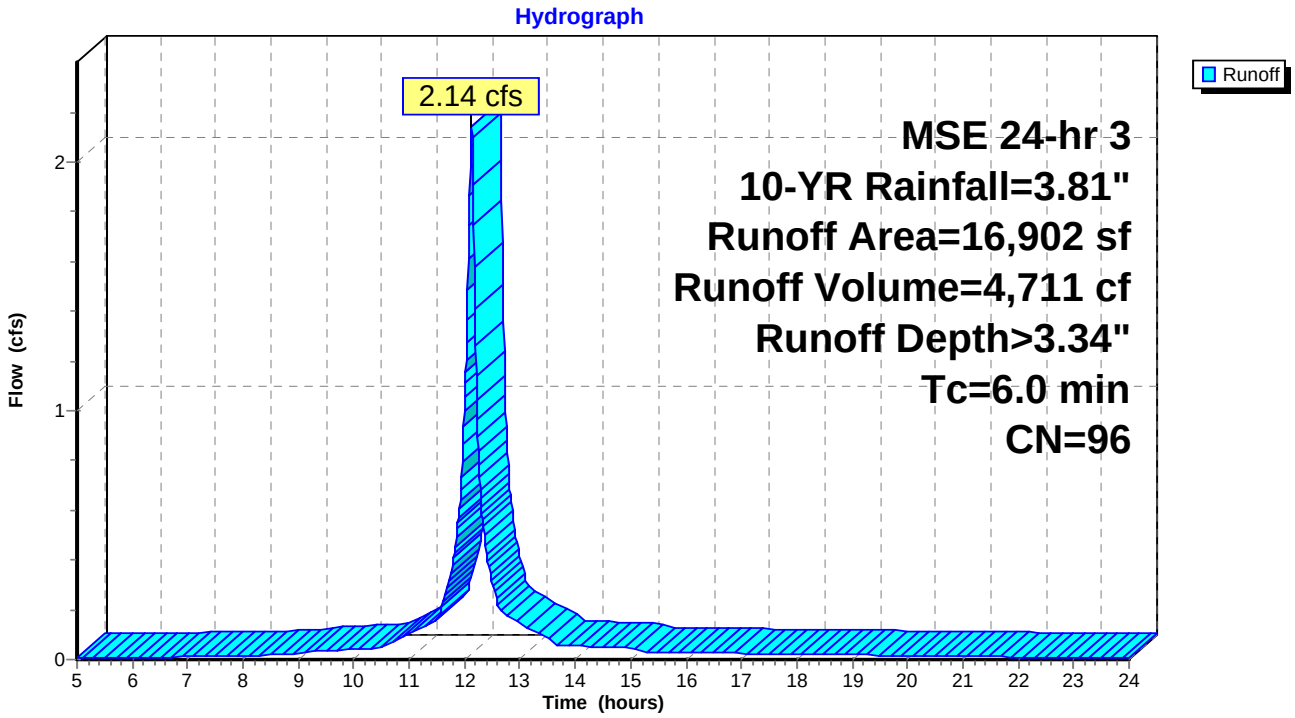
Runoff = 2.14 cfs @ 12.13 hrs, Volume= 4,711 cf, Depth> 3.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-YR Rainfall=3.81"

Area (sf)	CN	Description
1,917	80	>75% Grass cover, Good, HSG D
14,985	98	Paved parking, HSG D
16,902	96	Weighted Average
1,917		11.34% Pervious Area
14,985		88.66% Impervious Area

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

Subcatchment P1: P-1



Summary for Subcatchment P2: P-2

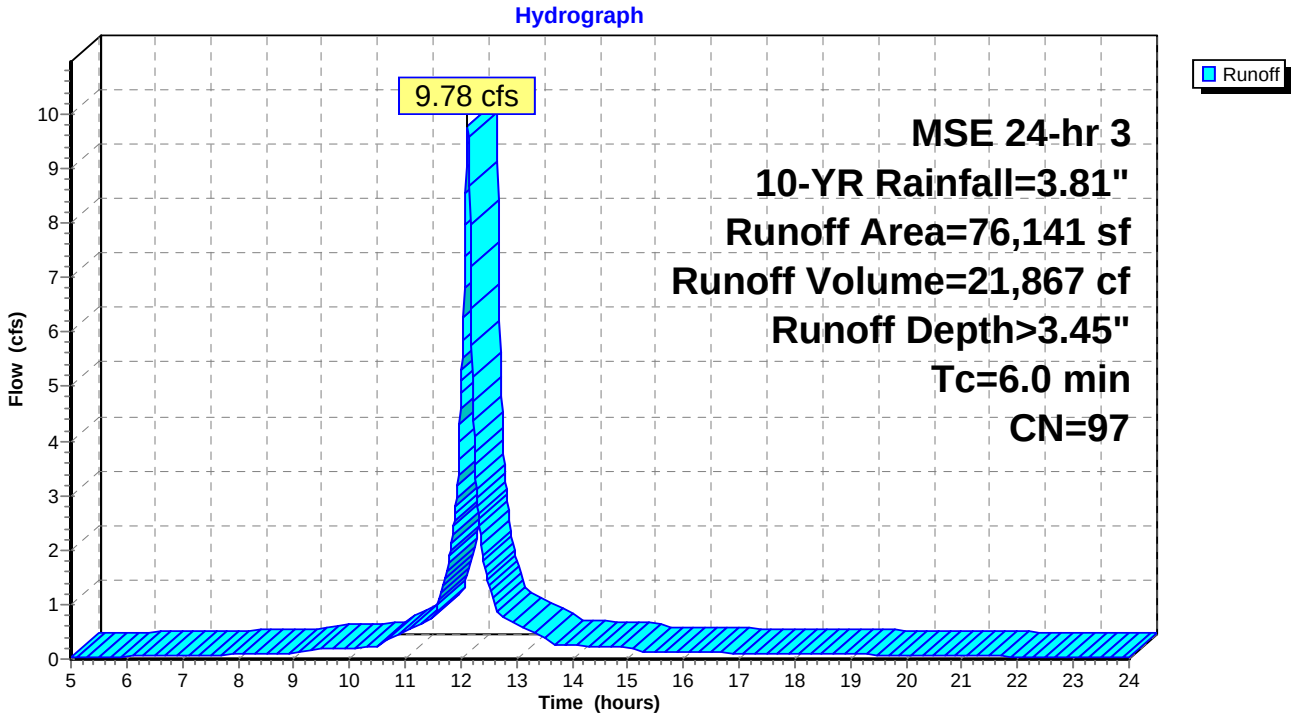
Runoff = 9.78 cfs @ 12.13 hrs, Volume= 21,867 cf, Depth> 3.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-YR Rainfall=3.81"

Area (sf)	CN	Description
4,809	80	>75% Grass cover, Good, HSG D
7,342	98	Paved parking, HSG D
63,990	98	Roofs, HSG D
76,141	97	Weighted Average
4,809		6.32% Pervious Area
71,332		93.68% Impervious Area

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

Subcatchment P2: P-2

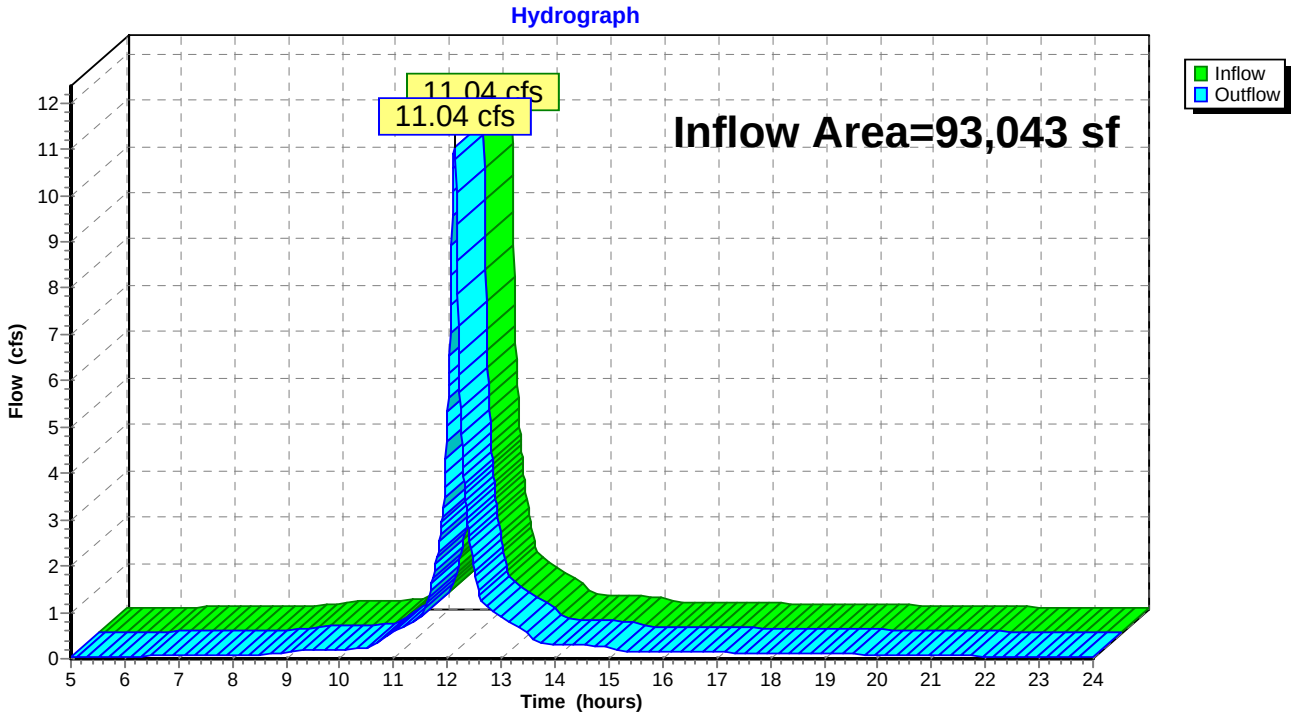


Summary for Reach 1: TOTAL PROPOSED OUTFALL

Inflow Area = 93,043 sf, 92.77% Impervious, Inflow Depth > 3.37" for 10-YR event
Inflow = 11.04 cfs @ 12.13 hrs, Volume= 26,161 cf
Outflow = 11.04 cfs @ 12.13 hrs, Volume= 26,161 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs

Reach 1: TOTAL PROPOSED OUTFALL



Summary for Pond 1P: UG Detention

Inflow Area = 16,902 sf, 88.66% Impervious, Inflow Depth > 3.34" for 10-YR event
Inflow = 2.14 cfs @ 12.13 hrs, Volume= 4,711 cf
Outflow = 1.42 cfs @ 12.19 hrs, Volume= 4,293 cf, Atten= 34%, Lag= 3.6 min
Primary = 1.42 cfs @ 12.19 hrs, Volume= 4,293 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs
Starting Elev= 24.00' Surf.Area= 513 sf Storage= 1,052 cf
Peak Elev= 26.61' @ 12.19 hrs Surf.Area= 445 sf Storage= 2,371 cf (1,319 cf above start)

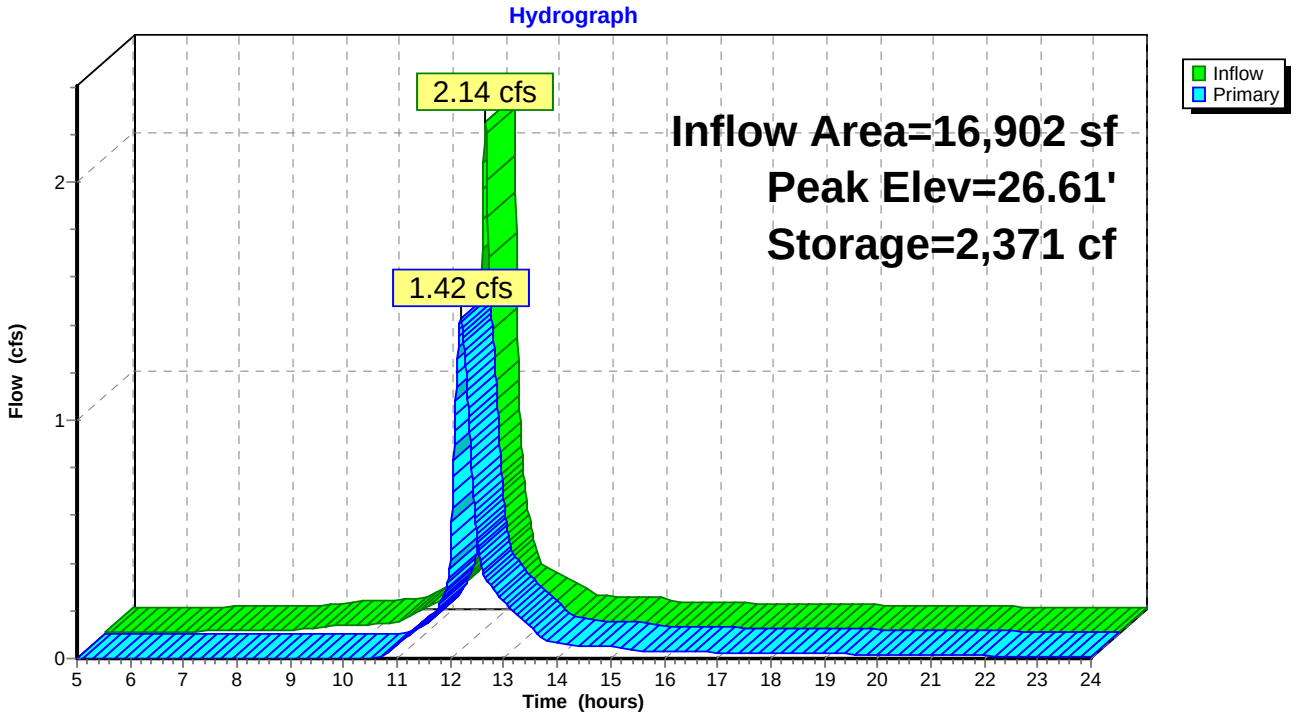
Plug-Flow detention time= 134.1 min calculated for 3,239 cf (69% of inflow)
Center-of-Mass det. time= 36.3 min (798.8 - 762.5)

Volume	Invert	Avail.Storage	Storage Description
#1	21.25'	2,886 cf	**84.0" Round UG Detenttion** L= 75.0'

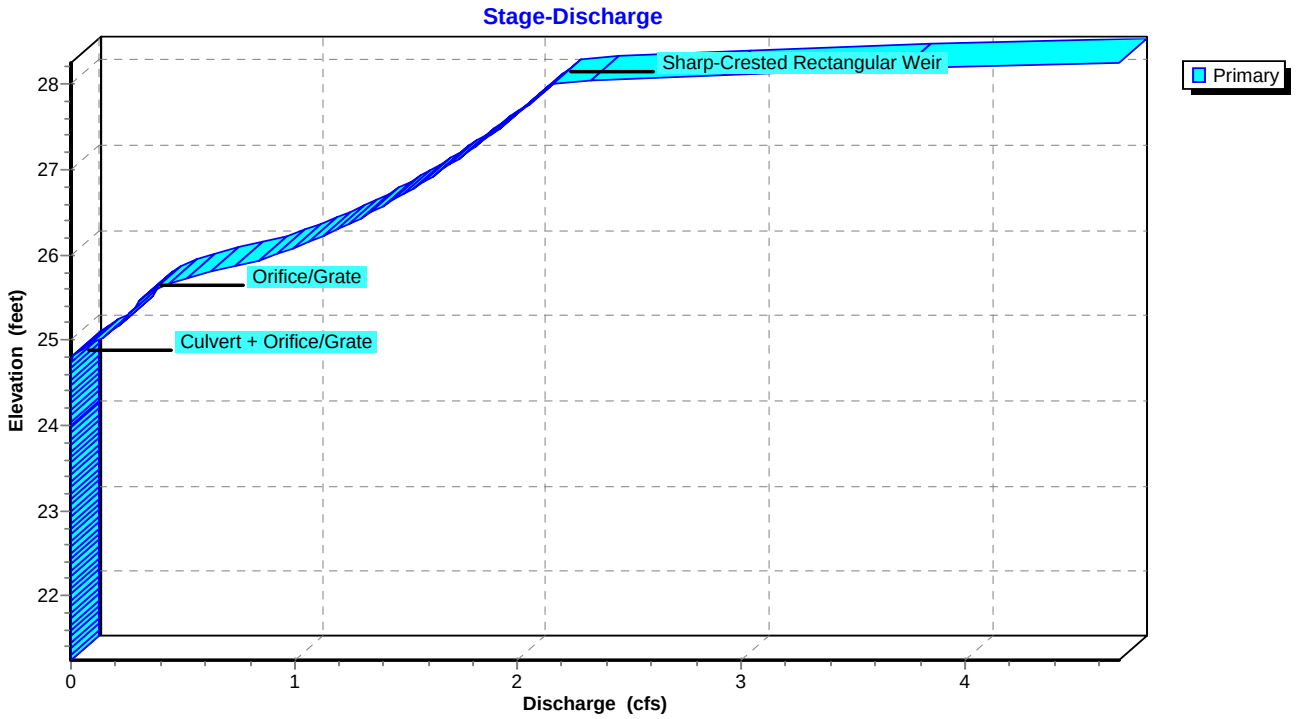
Device	Routing	Invert	Outlet Devices
#1	Primary	24.75'	**15.0" Round Culvert** L= 37.6' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 24.75' / 24.67' S= 0.0021 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf
#2	Device 1	24.75'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	25.50'	**6.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	28.00'	**6.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=1.42 cfs @ 12.19 hrs HW=26.61' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 1.42 cfs of 6.01 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.55 cfs @ 6.26 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.88 cfs @ 4.46 fps)
  └─**4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

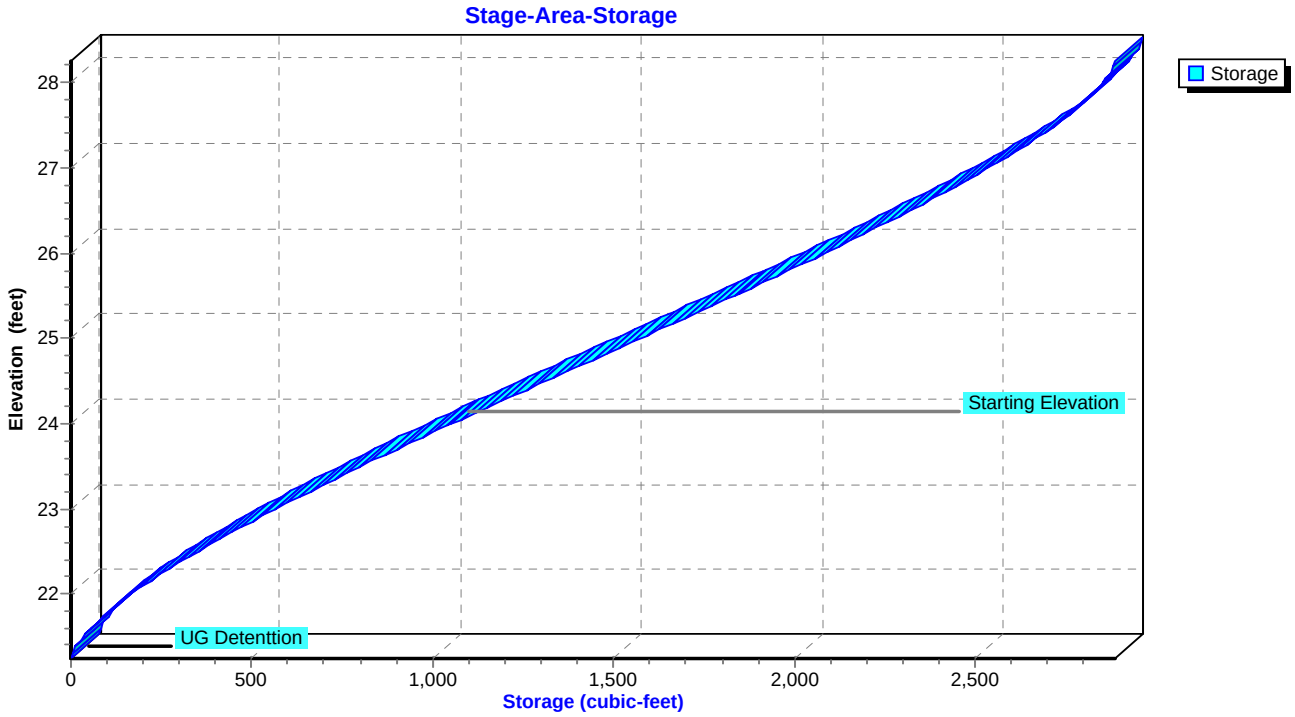
Pond 1P: UG Detention



Pond 1P: UG Detention



Pond 1P: UG Detention



Summary for Subcatchment P1: P-1

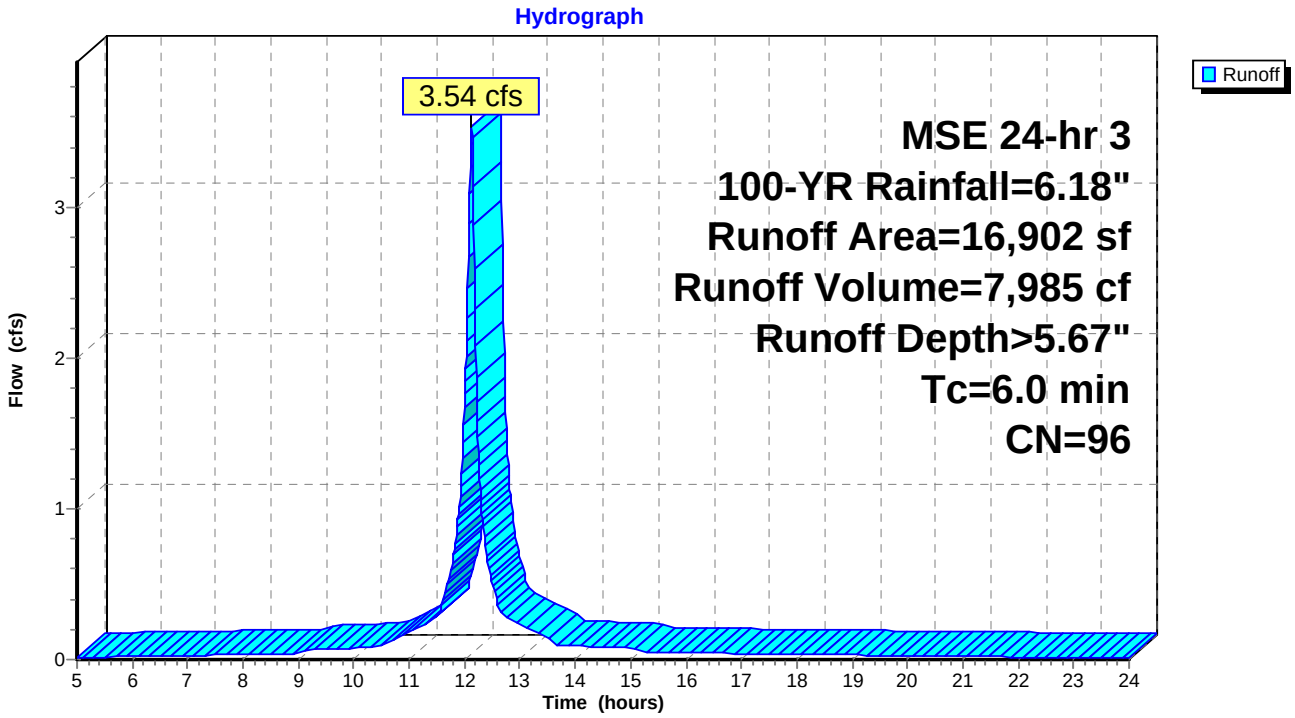
Runoff = 3.54 cfs @ 12.13 hrs, Volume= 7,985 cf, Depth> 5.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-YR Rainfall=6.18"

Area (sf)	CN	Description
1,917	80	>75% Grass cover, Good, HSG D
14,985	98	Paved parking, HSG D
16,902	96	Weighted Average
1,917		11.34% Pervious Area
14,985		88.66% Impervious Area

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

Subcatchment P1: P-1



Summary for Subcatchment P2: P-2

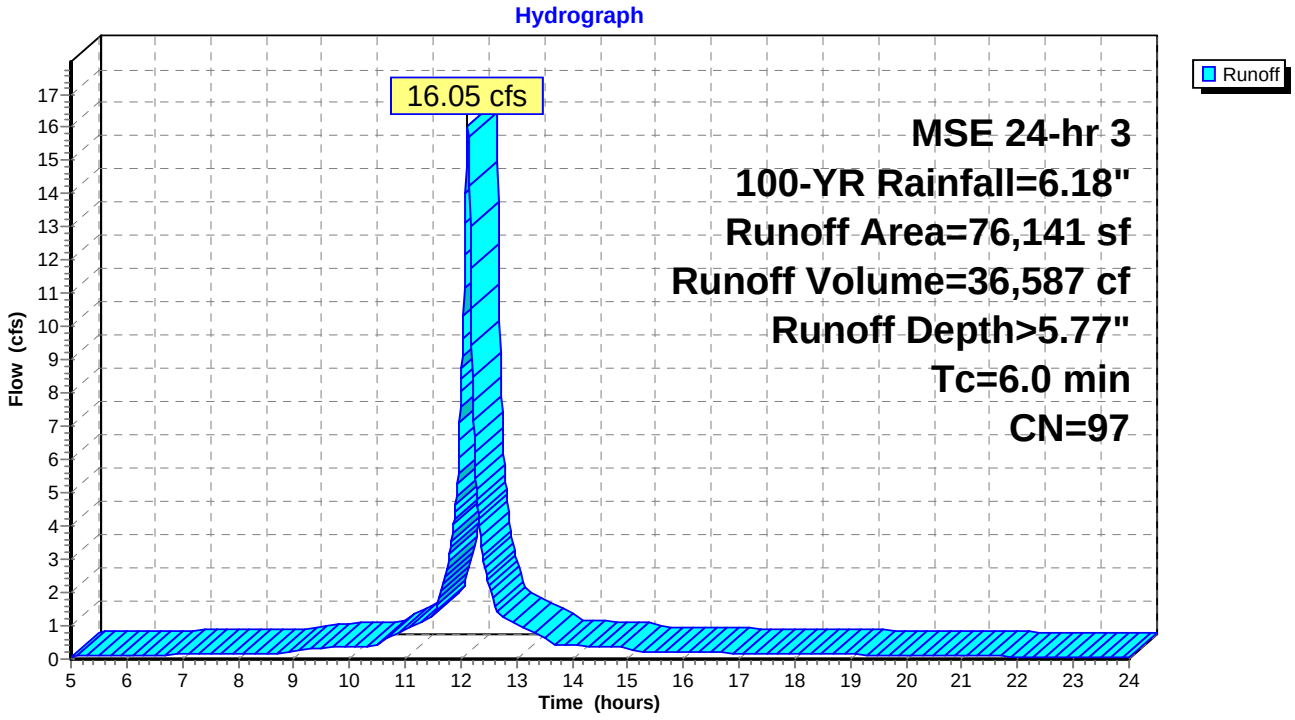
Runoff = 16.05 cfs @ 12.13 hrs, Volume= 36,587 cf, Depth> 5.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-YR Rainfall=6.18"

Area (sf)	CN	Description
4,809	80	>75% Grass cover, Good, HSG D
7,342	98	Paved parking, HSG D
63,990	98	Roofs, HSG D
76,141	97	Weighted Average
4,809		6.32% Pervious Area
71,332		93.68% Impervious Area

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

Subcatchment P2: P-2

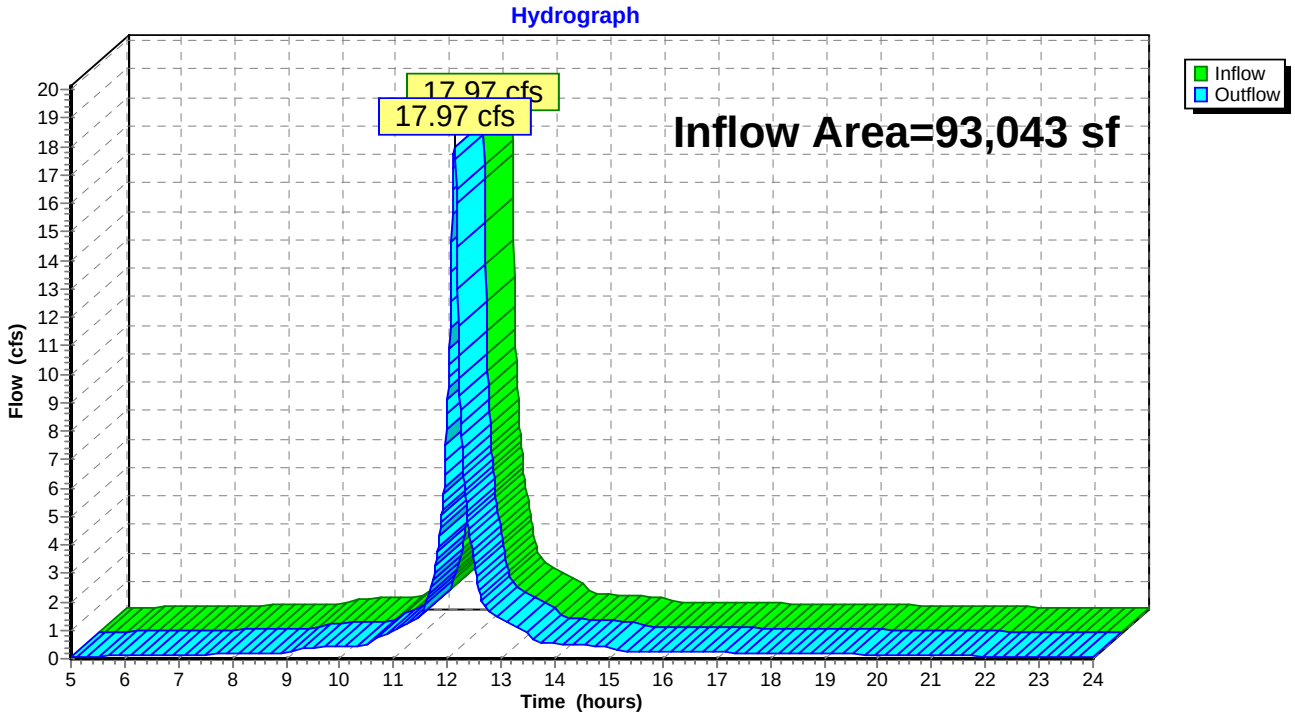


Summary for Reach 1: TOTAL PROPOSED OUTFALL

Inflow Area = 93,043 sf, 92.77% Impervious, Inflow Depth > 5.69" for 100-YR event
Inflow = 17.97 cfs @ 12.13 hrs, Volume= 44,149 cf
Outflow = 17.97 cfs @ 12.13 hrs, Volume= 44,149 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs

Reach 1: TOTAL PROPOSED OUTFALL



Summary for Pond 1P: UG Detention

Inflow Area = 16,902 sf, 88.66% Impervious, Inflow Depth > 5.67" for 100-YR event
Inflow = 3.54 cfs @ 12.13 hrs, Volume= 7,985 cf
Outflow = 3.00 cfs @ 12.17 hrs, Volume= 7,562 cf, Atten= 15%, Lag= 2.6 min
Primary = 3.00 cfs @ 12.17 hrs, Volume= 7,562 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-24.00 hrs, dt= 0.01 hrs
Starting Elev= 24.00' Surf.Area= 513 sf Storage= 1,052 cf
Peak Elev= 28.12' @ 12.17 hrs Surf.Area= 142 sf Storage= 2,874 cf (1,821 cf above start)

Plug-Flow detention time= 107.4 min calculated for 6,510 cf (82% of inflow)
Center-of-Mass det. time= 30.1 min (785.8 - 755.7)

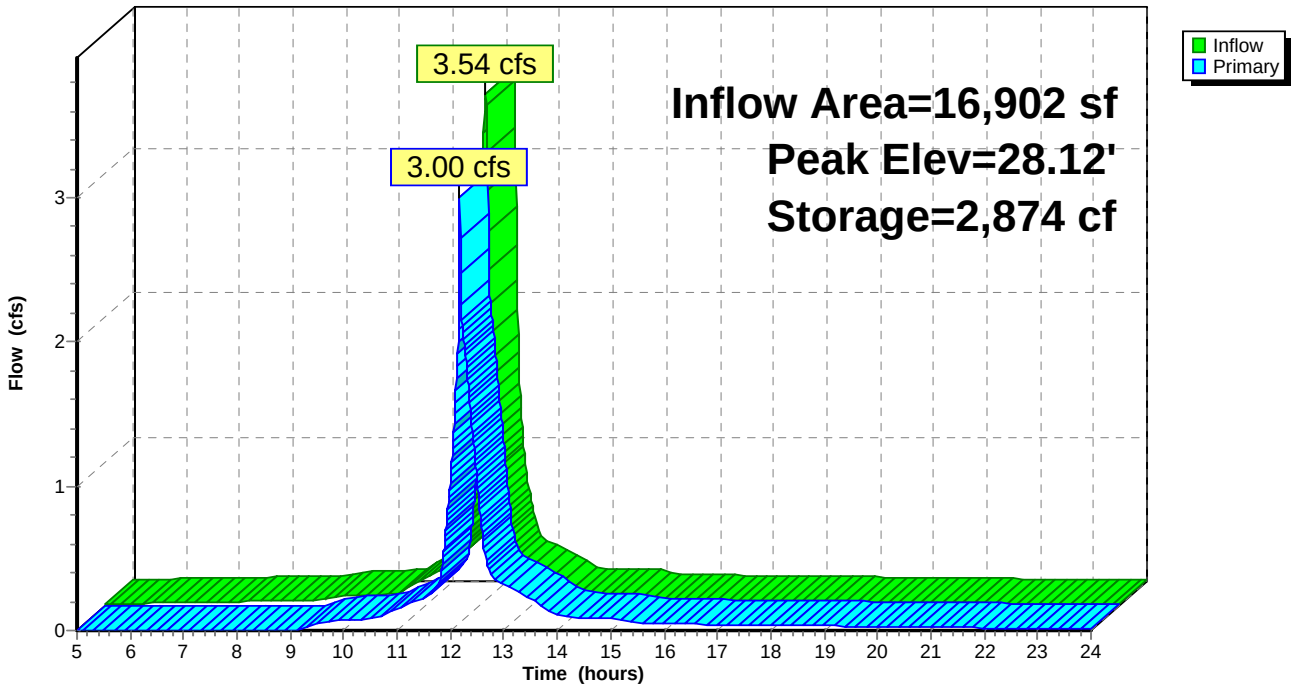
Volume	Invert	Avail.Storage	Storage Description
#1	21.25'	2,886 cf	**84.0" Round UG Detenttion** L= 75.0'

Device	Routing	Invert	Outlet Devices
#1	Primary	24.75'	**15.0" Round Culvert** L= 37.6' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 24.75' / 24.67' S= 0.0021 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf
#2	Device 1	24.75'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	25.50'	**6.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	28.00'	**6.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=2.91 cfs @ 12.17 hrs HW=28.11' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 2.91 cfs of 10.72 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.75 cfs @ 8.60 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 1.45 cfs @ 7.40 fps)
  └─**4=Sharp-Crested Rectangular Weir** (Weir Controls 0.70 cfs @ 1.08 fps)

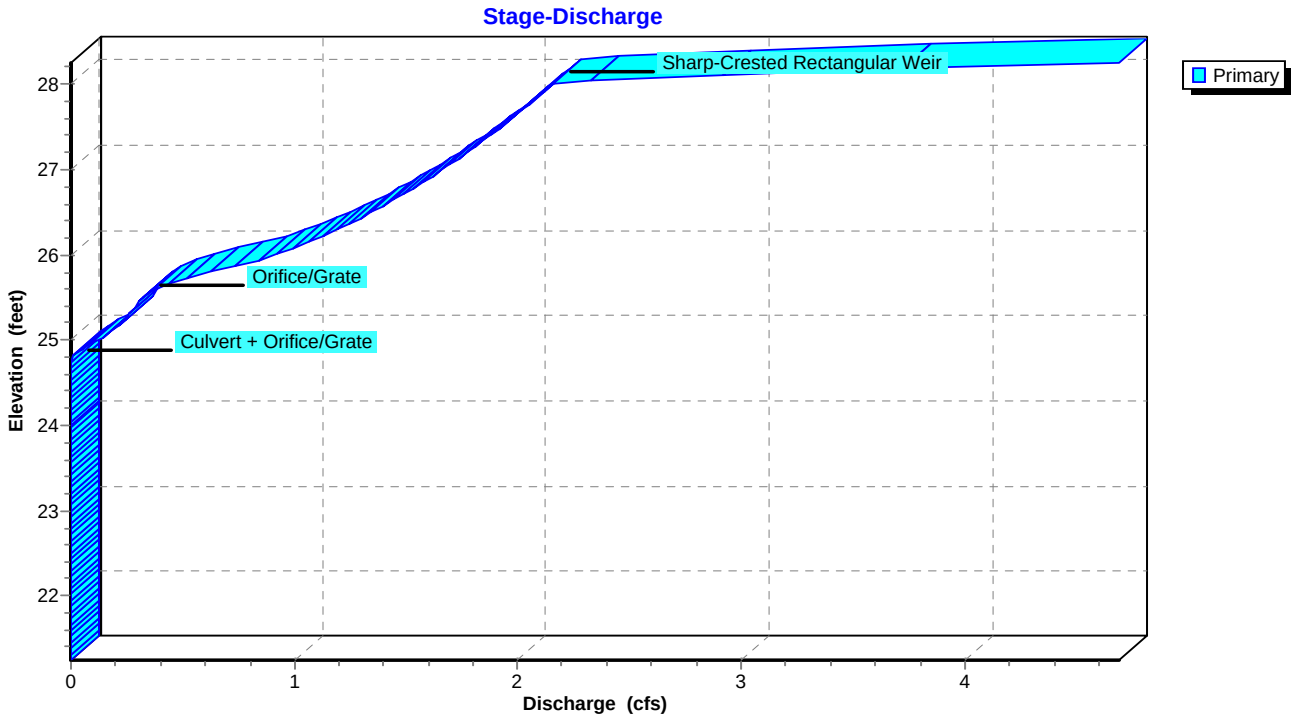
Pond 1P: UG Detention

Hydrograph

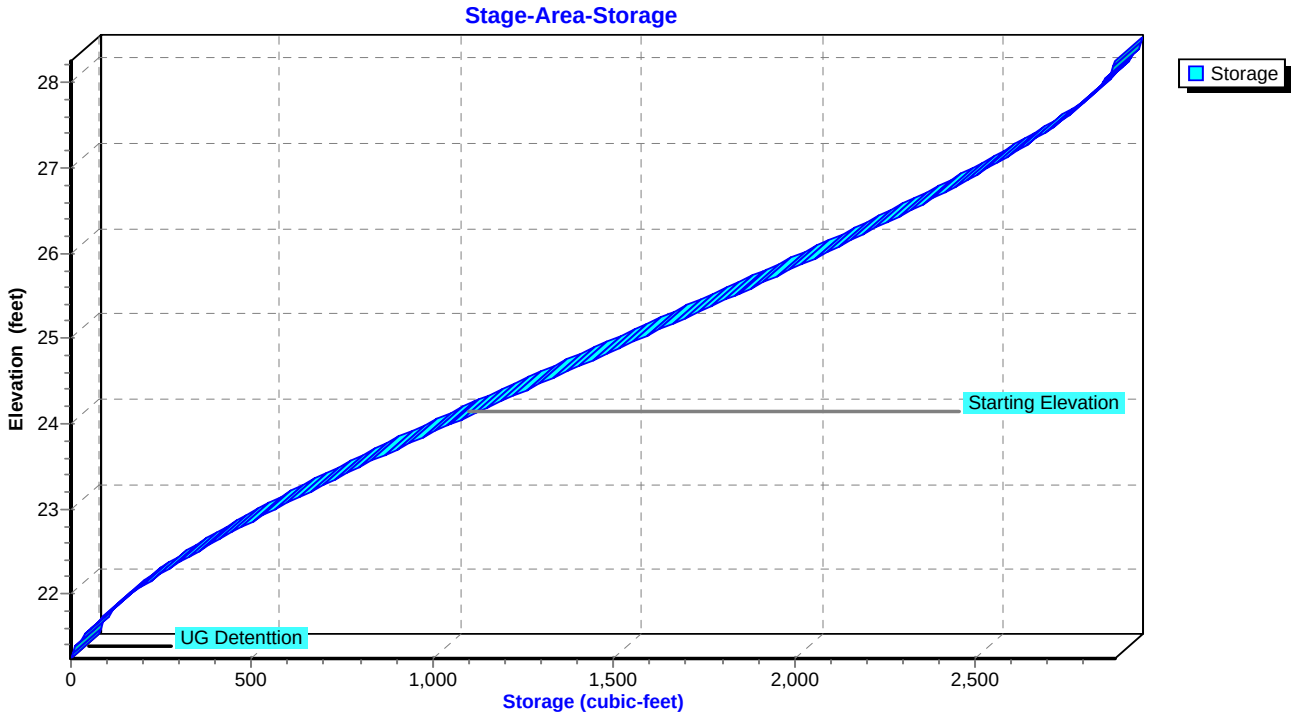


Pond 1P: UG Detention

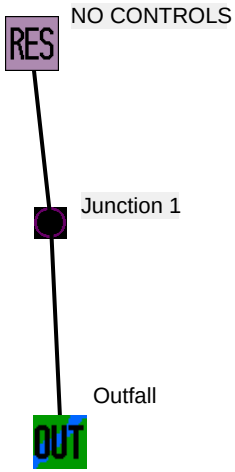
Stage-Discharge



Pond 1P: UG Detention



Storm Water Quality Calculations - WINSLAMM


NO CONTROLS
RES
Junction 1
Outfall
OUT

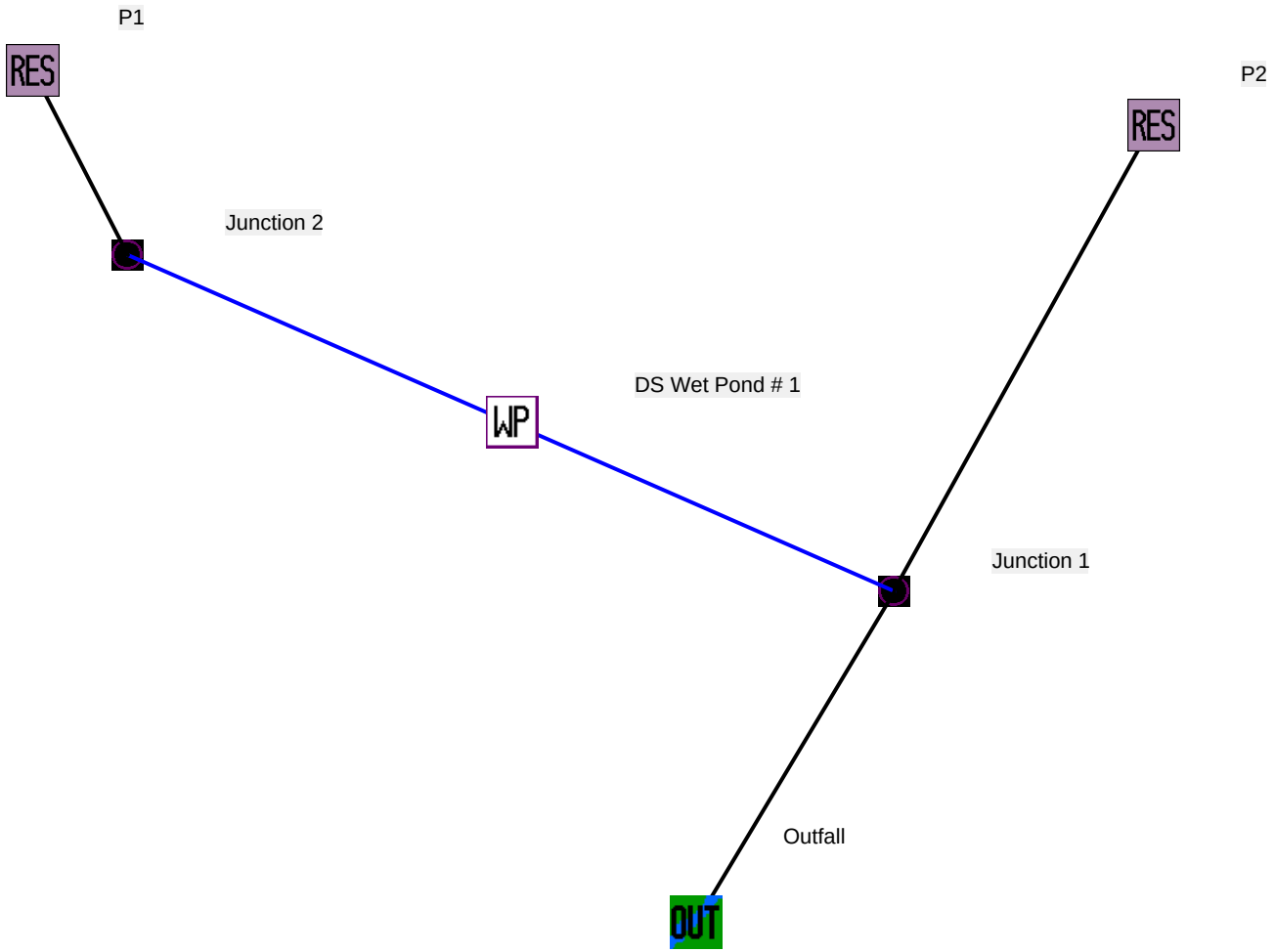
Data file name: P:\3170302\Eng Data\Hydrology\SLAMM\NO CONTROLS.mdb
WinSLAMM Version 10.4.1
Rain file name: C:\WinSLAMM Files\Rain Files\WisReg - Milwaukee WI 1969.RAN
Particulate Solids Concentration file name: C:\WinSLAMM Files\v10.1 WI_AVG01.pscx
Runoff Coefficient file name: C:\WinSLAMM Files\WI_SL06 Dec06.rsvx
Residential Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Institutional Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Commercial Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Industrial Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Other Urban Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Freeway Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Apply Street Delivery Files to Adjust the After Event Load Street Dirt Mass Balance: False
Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI_GEO03.ppdx
Source Area PSD and Peak to Average Flow Ratio File: C:\WinSLAMM Files\NURP Source Area PSD Files.csv
Cost Data file name:
If Other Device Pollutant Load Reduction Values = 1, Off-site Pollutant Loads are Removed from Pollutant Load % Reduction calculations
Seed for random number generator: -42
Study period starting date: 01/01/69 Study period ending date: 12/31/69
Start of Winter Season: 12/06 End of Winter Season: 03/28
Date: 07-24-2019 Time: 16:28:32
Site information: 3170302 Reserve at Waukesha

LU# 1 - Residential: NO CONTROLS Total area (ac): 0.400
    25 - Driveways 1: 0.400 ac. Connected PSD File: C:\WinSLAMM Files\NURP.cpz

SLAMM for Windows Version 10.4.1

Data file name: P:\3170302\Eng Data\Hydrology\SLAMM\NO CONTROLS.mdb
WinSLAMM Version 10.4.1
Rain file name: C:\WinSLAMM Files\Rain Files\WisReg - Milwaukee WI 1969.RAN
Particulate Solids Concentration file name: C:\WinSLAMM Files\v10.1 WI_AVG01.pscx
Runoff Coefficient file name: C:\WinSLAMM Files\WI_SL06 Dec06.rsvx
Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI_GEO03.ppdx
Residential Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Institutional Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Commercial Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Industrial Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Other Urban Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Freeway Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Apply Street Delivery Files to Adjust the After Event Load Street Dirt Mass Balance: False
Source Area PSD and Peak to Average Flow Ratio File: C:\WinSLAMM Files\NURP Source Area PSD Files.csv
Cost Data file name:
If Other Device Pollutant Load Reduction Values = 1, Off-site Pollutant Loads are Removed from Pollutant Load % Reduction calculations
Seed for random number generator: -42
Study period starting date: 01/01/69 Study period ending date: 12/31/69
Start of Winter Season: 12/06 End of Winter Season: 03/28
Model Run Start Date: 01/01/69 Model Run End Date: 12/31/69
Date of run: 07-24-2019 Time of run: 16:29:21
Total Area Modeled (acres): 0.400
Years in Model Run: 0.99

	Runoff Volume (cu ft)	Percent Runoff Volume Reduction	Particulate Solids Conc. (mg/L)	Particulate Solids Yield (lbs)	Percent Particulate Solids Reduction
Total of all Land Uses without Controls:	30730	-	154.0	295.4	-
Outfall Total with Controls:	30729	0.00%	154.0	295.4	0.00%
Annualized Total After Outfall Controls:	31156			299.5	


P1
RES
P2
RES
Junction 2
DS Wet Pond # 1
WP
Junction 1
Outfall
OUT

Data file name: P:\3170302\Eng Data\Hydrology\SLAMM\WITH CONTROLS.mdb
WinSLAMM Version 10.4.1
Rain file name: C:\WinSLAMM Files\Rain Files\WisReg - Milwaukee WI 1969.RAN
Particulate Solids Concentration file name: C:\WinSLAMM Files\v10.1 WI_AVG01.pscx
Runoff Coefficient file name: C:\WinSLAMM Files\WI_SL06 Dec06.rsvx
Residential Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Institutional Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Commercial Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Industrial Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Other Urban Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Freeway Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Apply Street Delivery Files to Adjust the After Event Load Street Dirt Mass Balance: False
Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI_GEO03.ppdx
Source Area PSD and Peak to Average Flow Ratio File: C:\WinSLAMM Files\NURP Source Area PSD Files.csv
Cost Data file name:
If Other Device Pollutant Load Reduction Values = 1, Off-site Pollutant Loads are Removed from Pollutant Load % Reduction calculations
Seed for random number generator: -42
Study period starting date: 01/01/69 Study period ending date: 12/31/69
Start of Winter Season: 12/06 End of Winter Season: 03/28
Date: 07-24-2019 Time: 16:30:42
Site information: 3170302 Reserve at Waukesha

LU# 1 - Residential: P2 Total area (ac): 1.760
1 - Roofs 1: 1.470 ac. Flat Connected PSD File: C:\WinSLAMM Files\NURP.cpz
25 - Driveways 1: 0.110 ac. Connected PSD File: C:\WinSLAMM Files\NURP.cpz
31 - Sidewalks 1: 0.070 ac. Connected PSD File: C:\WinSLAMM Files\NURP.cpz
45 - Large Landscaped Areas 1: 0.110 ac. Moderately Compacted Silty PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 2 - Residential: P1 Total area (ac): 0.380
25 - Driveways 1: 0.300 ac. Connected PSD File: C:\WinSLAMM Files\NURP.cpz
31 - Sidewalks 1: 0.040 ac. Connected PSD File: C:\WinSLAMM Files\NURP.cpz
45 - Large Landscaped Areas 1: 0.040 ac. Moderately Compacted Silty PSD File: C:\WinSLAMM Files\NURP.cpz

Control Practice 1: Wet Detention Pond CP# 1 (DS) - DS Wet Pond # 1
Particle Size Distribution file name: Not needed - calculated by program
Initial stage elevation (ft): 3.5
Peak to Average Flow Ratio: 3.8
Maximum flow allowed into pond (cfs): No maximum value entered
Outlet Characteristics:
Outlet type: Sharp Crested Weir
1. Sharp crested weir length (ft): 6
2. Sharp crested weir height from invert: 0.25
3. Sharp crested weir invert elevation above datum (ft): 6.75
Outlet type: Orifice 1
1. Orifice diameter (ft): 0.33
2. Number of orifices: 1
3. Invert elevation above datum (ft): 3.5
Outlet type: Orifice 2
1. Orifice diameter (ft): 0.5
2. Number of orifices: 1
3. Invert elevation above datum (ft): 4.25
Outlet type: Broad Crested Weir
1. Weir crest length (ft): 6
2. Weir crest width (ft): 0.5
3. Height from datum to bottom of weir opening: 6.99
Pond stage and surface area

Entry Number	Stage (ft)	Pond Area (acres)	Natural Seepage (in/hr)	Other Outflow (cfs)
0	0.00	0.0000	0.00	0.00
1	1.00	0.0095	0.00	0.00
2	2.00	0.0095	0.00	0.00
3	3.00	0.0095	0.00	0.00
4	4.00	0.0095	0.00	0.00
5	5.00	0.0095	0.00	0.00
6	6.00	0.0095	0.00	0.00
7	7.00	0.0095	0.00	0.00

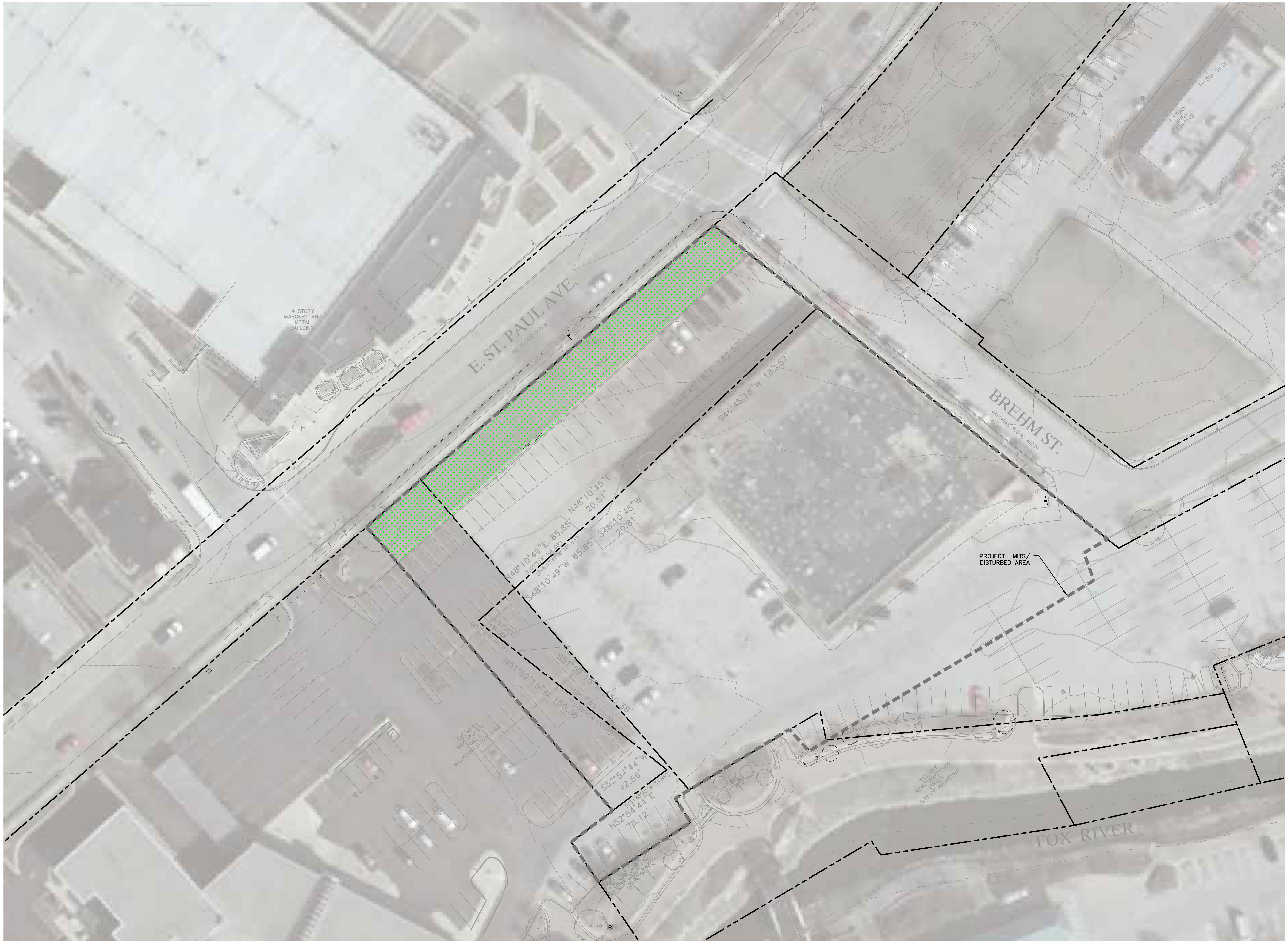
SLAMM for Windows Version 10.4.1

Data file name: P:\3170302\Eng Data\Hydrology\SLAMM\WITH CONTROLS.mdb
WinSLAMM Version 10.4.1
Rain file name: C:\WinSLAMM Files\Rain Files\WisReg - Milwaukee WI 1969.RAN
Particulate Solids Concentration file name: C:\WinSLAMM Files\v10.1 WI_AVG01.pscx
Runoff Coefficient file name: C:\WinSLAMM Files\WI_SL06 Dec06.rsvx
Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI_GEO03.ppdx
Residential Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Institutional Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Commercial Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Industrial Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Other Urban Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Freeway Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Apply Street Delivery Files to Adjust the After Event Load Street Dirt Mass Balance: False
Source Area PSD and Peak to Average Flow Ratio File: C:\WinSLAMM Files\NURP Source Area PSD Files.csv
Cost Data file name:
If Other Device Pollutant Load Reduction Values = 1, Off-site Pollutant Loads are Removed from Pollutant Load % Reduction calculations
Seed for random number generator: -42
Study period starting date: 01/01/69 Study period ending date: 12/31/69
Start of Winter Season: 12/06 End of Winter Season: 03/28
Model Run Start Date: 01/01/69 Model Run End Date: 12/31/69
Date of run: 07-24-2019 Time of run: 16:53:43
Total Area Modeled (acres): 2.140
Years in Model Run: 0.99

	Runoff Volume (cu ft)	Percent Runoff Volume Reduction	Particulate Solids Conc. (mg/L)	Particulate Solids Yield (lbs)	Percent Particulate Solids Reduction
Total of all Land Uses without Controls:	170962	-	72.98	778.9	-
Outfall Total with Controls:	170993	-0.02%	57.85	617.5	20.72%
Annualized Total After Outfall Controls:	173368			626.1	

Hydrology Exhibits

Pre-Developed Site Conditions



EXISTING SITE DATA

PROPERTY AREA =	93,043 SF	2.14 AC	
OVERALL GREEN SPACE =	8,356 SF	0.19 AC	8.98%
OVERALL IMPERVIOUS =	84,687 SF	1.95 AC	91.02%

N

GRAPHIC SCALE
15 0 15 30 60
(IN FEET)

LEGEND

- PERVIOUS AREA
- WATERSHED BREAK LINE
- WATERSHED LIMIT

*2010 AERIAL FROM WAUKESHA COUNTY GIS

811 Know what's below. Call before you dig.

R.A.SMITH, INC. ASSUMES NO RESPONSIBILITY FOR DAMAGES, LIABILITY OR COSTS RESULTING FROM CHANGES OR ALTERATIONS MADE TO THIS PLAN WITHOUT THE EXPRESSED WRITTEN CONSENT OF R.A.SMITH, INC.

DATE	DESCRIPTION

raSmith
CREATIVITY BEYOND ENGINEERING
16745 W. Bluemound Road
Brookfield, WI 53005-5938
(262) 781-1000
rasmith.com
Brookfield, WI | Milwaukee, WI | Appleton, WI | Madison, WI | Cedarburg, WI
Mount Pleasant, WI | Naperville, IL | Pittsburgh, PA | Irvine, CA

RESERVE AT WAUKESHA
CITY OF WAUKESHA, WI
PRE-DEVELOPMENT GREENSPACE EXHIBIT

DATE: 04/11/2019
SCALE: 1" = 30'
JOB NO. 3170302
PROJECT MANAGER: MATT P. KOCOUREK, P.E.
DESIGNED BY: CDC
CHECKED BY: RJY
SHEET NUMBER
HX 1

Post-Developed Site Conditions

PROPERTY LINE

GRAPHIC SCALE
15 0 15 30 60
(IN FEET)

LEGEND

PROPOSED GREENSPACE

WATERSHED LIMIT

PROPOSED SITE DATA

PROPERTY AREA =		93,043 SF	2.14 AC
OVERALL GREEN SPACE =	6,726 SF	0.15 AC	7.23%
OVERALL IMPERVIOUS =	86,317 SF	1.98 AC	92.77%

811 Know what's below. Call before you dig.

R.A.SMITH, INC. ASSUMES NO RESPONSIBILITY FOR DAMAGES, LIABILITY OR COSTS RESULTING FROM CHANGES OR ALTERATIONS MADE TO THIS PLAN WITHOUT THE EXPRESSED WRITTEN CONSENT OF R.A.SMITH, INC.

DATE	DESCRIPTION
07/29/2019	CITY SUBMITTAL
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---	---
---	---
---	---
---	---

raSmith
CREATIVITY BEYOND ENGINEERING
16745 W. Bluemound Road
Brookfield, WI 53005-5938
(262) 781-1000
rasmith.com
Brookfield, WI | Milwaukee, WI | Appleton, WI | Madison, WI | Cedarburg, WI
Mount Pleasant, WI | Naperville, IL | Pittsburgh, PA | Irvine, CA

RESERVE AT WAUKESHA
CITY OF WAUKESHA, WI

POST-DEVELOPMENT GREENSPACE EXHIBIT

DATE: 04/11/2019

SCALE: 1" = 30'

JOB NO. 3170302

PROJECT MANAGER:
MATT P. KOCOUREK, P.E.

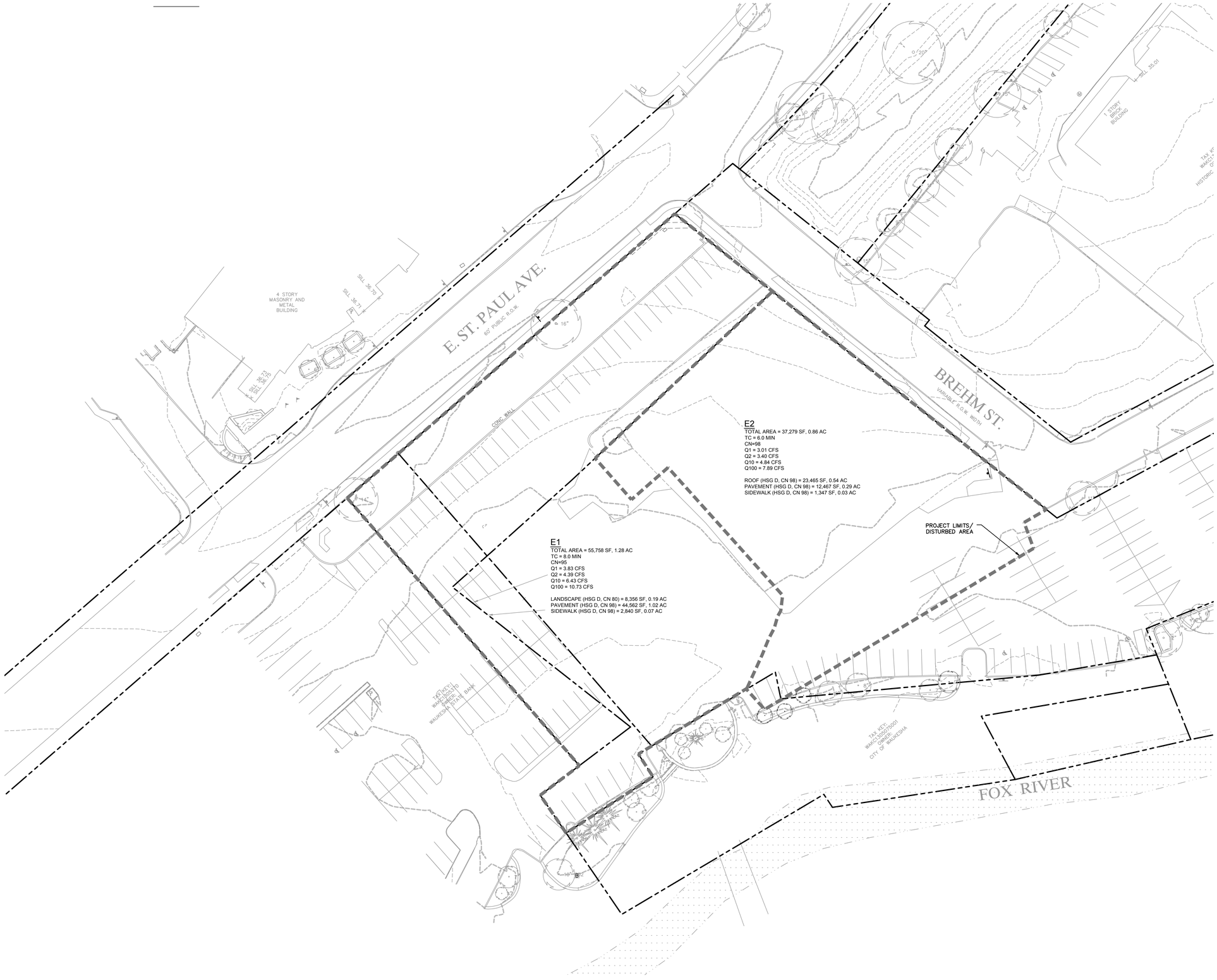
DESIGNED BY: CDC

CHECKED BY: RJY

SHEET NUMBER

HX 2

Pre-Developed Hydrology



DATE	DESCRIPTION
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raSmith
CREATIVITY BEYOND ENGINEERING
16745 W. Bluemound Road
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rasmith.com
Brookfield, WI | Milwaukee, WI | Appleton, WI | Madison, WI | Cedarburg, WI
Mount Pleasant, WI | Naperville, IL | Pittsburgh, PA | Irvine, CA

RESERVE AT WAUKESHA
CITY OF WAUKESHA, WI

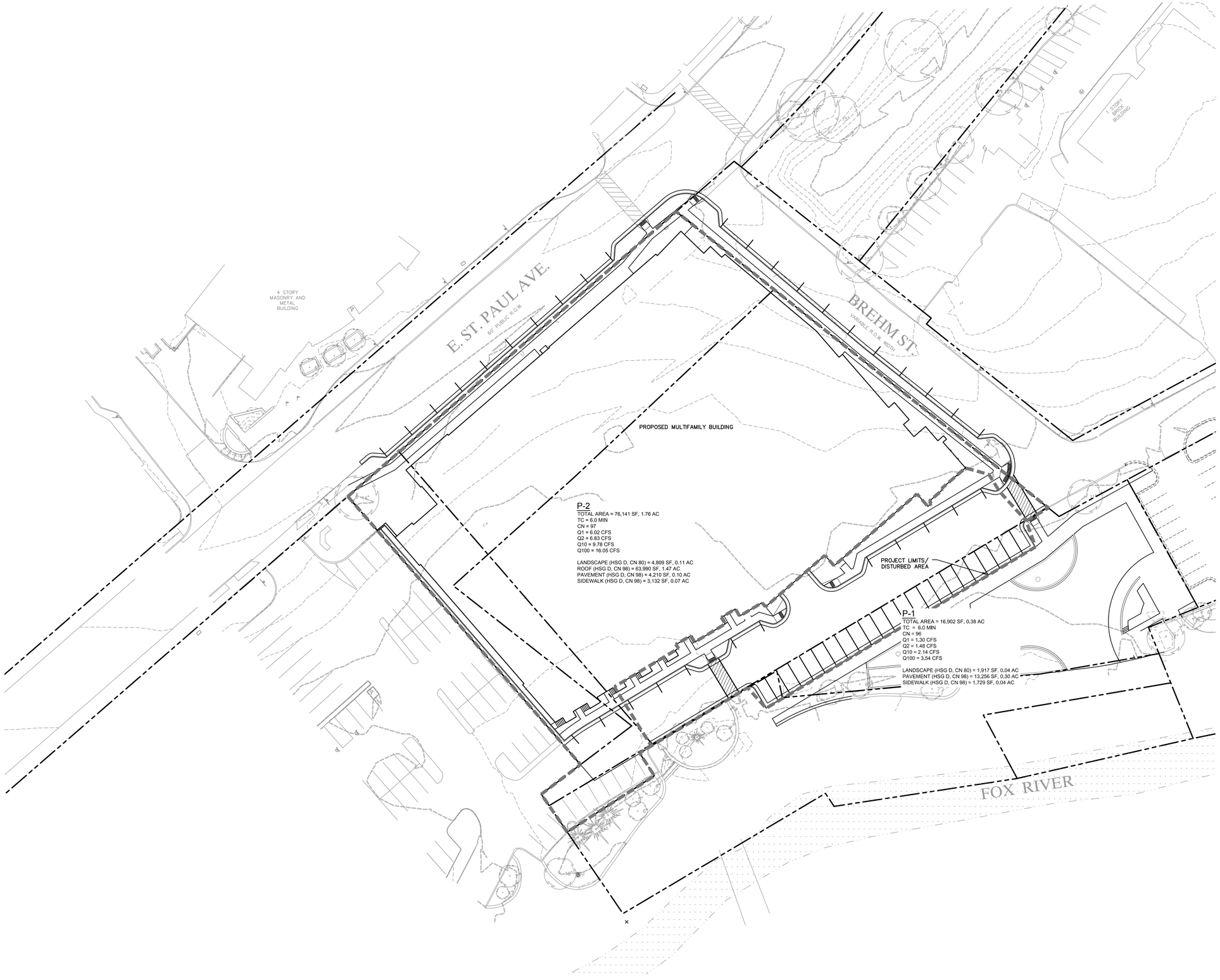
PRE-DEVELOPMENT HYDROLOGY EXHIBIT

Know what's below. Call before you dig.

DATE: 04/11/2019
SCALE: 1" = 30'
JOB NO. 3170302
PROJECT MANAGER: MATT P. KOCOUREK, P.E.
DESIGNED BY: CDC
CHECKED BY: RJY

SHEET NUMBER
HX 3

Post-Developed Hydrology



Know what's **below.**
Call before you dig.

R.A.SMITH, INC. ASSUMES NO RESPONSIBILITY FOR DAMAGES, LIABILITY OR COSTS RESULTING FROM CHANGES OR ALTERATIONS MADE TO THIS PLAN WITHOUT THE EXPRESSED WRITTEN CONSENT OF R.A.SMITH, INC.

DATE	DESCRIPTION
07/29/2019	CITY RESUBMITTAL
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raSmith
CREATIVITY BEYOND ENGINEERING
16745 W. Bluemound Road
Brookfield, WI 53005-5938
(262) 781-1000
rasmith.com
Brookfield, WI | Milwaukee, WI | Appleton, WI | Madison, WI | Cedarburg, WI
Mount Pleasant, WI | Naperville, IL | Pittsburgh, PA | Irvine, CA

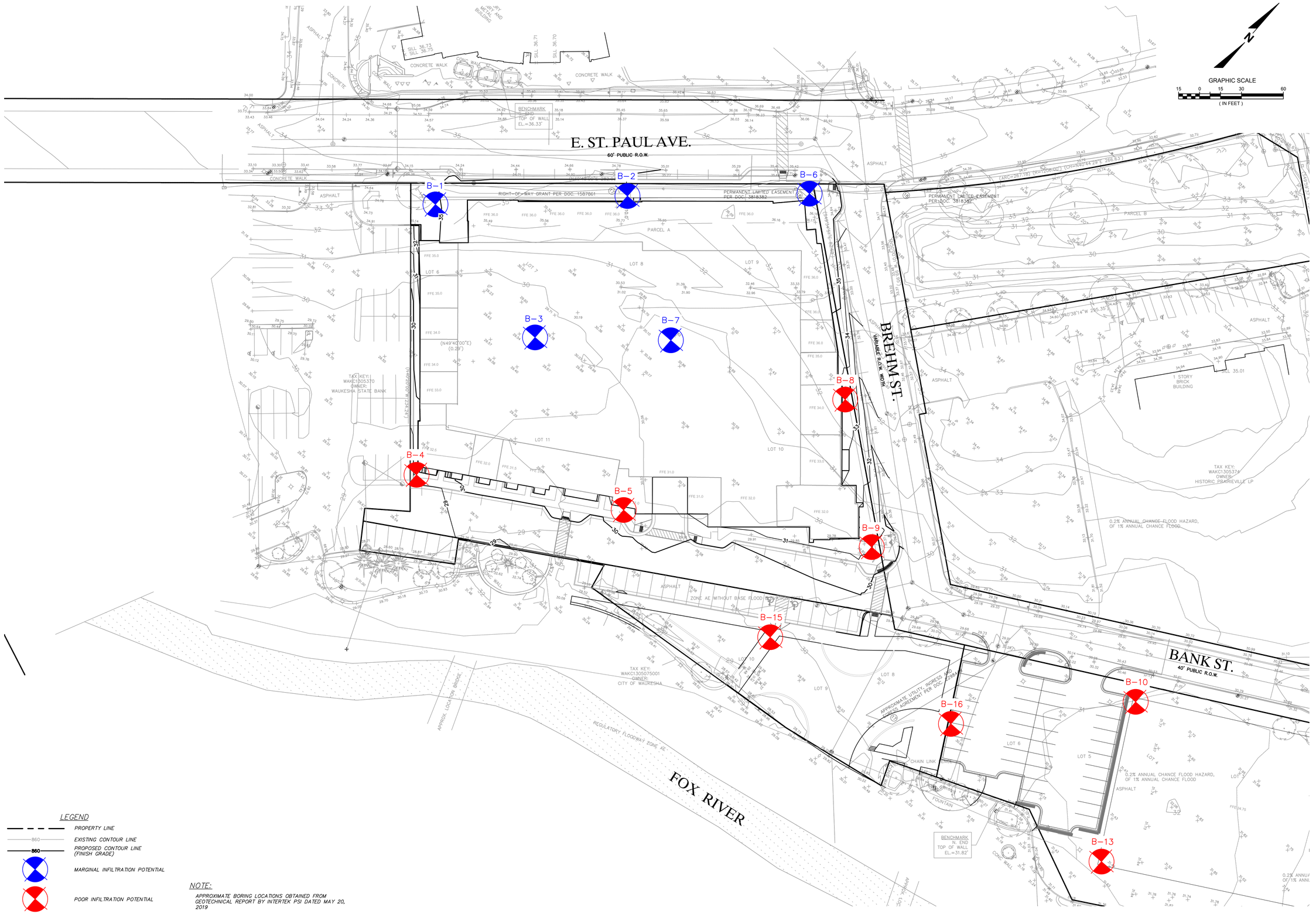
RESERVE AT WAUKESHA
CITY OF WAUKESHA, WI

POST-DEVELOPMENT HYDROLOGY EXHIBIT

DATE: 04/11/2019
SCALE: 1" = 30'
JOB NO. 3170302
PROJECT MANAGER: MATT P. KOCOUREK, P.E.
DESIGNED BY: CDC
CHECKED BY: RJY

SHEET NUMBER
HX 4

Infiltration Exhibit



LEGEND

- PROPERTY LINE
- 860 EXISTING CONTOUR LINE
- 860 PROPOSED CONTOUR LINE (FINISH GRADE)
- MARGINAL INFILTRATION POTENTIAL
- POOR INFILTRATION POTENTIAL

NOTE:

APPROXIMATE BORING LOCATIONS OBTAINED FROM GEOTECHNICAL REPORT BY INTERTEK PSI DATED MAY 20, 2019

DESCRIPTION	DATE

raSmith
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(262) 781-1000
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Brookfield, WI | Milwaukee, WI | Appleton, WI | Madison, WI | Cedarburg, WI
Mount Pleasant, WI | Naperville, IL | Pittsburgh, PA | Irvine, CA

THE RESERVE AT WAUKESHA
CITY OF WAUKESHA, WI

INFILTRATION EXHIBIT

DATE: 07/22/2019
SCALE: 1" = 30'
JOB NO. 3170302
PROJECT MANAGER: MATT P. KOCOUREK, P.E.
DESIGNED BY: KMR
CHECKED BY: JJJ

SHEET NUMBER
1 OF 1

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Maintenance Agreement

Document Number

Storm Water Management Practice Maintenance Agreement

Michael Campbell, Campbell Capital Group, LLC, as "Owner" of the property described below, in accordance with Chapter 32 City of Waukesha Storm Water Management and Erosion Control, agrees to install and maintain storm water management practice(s) on the subject property in accordance with approved plans and Storm Water Management Plan conditions. The owner further agrees to the terms stated in this document to ensure that the storm water management practice(s) continues serving the intended functions in perpetuity. This Agreement includes the following exhibits:

Exhibit A: Legal Description of the real estate for which this Agreement applies ("Property").
Exhibit B: Location Map(s) – shows an accurate location of each storm water management practice affected by this Agreement.
Exhibit C: Maintenance Plan – prescribes those activities that must be carried out to maintain compliance with this Agreement.

Note: After construction verification has been accepted by the City of Waukesha, for all planned storm water management practices, an addendum(s) to this agreement shall be recorded by the Owner showing design and construction details. The addendum(s) may contain several additional exhibits, including certification by City of Waukesha of Storm Water and Erosion Control Permit termination, as described below.

Name and Return Address

City of Waukesha
130 Delafield Street
Waukesha, WI 53188

Parcel Identification Number(s) – (PIN)

Through this Agreement, the Owner hereby subjects the Property to the following covenants, conditions and restrictions:

1. The Owner shall be responsible for the routine and extraordinary maintenance and repair of the storm water management practice(s) and drainage easements identified in Exhibit B until Storm Water and Erosion Control Permit termination by the City of Waukesha in accordance with Chapter 32 of the City Code of Ordinances.
2. After Storm Water and Erosion Control Permit termination under 1., the current Owner(s) shall be solely responsible for maintenance and repair of the storm water management practices and drainage easements in accordance with the maintenance plan contained in Exhibit C.
3. The Owner(s) shall, at their own cost, complete inspections of the storm water management practices at the time intervals listed in Exhibit C, and conduct the inspections by a qualified professional, file the reports with the City of Waukesha after each inspection and complete any maintenance or repair work recommended in the report. The Owner(s) shall be liable for the failure to undertake any maintenance or repairs. After the work is completed by the Contractor, the qualified professional shall verify that the work was properly completed and submit the follow-up report to the City within 30 days.
4. In addition, and independent of the requirements under paragraph 3 above, the City of Waukesha, or its designee, is authorized to access the property as necessary to conduct inspections of the storm water management practices or drainage easements to ascertain compliance with the intent of this Agreement and the activities prescribed in Exhibit C. The City of Waukesha may require work to be done which differs from the report described in paragraph 3 above, if the City of Waukesha reasonably concludes that such work is necessary and consistent with the intent of this agreement. Upon notification by the City of Waukesha of required maintenance or repairs, the Owner(s) shall complete the specified maintenance or repairs within a reasonable time frame determined by the City of Waukesha.
5. If the Owner(s) do not complete an inspection under 3. above or required maintenance or repairs under 4. above within the specified time period, the City of Waukesha is authorized, but not required, to perform the specified inspections, maintenance or repairs. In the case of an emergency situation, as determined by the City of Waukesha, no notice shall be required prior to the City of Waukesha performing emergency maintenance or repairs. The City of Waukesha may levy the costs and expenses of such inspections, maintenance or repair related actions as a special charge against the Property and collected as such in accordance with the procedures under s. 66.0627 Wis. Stats. or subch. VII of ch. 66 Wis. Stats.

6. This Agreement shall run with the Property and be binding upon all heirs, successors and assigns. After the Owner records the addendum noted above, the City of Waukesha shall have the sole authority to modify this agreement upon a 30-day notice to the current Owner(s).

Dated this ___ day of _____, 2019.

Owner:

_____
(Owners Signature)

_____
(Owners Typed Name)

Acknowledgements

State of Wisconsin:
County of Waukesha

Personally came before me this ____ day of _____, 2019, the above named Michael Campbell to me known to be the person who executed the foregoing instrument and acknowledged the same.

_____.
[Name]
Notary Public, Waukesha County, WI
My commission expires:_____.

This document was drafted by:

Jeff Yersin, PE
RA Smith Inc.
16745 W. Bluemound Rd
Brookfield, WI 53005

For Certification Stamp

City of Waukesha Common Council Approval

Dated this ___ day of _____, 2019.

_____

Shawn N. Reilly, Mayor

_____

Gina Kozlik, City Clerk

Acknowledgements

State of Wisconsin:
County of Waukesha

Personally came before me this ____ day of _____, 2019, the above named _____ to me known to be the person who executed the foregoing instrument and acknowledged the same.

_____.
[Name]
Notary Public, Waukesha County, WI
My commission expires:_____.

Exhibit A – Legal Description

The following description and reduced copy map identifies the land parcel(s) affected by this Agreement. For a larger scale view of the referenced document, contact the Waukesha County Register of Deeds office.

Project Identifier: **The Reserve at Waukesha** Acres**: TBD**
Date of Recording: **TBD**
Map Produced By: **RASmith Inc, 16745 W. Bluemound Rd, Brookfield, WI 53005**
Legal Description: **TBD**

Exhibit B - Location Map
Storm Water Management Practices Covered by this Agreement

The storm water management practices covered by this Agreement are depicted in the reduced copy of a portion of the construction plans, as shown below. The practices include an underground detention system with Outlet Structure for storm water quantity and quality.

Subdivision Name**:**	**The Reserve at Waukesha**
Storm water Practices**:**	**Underground Detention**
Location of Practices**:**	**Private Drive SW of Brehm St and Bank St intersection**
Owners of Storm water BMP:	**Campbell Capital Group, LLC**

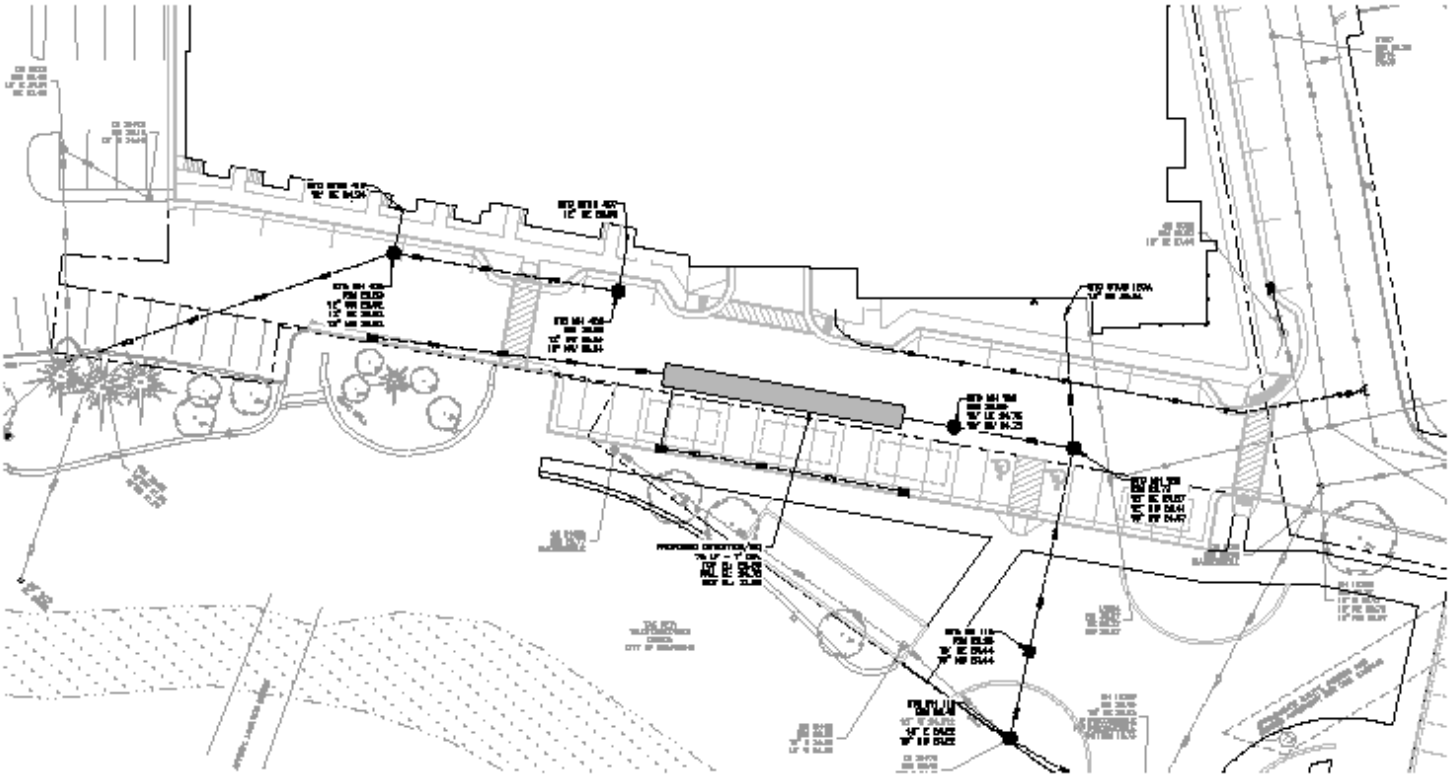

Exhibit C
Storm Water Practice Maintenance Plan

This exhibit explains the basic function of each of the storm water practices listed in Exhibit B and prescribes the minimum maintenance requirements to remain compliant with this Agreement. The maintenance activities listed below are aimed to ensure these practices continue serving their intended functions in perpetuity. The list of activities is not all inclusive, but rather indicates the minimum type of maintenance that can be expected for this particular site. Access to the stormwater practices for maintenance vehicles is shown in Exhibit B. Any failure of a storm water practice that is caused by a lack of maintenance will subject the Owner(s) to enforcement of the provisions listed on page 1 of this Agreement by the City of Waukesha.

System Description:
The 75' – 84" diameter underground detention basin is designed to trap 40% of total suspended solids of newly created roads and parking lots only as compared to no controls. Additionally, proposed runoff shall be maintain pre-development downstream peak flows for the 1-yr, 2-yr, 10-yr, and 100-yr, 24 hour storms. The underground basin has an outlet control structure that regulates flows. The detention system has a permanent pool depth of 3.5'.

Minimum Maintenance Requirements:
To ensure the proper long-term function of the storm water management practices described above, the following activities must be completed:

1. All outlet pipes must be checked semi-annually to ensure there is no blockage from floating debris or ice, especially the 4 and 6 inch orifices in the Outlet Structure. Any blockage must be removed immediately.
2. When sediment in the underground detention system has accumulated to an elevation of three feet below the outlet elevation, it must be removed (see Exhibit D). All removed sediment must be placed in an appropriate upland disposal site and stabilized (grass cover) to prevent sediment from washing back into the basin.
3. Any other repair or maintenance needed to ensure the continued function of the storm water practices or as ordered by the City of Waukesha under the provisions listed on page 1 of this Agreement.
4. The titleholder(s) or their designee must document all inspections as specified above. Documentation shall include as a minimum: (a) Inspectors Name, Address and Telephone Number, (b) Date of Inspections, (c) Condition Report of the Storm Water Management Practice, (d) Corrective Actions to be Taken and Time Frame for Completion, (e) Follow-up Documentation after Completion of the Maintenance Activities. All documentation is to be delivered to the attention of the City Engineer at the City of Waukesha Engineering Department on January 10th and July 10th each year.