STORMWATER MANAGEMENT REPORT

WAUKESHA MEMORIAL BOULEVARD
(PROHEALTH WAUKESHA MEMORIAL HOSPITAL)
WAUKESHA, WISCONSIN

PREPARED FOR
ProHealth Care, Inc
725 American Ave
Waukesha, WI, 53188

PREPARED BY

Project Number – 20411

03/17/2022

Paul Imig, P.E.
Project Engineer

Chris Carr P.E.
Senior Civil Engineer

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1. INTRODUCTION

This report presents the proposed storm water management plan, including requirements and methods of analysis for the proposed Waukesha Memorial Boulevard. The project site is located between Lawndale Ave and Madison St and was the old Fairview Ave.

This project involves the redevelopment of the former city street (Fairview Ave) between Lawndale Ave and Madison St and has a parcel area of 3.39 acres. The proposed development entails the demolition of an existing building, existing parking lot and the construction of a new boulevard, park, and parking lot with accompanying green infrastructure.

Implementation of green infrastructure is a key aspect of this redevelopment. Biofilters will be installed at five locations throughout the site.

This storm water management system best management practices (BMPs) provides multiple biofilters to meet municipal and state requirements. The stormwater facility will connect to storm sewer on site and will ultimately connect to the existing public storm sewer system in Madison St.

2. EXISTING CONDITIONS SUMMARY

The project is 3.702-acres in area and is bound by Lawndale Ave to the south, Residential homes and Fairmont Ave to the east, Madison Street to the north, and a residential neighborhood to the west. In general, the site slopes from Southeast to the Northwest with an approximate 20-foot elevation change from Southeast to Northwest. The existing site is divided down the middle by the existing Fairview Ave. The east side of the site drains into the existing Fairview Ave and runs north to Madison St where is discharges into an existing catch basin. The west side of the site drains northwest to a swale that discharges west. The total disturbance area is approximately 3.702 acres. The disturbed area contains approximately 138,146 square feet of existing residential lots approximately ¼ acre in size, 17,269 square feet of existing roadway, and 5,844 square feet of existing parking lot. An existing conditions survey is included in the preliminary civil plans attached to this report. Delineated areas for the existing conditions modeling can be found in SW 1.0 in Appendix A. The soils onsite consist of mostly silty andy clay which has been modeled as a type C soil. Please refer to the Geotech report by GESTRA Engineering, Inc. dated March 2, 2022 in Appendix B for more information regarding the current on site soil conditions.

3. PROPOSED CONDITIONS SUMMARY

The redevelopment project consists of demolition of an existing house and road for the construction of a parking lot expansion and a new boulevard street that will align with the entrance and exit from the hospital to the south. The new site infrastructure includes drives, utilities and a biofilter green infrastructure system to meet the storm water requirements for the project. The stormwater system is designed to match existing peak flows leaving the site. The project will disturb approximately 3.702 acres of land. Under the developed conditions, storm water from the new road will drain to the middle of the boulevard section where it will be treated by a series of biofilters to achieve the required Total Suspended Solids (TSS) removal prior to being discharged into the off-site storm sewer and the existing swale. The on-site storm water will be discharged to the offsite storm sewer and onsite grass swale. which will ultimately connect into the existing public storm water system to the west. Refer to the attached site civil plans. Delineated areas for the proposed conditions modeling can be found in SW 2.0 in Appendix A.

4. STORM WATER MANAGEMENT REQUIREMENTS

The project is considered a redevelopment and will disturb more than one acre of land, as a result the project will be subject to the following storm water management requirements under WDNR NR 151 and City of Waukesha storm water management regulations.

<u>WDNR NR 151 & City of Waukesha Municipal Code – Chapter 32 - STORMWATER MANAGEMENT & EROSION CONTROL</u>

By design, each storm water management plan shall meet the following post-development total suspended solids reduction targets, based on average annual rainfalls, as compared to no runoff management controls:

(ii) For redevelopment, 40% reduction of total suspended solids load from parking areas and roads

<u>City of Waukesha Municipal Code – Chapter 32 - STORMWATER MANAGEMENT & EROSION CONTROL</u>

To minimize downstream bank erosion and the failure of downstream conveyance systems, the calculated post-development peak storm water discharge rate shall not exceed the calculated pre-development discharge rates for the 1-year, 2-year, 10-year, and 100-year, 24-hour design storms

5. DESCRIPTION OF PROPOSED STORM WATER MANAGEMENT FACILITIES

Storm water treatment and peak flow reduction requirements for the development will be achieved using five separate biofilter systems.

The first biofilter is labeled Bio 1 is in the southern median of the road. Bio 1 treats the most southern portion of the road and surrounding area. Bio 1 has an area of 94 S.F. with a 3' engineered storage layer underneath it. Bio 1 discharges into Bio 2.

Bio 2 is just north of Bio 1 in the road median. Bio 2 treats a small portion of the road and landscape in the surrounding area. The porous paver has an area of 116 S.F. with a 3' engineered storage layer underneath it. Bio 2 discharges into the existing swale in the northwest corner of the site.

Bio 3 is in the middle of the road. Bio 3 treats much of the road and landscape in the surrounding area. Bio 3 has an area of 237 S.F. with a 3' engineered storage layer underneath it. Bio 3 discharges to Bio 4 to the north.

Bio 4 is the furthest biofilter north in the road median site. Bio 4 treats much of the road and parking in the surrounding area. It is also the emergency overflow area for all the bios in the road median. Bio 4 has an area of 191 S.F. with a 3' engineered storage layer underneath it. Bio 4 discharges to an existing storm manhole in Madison St.

Lastly Bio 5 will treat the new parking lot addition on the southeast side of the site. Bio 5 is 1,113 S.F. in size with a 3' engineered storage layer. Bio 5 also discharges to the swale in the northwest side of the site.

6. MODELING & CALCULATIONS

The hydraulic calculations and analysis presented in this report were performed using HydroCad Watershed Modeling software which utilizes the methodologies of TR-55 for a hydrograph based analysis of watershed conditions. Hydrographs were developed using a standard MSE 3 unit hydrograph for the various 24-hr storm events. Rainfall depths used in this model area as follows: 1 year = 2.42 in., 2 year = 2.72 in., 10 year = 3.83 in., 100 year = 6.18 in. WinSLAMM modeling was used to model TSS reduction.

Based on the NRCS soils data for the site, the native soils are type C soils (CN = 74), as used in the modeling. Refer to the NRCS soil Data in Appendix B.

Time of concentration values were calculated based on the standard TR-55 method.

HydroCad 10.10-4a and WinSLAMM v10.4 were used for quantity and quality control calculations, respectively.

7. SUMMARY OF MODELING/CALCULATIONS

A summary of results can be viewed in the tables below:

Peak Flow Summary Table:

Design Storm (yr)	Pre-development (cfs)	Post-Development (cfs)
1	7.98	4.56
2	9.65	5.69
10	16.05	9.37
100	29.92	21.48

Water Quality (TSS Reduction) Summary Table:

Total Drainage Area (AC)	Pounds of TSS Loading Without Controls (lbs)	Pounds of TSS Remaining With Control Treatment (lbs)	Removal Rate
1.568	**435.0**	**123.1**	**71.70%**

The biofilters will remove more than 40% TSS required by WDNR and City regulations.

8. CONSTRUCTION

A construction site WPDES permit has been obtained and will be located on site during land disturbing activities. Erosion control inspection during construction will be the responsibility of the General Contractor and erosion control inspection reports will be kept on-site during construction.

9. MAINTENANCE PLAN

The Owner will be responsible for the regular inspection of the storm water management facilities to ensure that they are functioning properly and the Owner will be required to enter into a storm water maintenance agreement with the City. A draft of the storm water maintenance agreement including a listing of inspection and maintenance activities with frequencies is included in Appendix D.

10. CONCLUSION

Based on Sigma's evaluation, the proposed storm water management approach as summarized in this report and presented on the attached plans and attachments, meets City, and WDNR storm water management requirements for both flow control and TSS removal

Appendix A

Stormwater Figures

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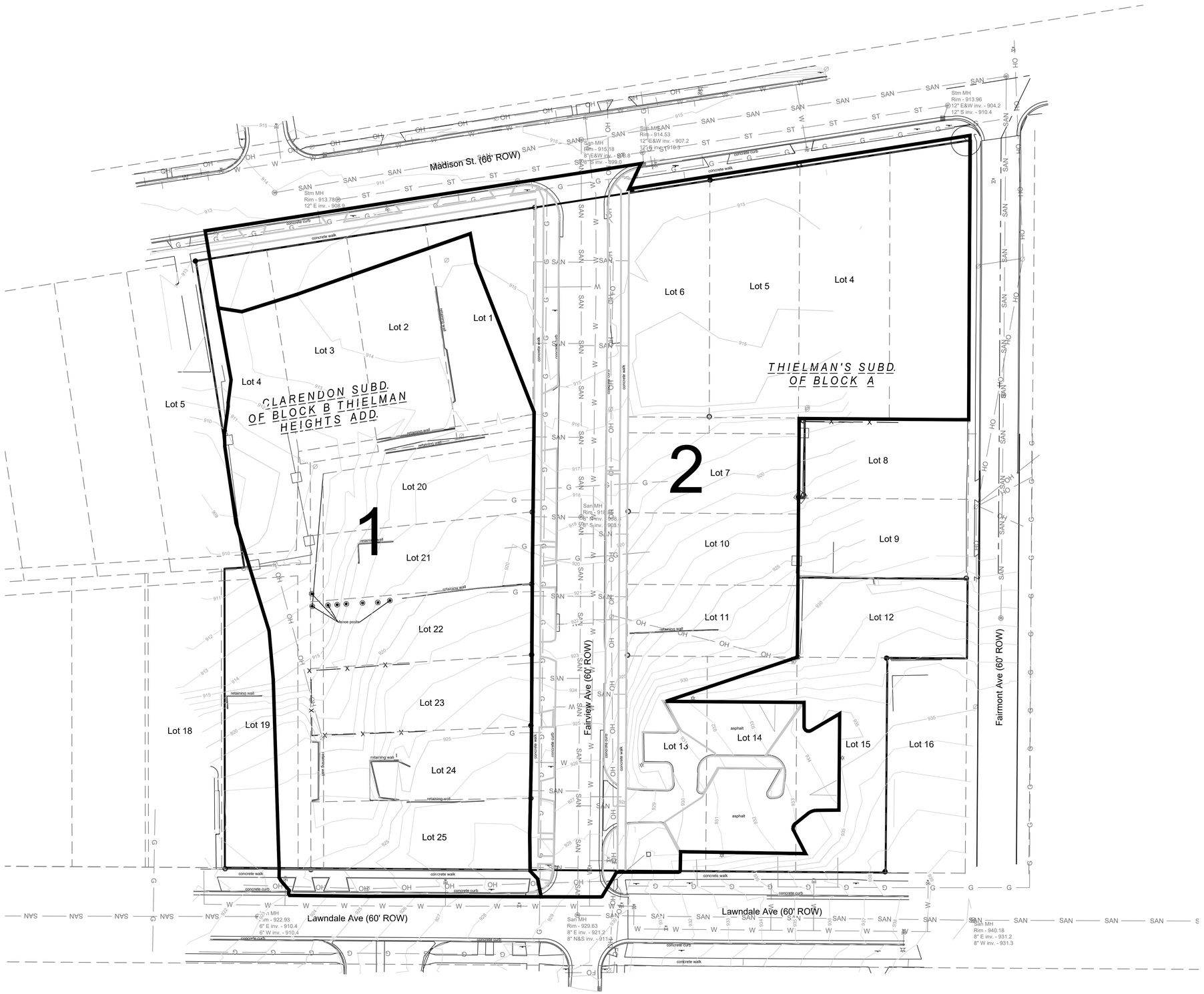

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WAUKESHA MEMORIAL BOULEVARD
PROHEALTH WAUKESHA MEMORIAL HOSPITAL
WAUKESHA, WI

EXISTING STORMWATER CONDITIONS

PRELIMINARY
NOT FOR
CONSTRUCTION

SCALE:	1"=30'
PROJECT NO:	20411
DESIGN DATE:	01-07-2022
PLOT DATE:	1/20/2022
DRAWN BY:	----
CHECKED BY:	PJI
APPROVED BY:	CTC
SHEET NO:	EX

CTRAUTSCHOLD

EX

20411

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0 30 60 Feet

WAUKESHA MEMORIAL BOULEVARD
PROHEALTH WAUKESHA MEMORIAL HOSPITAL
WAUKESHA, WI

PROPOSED STORMWATER

PRELIMINARY NOT FOR CONSTRUCTION

SCALE:	1"=30'
PROJECT NO:	20411
DESIGN DATE:	01-07-2022
PLOT DATE:	3/17/2022
DRAWN BY:	----
CHECKED BY:	PJI
APPROVED BY:	CTC
SHEET NO:	EX

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Appendix B

Geotech Report

GEOTECHNICAL ENGINEERING REPORT

Waukesha Memorial Boulevard
From Lawndale Avenue to Madison Street
Waukesha, Wisconsin

GESTRA Project No.: 22009-10
March 2, 2022

Prepared For:
The Sigma Group
1300 West Canal Street
Milwaukee, WI 53233

GESTRA

Geotechnical Engineering Report

Waukesha Memorial Boulevard
From Lawndale Avenue to Madison Street
Waukesha, Wisconsin

GESTRA Project No. 22009-10
March 2, 2022

Prepared For:

The Sigma Group
1300 West Canal Street
Milwaukee, WI 53233

Prepared By:

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Geotechnical Engineering Report
Waukesha Memorial Boulevard
From Lawndale Avenue to Madison Street
Waukesha, Wisconsin

1.0 INTRODUCTION

GESTRA Engineering, Inc. (GESTRA) was authorized by The Sigma Group (Sigma) to complete a subsurface exploration and geotechnical report for the new Waukesha Memorial Boulevard roadway project in Waukesha, Wisconsin. This report presents the results from the subsurface soil exploration and describes the field exploration, laboratory test results, and provides recommendations pertaining to the design and construction of the proposed project.

The engineering recommendations and analysis contained within this report are based on the following project information which is a projection of GESTRA's understanding of the project. If for any reason the actual project information differs from what is reported below, GESTRA should be contacted so that we can review our recommendations in light of any new information.

1.1 PROJECT INFORMATION

The proposed project is the construction of a new divided private roadway (referred to as Waukesha Memorial Boulevard), parking lot expansion and bio swales. The project is located north of the Waukesha Memorial Hospital and the new roadway will connect Lawndale Avenue to Madison Street. The parking lot expansion is planned just north of Lawndale Avenue, on the west side of the existing parking lot, and east of the future Waukesha Memorial Boulevard.

The existing Fairview Avenue that connects Lawndale Avenue to Madison Street will be vacated and removed. A portion of the new parking lot will be located over the existing Fairview Avenue. Waukesha Memorial Boulevard will be located through former residential properties, but the houses and structures have been razed and backfilled. The future roadway grades will range from 925 feet on the south end to 913 feet on the north end. The majority of the proposed and existing grades are within 2 feet +\-, with an area that will require about 4 feet of fill in the northern third of the alignment.

The primary stormwater feature will be a bio swale (referred to as Bio 5) that is planned just north of the northwest corner of the parking lot expansion and designed with bottom elevation of 919 feet. Four smaller bio swales (referred to as Bio 1 through 4) are planned within the median of Waukesha Memorial Boulevard and will be approximately 1-foot to 2-feet lower than the grades of the adjacent roadway. Additional details related to the design of the bio swales are not available at this time.

2.0 SCOPE OF WORK

GESTRA has performed the following services for the project:

- Contacted Diggers Hotline to locate the public utilities and subcontracted a private locator to mark the private utilities at the site.
- Performed a site visit to check for boring access and utilities marking.

- Completed ten (10) standard penetration test (SPT) soil borings from a depth of 10 feet to 12 feet below ground surface (bgs). At the completion of drilling, boreholes were abandoned per WDNR requirements.
- Performed laboratory soil testing to assign classification and engineering properties to the soils encountered. The laboratory testing included hand penetrometer, moisture and organic contents (LOI), Atterberg limits, hydrometer, and percent passing the number 200 sieve (P200).
- Prepared this engineering report presenting the results of the field exploration, laboratory testing, and providing the following recommendations:
    a. Pavement: soil parameters based on WisDOT pavement design guidance: Wisconsin Design Group Index (DGI), frost class classification (FI), soil support value (SSV), modulus for subgrade reaction (k), and drainage class.
    b. Construction Considerations: reuse of on-site soils for fill, fill compaction and placement, groundwater control, subgrade preparation, discussion of potential excavation below subgrade (EBS).
    c. Stormwater: Soil classification per the USCS system and per the Field Book for Describing and Sampling Soils (USDA, NRCS, 2012), provided a discussion of soils conditions related to infiltration/wet detention basins design, and WDNR Storm Forms.

3.0 EXPLORATION RESULTS

3.1 SITE CONDITIONS

The project site is currently an undeveloped vegetation covered and grass landscape area. An existing parking lot is located at northeast corner of Lawndale Avenue and Fairview Avenue. Based on the "Grading Plan" dated 01-07-2000 by Sigma provided to GESTRA, the topography of the site generally slopes downward from the southeast to the northwest portion of the site from approximate elevation 939 feet to 909 feet. The ground surface elevations at our boring locations ranged between 911.2 feet at boring SB-9 and 930.4 feet at boring SB-7.

Based on historical aerial photos on the Waukesha County GIS Map, the project site used to have several buildings that were razed sometime between 2010 and 2020. No information is available related to the demolition or fill placed. The existing parking lot was constructed sometime between 2017 to 2020.

3.2 PEDOLOGICAL INFORMATION

The USDA NRCS Web Soil Survey was used to research the pedologic mapping for the project site area. This survey was reviewed for mapped soil types and compared to Wisconsin Department of Transportation (WisDOT) Geotechnical Manual for pedological information. We have included the Web Soil Survey maps in Appendix III.

Hochheim loam soil unit (HmB and HmC2) was mapped within the project limits. Per the WisDOT Geotechnical Manual, Hochheim loam soil mapped generally consists of gravelly loam, gravelly sandy loam, and loam. However, these soils may not be representative of the subgrade conditions near the ground surface due to past earthwork in the project area.

3.3 SUBSURFACE SOIL PROFILE

All of the borings were drilled on surficial grass/vegetation and topsoil. The following paragraphs provide an additional description of the materials encountered at the boring locations and Table 3-1 provides general details related to the soil profile at each boring location.

Table 3-1: Generalized Soil Profile

Boring Number	Surface Elevation (feet)	Surface Topsoil (feet)	Fill/Possible Fill Depth (Feet)	Native Soil Description
SB-1	914.9	0.8	8.5	Silty clay, silt
SB-2	915.1	0.3	3.4 [a]	Lean clay, silty sand
SB-3	913.7	1	10 (EOB)	NE [d]
SB-4	916.8	1	7.5	Silty sand, silty sand with gravel
SB-5	921.9	0.8	5.5	Silty sand
SB-6	925.6	0.7	6	Silty sand, sand with silt and gravel
SB-7	930.4	0.3	2.5	Silty sand, silty sand with gravel
SB-8 [b]	926.4	0.5	6.5	Silty sand
SB-9	911.2	3.2	NE	Lean clay, lean clay with sand, clayey sand
SB-10	913.6	1	3.5 [c]	Possible buried topsoil, lean clay, silt

Notes: NE = Not Encountered.
a – Possible topsoil layer within fill material.
b – Boring encountered auger refusal at 2 feet at initial location and was offset 4 feet south and continued sampling to termination depth of boring.
c – Possible buried topsoil encountered at the bottom of fill material to 7 feet.
d – From 6.5 feet to depth of boring material may have been disturbed by root zone.

Topsoil/Possible Buried Topsoil:

The surface topsoil was observed typically to be between 3.5 and 12 inches. The exception was SB-9 where the topsoil was observed to extend to approximately 3.2 feet below ground surface (bgs). Possible buried topsoil was encountered within and below the fill in borings SB-2 and SB-10. Organic content of samples of the topsoil/possible buried topsoil tested in borings SB-9 and SB-10 were 5.6% and 7%, respectively.

Fill/Possible Fill (Fill):

Fill material was encountered below the surface topsoil in all borings. Within the location of boring SB-8, auger refusal was encountered at 2 feet bgs due to an obstruction (possible buried former structure). In 9 of the 10 borings performed, the fill was observed to range between an estimated depth of 2.5 feet bgs in boring SB-7 to 8.5 feet bgs in boring SB-1. The fill extended to the termination depth in boring SB-3 (10 bgs); however, below 6.5 feet, this material may have been part of a root zone from vegetation. The encountered fill materials consisted of both cohesive and granular soils. Possible foundry sand, concrete pieces, asphalt and possible slag pieces were

observed in the fill materials in borings SB-1, SB-3, SB-5, SB-6, SB-8 and SB-10. SPT N-values of the fill material varies and ranged from 4 to over 50 blows per foot (bpf). Moisture contents of samples of the clay fill soil tested ranged from 11.1% to 32.9%. Organic content on selected fill samples with a darker color tested ranged from 2.1% to 5.4%.

Native Soils:

With the exception of boring SB-3, the native soils were encountered below the fill materials. Borings SB-3 was terminated in the fill material or a zone of material possibly disturbed by roots. The native soil typically consisted of silty sand with varying amounts of gravel. SPT N-values of the silty sand varied from 9 to over 50 bpf. Clay with varying amounts of sand and gravel and silt was encountered in borings SB-1, SB-2, SB-9 and SB-10. Moisture contents of samples of the native clay soil tested from the borings ranged from 16.7% to 23.8%. Hand penetrometer readings of clay soils ranged from 1.5 ton per square foot (tsf) to 3 tsf.

Results of the field and laboratory tests and observations are depicted on the boring logs included in Appendix I this report. Soils were grouped together based on similar observed properties. The stratification lines were estimated by the reviewing engineer based on available data and experience. The actual in-situ changes between layers may differ slightly and may be more gradual than depicted on the boring logs. Subsurface and groundwater conditions can vary between borehole locations and in areas not explored.

It is important to note that the soil observations, topsoil and fill depths thickness estimates were made in small diameter boreholes. Therefore, it should be understood that thicker or thinner deposits of the individual strata are likely to be encountered within other portions of the project. Furthermore, the estimation of strata thickness at a particular location can differ from person to person due to a sometimes indistinct transition between the soils encountered. Additionally, it must be recognized that in the absence of foreign substances and/or debris within the soil samples obtained, it is sometimes difficult to distinguish between natural soils and clean soil fill.

3.4 GROUNDWATER OBSERVATIONS

Groundwater observations were made during and at the completion of drilling operations. Water was observed while drilling in boring SB-9 at 9 feet, but was not encountered after completion of drilling operation. Therefore, the water in SB-9 may have been perched or trapped water. Water was not observed in any other boring completed.

Groundwater level fluctuations may occur with time and seasonal changes due to variations in precipitation, evaporation, surface water runoff and local dewatering. Perched water pockets and a higher water table may also be encountered during wet weather periods, particularly in more permeable silt and sand seams or granular fill material overlying less permeable clays. Installation and monitoring of an observation well would be required to assess true groundwater elevation.

4.0 ANALYSIS AND RECOMMENDATIONS

4.1 GEOTECHNICAL CONSIDERATIONS

Based on conditions encountered at the site, the geotechnical concerns at the project site are the presence of existing fill materials and buried topsoil. With the exception of boring SB-9, fill was encountered directly below the surface topsoil in all borings and extended to estimated depths varying from 2.5 feet bgs to termination depth of boring (10 feet bgs). Possible foundry sand,

concrete pieces, asphalt pieces, steel wires, slag pieces were encountered within the fill materials in borings SB-1, SB-3, SB-5, SB-6, SB-8, and SB-10. The possible buried topsoil was observed in borings SB-2 and SB-10. Laboratory testing indicated organic contents of the possible buried topsoil up to 7%.

Based on the variation of the SPT N-values and moisture content of the clayey fill material, foreign material observed, and presence of possible buried topsoil, it is likely that the fill was not placed in a controlled manner. We understand the project earthwork will not include complete removal of the existing fill. Due to the unknown nature of the fill placement, layers of buried unsuitable material, and variation of the fill; the owner, contractor and project team must understand and accept the potential risks related to constructing pavements over the existing fill. These risks may include excessive total and differential settlement, buried unsuitable material or inconsistent material that could result in additional site excavation, subgrade instability, or other potential detrimental conditions that would affect the performance of the pavements. If the owner and contractor cannot accept these risks, then the project should consider mass excavation of existing fill and replacement with engineered fill. If it is decided to leave existing fill in place, additional precautions should be taken during subgrade preparations to limit disturbance of the material and soil correction should be anticipated for the project. An additional discussion of soil correction options is included in Section 4.2 of this report.

Boring SB-8 encountered auger refusal at 2 feet bgs and we assume this is likely related to a former buried structure. No records are available related to the previously demolition performed at the project site. If existing foundations or below grade walls are encountered, we recommended they be removed to a minimum depth of 2 feet below the subgrade elevation.

4.2 SITE PREPARATION

We recommend the initial site preparation start with complete removal of the existing asphalt pavements, surficial topsoil and vegetation. The surface topsoil was typically between 3.5 and 12 inches. The exception was SB-9 where the topsoil was observed to approximately 3.2 feet below ground surface (bgs). We recommend that any soil that contains significant amounts of organics, debris, deleterious material, and/or other unsuitable materials is encountered; it should be removed and replaced with new engineered fill. In addition, all unused utilities should be properly removed or abandoned. Material removed from the project site should be disposed in accordance with all applicable federal, state, and local regulations. Soil should not be stockpiled near or adjacent to the excavations.

We recommend recompacting any loose exposed material after the initial site preparation. Any areas of significant deflection during recompaction may be disked, dried, and re-compacted if weather permits, or removed and replaced with engineered fill.

After recompaction and prior to fill placement or pavement construction, a proof roll is recommended with a minimum 20-ton tri-axle dump truck, or like machinery imparting similar static loading on the soil and moving at no more than walking speed. A geotechnical engineer or their designated representative should be present during the proof roll in order to identify soft or unstable areas, if any, and subsequently recommend remediation procedures.

Based on the subgrade soils encountered in our borings, subgrade correction can be anticipated for the project site. Where high moisture content soil (20% or more), soils with low SPT blow counts (N<10), and/or soils that contain significant amounts of organics are present, it should be

anticipated that an unstable subgrade condition is likely. These conditions were encountered at soil borings SB-3 (possible foundry sand with organic content of 5.4%), SB-5/SB-9 (high moisture content clay below topsoil) and SB-2/SB-10 (possible buried topsoil). The type of improvement and the depth of remediation needed should be determined at the time of construction based on drainage, weather, and soil conditions. The following options may be considered for soil correction.

Removal and Replacement through Excavation Below Subgrade (EBS):

For this option, unsuitable soils should be removed and replaced with suitable engineered fill. The engineered fill should be compacted to at least 95% of the maximum dry density as obtained by the maximum modified Proctor density value (ASTM D1557). If an open graded clean stone is used as fill, a geotextile might be necessary to provide an adequate separation between the underlying subgrade and new fill and to prevent migration of the finer subgrade soils into the void space of the new fill.

Removal and replacement could also include a geogrid to reduce the depth of excavation with an associated amount of acceptable granular fill placed. A typical geogrid section would include Type SR (Subgrade Reinforcement) geogrid per WisDOT 2022 Standard Specification Section 645.2.3.2 and an estimated 12 inches of granular fill. An alternate combination of geogrid strength and related thickness of granular fill could be considered, but the system selected should be designed by an experienced contractor, engineer or geogrid supplier based on the site soil conditions.

Recondition the soft subgrade through moisture/density control:

If this option is chosen, the subgrade should be aerated through disking and dried to within two (2) percent of its optimum moisture content after which the dried soils can be re-compacted in place to at least 95% of the maximum modified Proctor density value (ASTM D1557). This method may not be effective if unstable soils extend to depths greater than 1 foot and should not be considered for areas of unsuitable soils or buried topsoil.

Additional Base Course Thickness or Stone Fill:

Increasing the base course thickness or incorporating open graded stone in the subgrade might be another alternative for improving subgrade conditions. A geotextile separator fabric is recommended under open graded stone in order to prevent contamination of stone where soft subgrade and/or cohesive soils are encountered.

Chemical Stabilization

The soft or unstable soils can also be stabilized with cement or fly ash. Chemical stabilization is typically more cost effective if performed over large areas in a single mobilization. In the case of soil stabilization, a proper mix design should be performed prior to the performance of any soil modification as the variability of the soil may limit the effectiveness of soil modification. GESTRA did not perform the mix design as it was not part of our scope of services.

The information presented in this report may be used to evaluate the site conditions for construction, but the contractor is responsible for determining site preparation means and methods required to complete the project.

Site grading should direct runoff away from planned pavement areas and should be maintained throughout construction so that the potential for softening of the subgrade soils is reduced. Equipment and working traffic should also be kept to a minimum on subgrade surfaces, especially during times of precipitation or following spring thaw. The contractor is responsible for maintaining completed earthwork areas. Consideration should be given to installing construction roads or utilizing the existing pavement for construction traffic to reduce disturbance to the subgrade soils.

Additional subgrade fill will be required to reach finish grades for portions of the new pavement areas. As a general rule for new fill placement, the lift thickness should not exceed 12 inches for granular soils and 9 inches for cohesive soils and the maximum particle size should be limited to 25% of the lift thickness. Engineered fill placed for the pavement subgrade/base course should be compacted to a minimum of 95% of the modified Proctor dry density value. Structural soil fill should be placed a minimum of five feet beyond the edges of the pavement areas, and an additional foot horizontally for each vertical foot of new fill to be placed to provide adequate lateral confinement. The inorganic site soils free of any construction debris that would be removed from excavations could be reused as structural fill; however, moisture conditioning and sorting of the material may be necessary.

This geotechnical report identifies or recommends material that may be used as engineered fill, but the contractor is responsible for utilizing materials that meet the project requirements and determining means and methods required for placement and compaction. Typically, clay soils are easier to dry or rework when placed over large open areas. Additionally, clay soils can be difficult to compact or moisture condition in trench backfill situations and may increase potential for consolidation and settlement of the backfill if it is not placed or compacted properly. Granular soils may be easier to place and compact in trench backfill situations, but may increase construction costs if the material has to be imported.

4.3 SOIL PARAMETERS

From the results of the geotechnical evaluation and information from the USDA NRCS Web Soil Survey, WisDOT Facilities Development Manual (FDM, 14-5-1), and WisDOT Geotechnical Manual; we recommend that the specific pavement design values outlined below be used in establishing the appropriate pavement section(s) for the project. These parameters assume soil subgrade preparation has been performed as recommended in this report, exposed unsuitable material is removed and are based on a subgrade soil type (AASHTO classification A-7-6) as a result of the clay fill and native clay soils observed. The subgrade conditions varied throughout the borings, so the soil type selected was based on the most prevalent material and the value may be conservative for areas of granular soils in the subgrade or if subgrade improvement is performed.

Table 4.1: Subgrade Soil Parameters

Design Group Index	14
Frost Index	F-3
Soil Support Value (SSV)	3.9
Drainage Class	P
Modulus of Subgrade Reaction (k)	125

Note: P = Poorly Drained.

The above soil parameters assume the recommendations of Section 4.2 are followed. Additionally, the use of the recommended design values is based on the following assumptions:

- The subgrade has been closely monitored during development of the road subbase.
- The subgrade has been thoroughly and adequately compacted.
- Wet zones have been dried, drained, or removed.
- Pockets of dissimilar material have been removed, replaced or mixed to achieve a homogeneous subgrade.
- Adequate subgrade drainage has been achieved. (Reference: WisDOT, Geotechnical Bulletin No. 1).

One of the important considerations in designing a high quality and durable pavement is providing adequate drainage. Drainage design for the proposed pavement section is outside of the scope of GESTRA's services for this project. It is important that bird baths (leeching basins) and surface waves are not created during construction of the HMA layer. A proper slope should be allowed and drainage should be provided along the edges of pavements and around catch basins to prevent the accumulation of free water within the base course, which otherwise may result in subgrade softening and pavement deterioration under exposure and repeated traffic conditions.

All pavements require regular maintenance and repair in order to maintain the serviceability of the pavement. These repairs and maintenance are due to normal wear and tear of the pavement surface and are required in order to extend the serviceability life of the pavement.

4.4 SITE EVALUATION OF STORMWATER

The samples collected from the borings were evaluated for stormwater features, and the WDNR Soil and Site Evaluation-Storm forms are included in Appendix I. The texture of the samples collected was identified visually. With the exception of boring SB-9, fill was observed below topsoil from an estimated depth of 2.5 feet bgs in boring SB-7 to 8.5 feet bgs in boring SB-1 and extended to the termination depth of 10 feet bgs in boring SB-3. The majority of the fill was visually classified as Clay, but included Sand, Sandy Clay, Sandy Loam, Sandy Clay Loam, Loamy Sand, and Loam.

Native Clay, Sandy Clay Loam, and Gravelly Sandy Clay Loam were encountered below the fill (3.4 feet) in boring SB-2. Sandy Loam was observed in SB-5 below the fill (5.5 feet) to the termination depth of boring. Water was encountered in SB-9 at 9 feet bgs during drilling but was not encountered after completion of drilling operation. Water was not observed in the remaining borings during or at the completion of drilling operations. Infiltration rates for the observed soil

textures were estimated based on the information provided in WDNR Technical Standard 1002, Table 2 (dated September 2017), and are presented in the Soil and Site Evaluation-Storm forms attached in Appendix I. The stratification lines between the soil types were identified based on the available data. The actual in-situ changes between layers may differ slightly and may be more gradual than depicted on the evaluation form. Subsurface and groundwater conditions can vary in areas not explored by GESTRA.

Based on our interpretation of the Wisconsin Department of Natural Resources (WDNR) NR 151.12(5)(c)6.a and Conservation Standard Practice 1002, infiltration is not required if sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, or clay is located within 5 feet of the bottom of the infiltration system. Borings SB-1, SB-3, SB-4, SB-6, SB-9, and SB-10, were reviewed for the bio swales in the roadway median (Bio 1 through 4). At these boring locations, fill consisting of Sandy Clay/Clay was the predominate material which may be considered exempt from infiltration requirements. For boring SB-5 located in the area of bio swale Bio 5, fill material was observed to approximately 2 ½ feet below the planned bottom of basin and native Sandy Loam was observed below the fill. The native soils in SB-5 may be designed for infiltration; however, based on the SPT-N values of the material, soil compaction mitigation should be included as part of the soil preparation.

Boring SB-2 was located in a likely greenspace outside of the roadway and parking lot construction limits. Fill material was observed to approximately 3.4 feet bgs and was visually classified as Clay. The underlying native soils consisted of Clay, Sandy Clay Loam. Therefore, based on the soil types encountered, the location of SB-2 may be considered exempt from infiltration requirements.

In addition to the infiltration evaluation, we evaluated the soil conditions following the general guidelines of the WDNR Conservation Practice Standard 1001(Wet Detention Ponds) if the basin is design for wet detention. The existing soil conditions were compared to Appendix D (Liner Flow Chart for Wet Detention Ponds) to determine if a liner is required. Within boring location SB-5, extremely and/or very gravelly sandy loam soil layer was encountered around the planned bottom elevation of the basin. Therefore, construction of a liner may be required.

The following recommendations are for the construction of a clay liner based on the information available in the Wisconsin Department of Safety and Professional Services Chapter SPS 382.365 and 360.30 and Appendix D of Technical Standard 1001 (Type A liner). At this time, the liner requirements have not been established and our recommendations are based on an assumed Type A clay liner. For a Type A liner, the base, sides and berms at elevations below the design high-water level should be constructed out of clay soils with the following properties.

- an average plasticity index (PI) of 12 or more with none less than 10,
- an average liquid limit (LL) of 25 or greater with none less than 20,
- a minimum of 50% of the soil by weight finer than the #200 sieve,
- a minimum of 90% of the soil by weight finer than the #4 sieve, and
- in-place hydraulic conductivity of the compacted soils should be $1x10^{-7}$ cm/sec or less.

Alternatively, a high-density polyethylene (HDPE) or geosynthetic clay liner (GCL) could be considered in lieu of the installation of a clay liner. Another option would be constructing the liner using a soil-bentonite clay mix, but this system typically requires design and construction by a

specialty contractor. Refer to Appendix D of Technical Standard 1001 for additional information related to the clay liner and these alternative liners.

The clay liner soils should be compacted using a sheepsfoot (or similar type) compactor to a minimum of 90% of the modified Proctor dry density value and at a moisture content at least 2% wet of optimum as determined by ASTM D1557. This material should be compacted in maximum 6-inch loose lifts and the compacted clay should be free of organics, cobbles, boulders, debris and any other unsuitable soils. The clay shall be disked or otherwise mechanically processed before compaction to break up clods so that the maximum clod size is 4 inches. The resulting clay liner should have a minimum thickness of 2 feet. Refer to NRCS Wisconsin Construction Specification 300 – Clay Liners for additional information pertaining to the placement and compaction of clay liner material.

Additional quality assurance testing is recommended during construction to confirm the material being placed meets the project requirements, including testing the clay liner materials for hydraulic conductivity and material properties. Regardless of the liner system selected, we recommend it be installed by a company with demonstrated prior experience with the product.

4.5 CONSTRUCTION CONSIDERATIONS

The detailed means and method of excavation and construction should be decided by the contractor and approved by the project design team. Based on the specific site information, geotechnical exploration results and requirements for the proposed project, the following issues should be taken in consideration during construction.

Dewatering

Based on the soil borings performed, substantial water is not anticipated to be encountered during excavation. However, perched or trapped water may be encountered within the granular soils if underlain by clayey soils or within pockets of granular material placed as fill. If water is encountered during excavation, we anticipate the appropriate number of temporary sump pits and pumps should be sufficient to remove anticipated volume of water in the excavation. The contractor should be prepared to control groundwater and surface water and prevent it from accumulating in excavations or otherwise affecting construction.

Excavation Stability

Caving is a common issue for excavation side walls during construction, especially if fill material, granular soils, and/or water seepage are observed. An excavation plan should be developed and the length of excavation left open should be limited to prevent caving soil from covering the prepared soils.

A temporary soil retention system may also be necessary in order to prevent caving or provide support of surrounding structures or utilities during construction. Providing recommendations or designing the retention system is out of the scope for GESTRA. The contractor must comply with the federal, state, local and updated OSHA regulations during excavation and in retention system design to ensure excavation safety.

Occupational Safety and Health Act (OSHA) has instituted strict standards for temporary construction excavations. These standards are outlined in 29 CFR Part 1926 Subpart P. Excavations within unstable soil conditions or extending five feet or more in depth should be adequately sloped or braced according to these standards. Excavation safety is the responsibility

of the contractor. Material stockpiles or heavy equipment should not be placed near the edge of the excavation slopes. The actual stable slope angle should be determined during construction and will depend upon the loading, soil, and groundwater conditions encountered.

Existing Fill

Foreign material was encountered within samples of the existing fill material collected from boring SB-1, SB-3, SB-5, SB-6, SB-8 and SB-10. As a result, excavating, handling and disposing material offsite may have special requirements. GESTRA has not evaluated the material with respect to environmental considerations.

Weather Implications

The subgrade soil might become unstable with exposure to adverse weather such as rain, snow and freezing temperatures. The unstable areas due to weather exposure may require an additional undercut or stabilization and the representative geotechnical engineer should assist with the determination of the depth of additional undercut or stabilization procedure based on observation of the field condition.

Soil Sensitivity

Soil at the construction site will be exposed to moisture and disturbance from construction traffic, construction equipment and human factors. Due to the disturbance, soil may become sensitive with contact of water. Contractor should try to lessen the exposure the soil at the construction site may encounter to moisture and disturbances. Therefore, the basins should be constructed immediately after the review of the representative geotechnical engineer.

5.0 EXPLORATION AND TESTING PROCEDURES

5.1 LAYOUT AND ELEVATION PROCEDURES

A total of ten (10) soil borings were completed at the locations shown on the attached Boring Location Map in Appendix I. The location of the borings were selected and marked in the field by Sigma. Some adjustments and offsets from the planned boring locations was required for drill rig access and due to site conditions and vegetation and the offset distance and direction are noted on the logs. The planned location of boring SB-8 encountered shallow refusal (2 feet bgs); the boring was offset 4 feet south and continued sampling to the termination depth of boring. Sigma also provided borehole location and elevation information to GESTRA. Elevation and location of the borings SB-3, SB-6, and SB-9 on the soil boring logs were the as-drilled locations and were obtained by GESTRA using a Geomax Zenith 35 GNSS-INS receiver. These coordinates and elevation were not obtained by a licensed surveyor.

5.2 FIELD TESTING PROCEDURES

The boreholes were drilled using a track mounted D50 drill rig. The boreholes were initiated and advanced by using hollow stem augers. The borings were sampled at 2-foot continuous intervals to the termination depth of the borings.

All representative soil samples were taken in general accordance with the “Standard Method for Penetration Test and Split-Barrel Sampling of Soils” (ASTM D1586). After each sampling, a soil sample was retained and placed in a jar and recorded for type, color, consistency, and moisture, sealed and then transported to the laboratory for further review and testing, if required. The specific

drilling method used including the depths, rig type, crew chief, are included on each of the individual boring logs as it may change for each borehole.

5.3 LABORATORY TESTING PROCEDURES

After completion of drilling operations, all of the retained soil samples were transported to GESTRA's laboratory and classified by a geotechnical engineer using the Unified Soil Classification System (USCS). The borings were also classified using the Field Book for Describing and Sampling Soils, USDA, NRCS, 2012. Charts describing the classification systems used are included in Appendix I of this report. The engineer assigned laboratory testing suited to extract important index properties of the soil layers. These tests included hand penetrometer, moisture and organic contents (LOI), Atterberg limits, hydrometer, and P200.

STANDARD OF CARE

Our exploration was limited to evaluating subsurface soil and groundwater conditions pertaining to the proposed project. GESTRA did not perform any environmental, chemical, or hydrogeologic testing as these were not part of our work scope.

This report should be made available in its entirety to bidding contractors for information purposes. The soil borings and site sketch should not be detached from this report. Our report is not valid if used for purposes other than what is described in the report.

All OSHA regulations such as those regarding proper sloping and temporary shoring of excavations should be followed during the entire construction process.

GESTRA has presented our professional opinions in this report in the form of recommendations. Our opinions are based on our understanding of current project information and related accepted engineering practices at the time of this report. Other than this, no warranty is implied or intended.

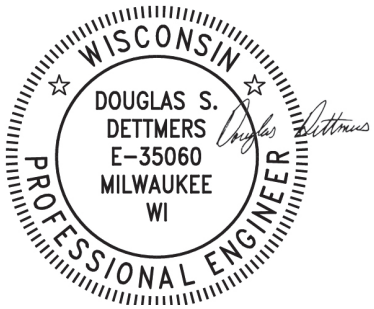
Sincerely,

GESTRA Engineering, Inc.

Report Prepared By:

Tri Tran, Ph.D., E.I.T.
Staff Engineer

Report Reviewed By:



Digitally signed by Douglas Dettmers
Date: 2022.03.02 16:34:32 -06'00'

Douglas Dettmers, P.E.
Senior Engineer

APPENDIX I

SITE LOCATION MAP, BORING LOCATION MAP, SOIL BORING LOGS, SOIL AND SITE EVALUATION-STORM FORMS, GENERAL NOTES AND SOILS CLASSIFICATION

Base map obtained from Waukesha County GIS Map

GESTRA Engineering, Inc.
191 W. Edgerton Avenue
Milwaukee, WI 53207
Phone: (414) 933-7444
Fax: (414) 933-7844

Project Name & Location:
Waukesha Memorial Boulevard
From Lawndale Avenue to Madison Street
Waukesha, Wisconsin

Drawing Title:
Site Location Map

Project No.: 22009-10

Scale: Not to Scale

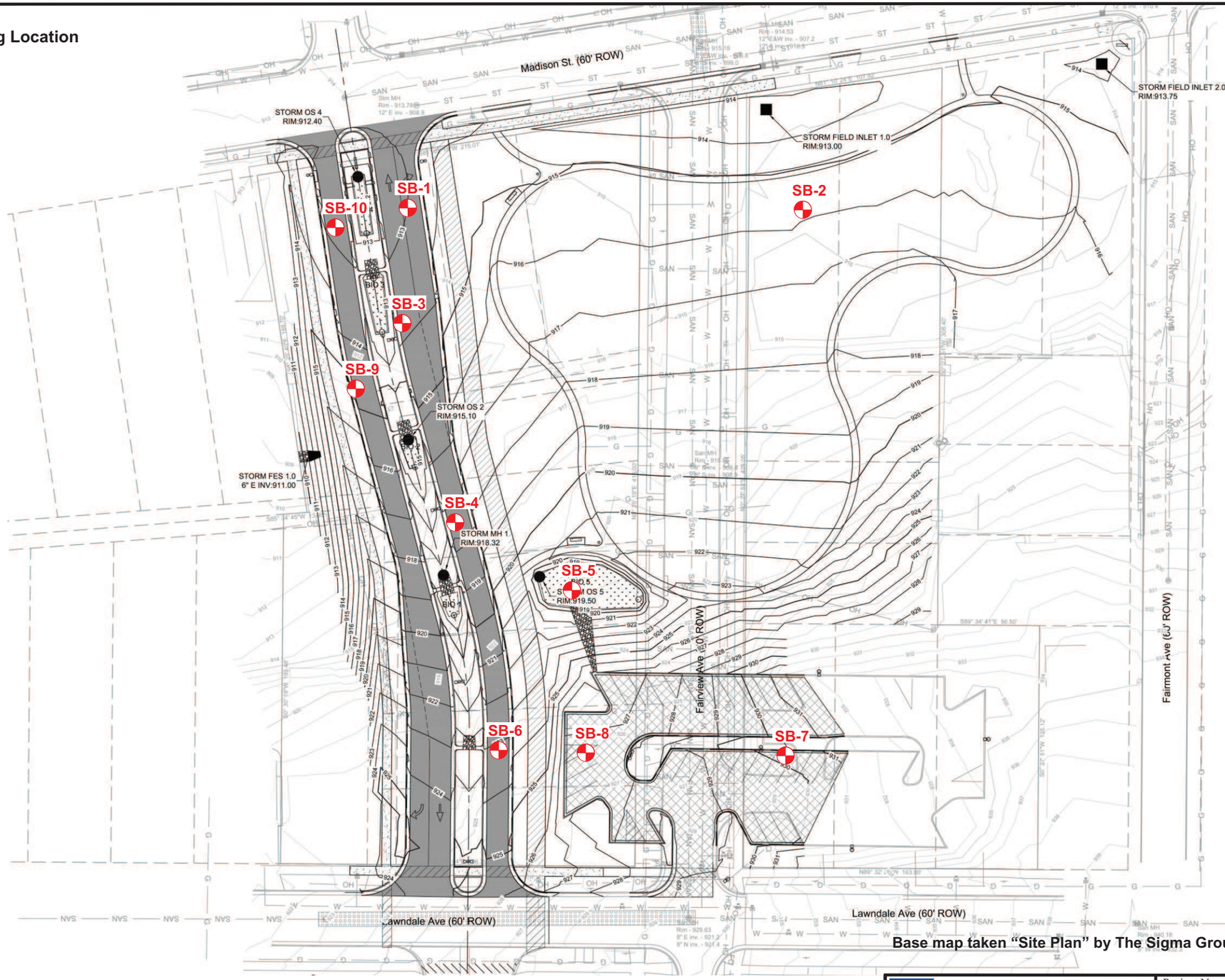
Drawing No.: 1 of 1

Prepared by: T. Tran

Checked by: D. Dettmers

Date: February 10, 2022

= Approximate Boring Location



Base map taken "Site Plan" by The Sigma Group dated 1/7/2022 provided to GESTRA

Paper Size: 17" x 11"

GESTRA Engineering, Inc.
191 W. Edgerton Avenue
Milwaukee, WI 53207
Phone: (414) 933-7444
Fax: (414) 933-7844

Project Name & Location:
Waukesha Memorial Boulevard
From Lawndale Avenue to Madison Street
Waukesha, Wisconsin

Drawing Title:
Boring Location Map

Project No.: 22009-10

Scale: 1 inch = 60 feet

Drawing No.: 1 of 1

Prepared by: T. Tran

Checked by: D. Dettmers

Date: February 10, 2022

SOIL BORING LOG

GESTRA Engineering Inc.
191 W Edgerton Avenue
Milwaukee, WI 53207
Phone: 414-933-7444, Fax: 414-933-7844

PROJECT NAME: Waukesha Memorial Boulevard		DATE DRILLING STARTED: 2/8/2022	PAGE NUMBER: 1 of 1
PROJECT LOCATION: Waukesha, Wisconsin		DATE DRILLING ENDED: 2/8/2022	BORING NUMBER: SB-1
BORING DRILLED BY: FIRM: GESTRA CREW CHIEF: D. Harris	FIELD LOG: P. Chavez LAB LOG / QC: T. Tran	NORTHING: 374307 EASTING: 2438332	PROJECT NUMBER: 22009-10 DRILLING RIG: Diedrich D50 ATV DRILLING METHOD: 3¼" HSA SURFACE ELEVATION: 914.6 ft

Number and Type	Recovery (in)	Blow Counts	N - Value	Depth (ft) / Elevation	Soil Description and Geological Origin for Each Major Unit	USCS Classification	Graphic	Well Diagram	Unconfined Comp. Strength (Q_u or Q_p) (tsf)	Liquid Limit	Plasticity Index	Moisture Content (%)	Comments
SS - 1	16	37 50/5"	R		TOPSOIL (10-inches) 0.8 (913.8) LEAN CLAY WITH SAND AND GRAVEL, brown, moist (FILL)								Driller noted 8-inches frost.
SS - 2	13	5 12 11 6	23		2.5 (912.1) SAND WITH SILT AND CONCRETE PIECES, black, moist, trace wood (FILL) 4 (910.6)								
SS - 3	16	3 4 8 10	12	910.0 5	SANDY LEAN CLAY, black, moist (FILL) gray with brown at bottom of sample 5.5 (909.1)							23.9	Sample 3A. LOI = 3.5%
SS - 4	4	4 3 5 5	8		SILTY SAND, black, moist, trace gravel (FILL-Possible foundry sand) 6 (908.6) SANDY LEAN CLAY, dark brown, moist, trace large gravel (FILL) 8.5 (906.1)							18.3	Sample 3B. LOI = 2.1%
SS - 5	18	3 4 7 7	11	905.0 10	SILTY CLAY, brown with gray, moist, very stiff 9.8 (904.8)	CL-ML			2.5			18.4	
SS - 6	14	4 4 6 8	10		SILT, brown with gray, moist, medium dense, trace sand 12 (902.6)	ML						15.4	
				900.0 15	End of Boring at 12.0 ft.								

WATER & CAVE-IN OBSERVATION DATA

▽	WATER ENCOUNTERED DURING DRILLING: NE ft.		CAVE DEPTH AT COMPLETION: NMR	WET ☐ DRY ☐
▼	WATER LEVEL AT COMPLETION: NE		CAVE DEPTH AFTER 0 HOURS: NMR	WET ☐ DRY ☐
▼	WATER LEVEL AFTER 0 HOURS: NMR			

NOTE: Stratification lines between soil types represent the approximate boundary; gradual transition between in-situ soil layers should be expected.

SOIL BORING LOG

GESTRA Engineering Inc.
191 W Edgerton Avenue
Milwaukee, WI 53207
Phone: 414-933-7444, Fax: 414-933-7844

PROJECT NAME: Waukesha Memorial Boulevard		DATE DRILLING STARTED: 2/8/2022	PAGE NUMBER: 1 of 1
PROJECT LOCATION: Waukesha, Wisconsin		DATE DRILLING ENDED: 2/8/2022	BORING NUMBER: SB-2
BORING DRILLED BY: FIRM: GESTRA CREW CHIEF: D. Harris	FIELD LOG: P. Chavez LAB LOG / QC: T. Tran	NORTHING: 374307 EASTING: 2438549	PROJECT NUMBER: 22009-10 DRILLING RIG: Diedrich D50 ATV DRILLING METHOD: 3¼" HSA SURFACE ELEVATION: 915.1 ft

Number and Type	Recovery (in)	Blow Counts	N - Value	Depth (ft)	Elevation	Soil Description and Geological Origin for Each Major Unit	USCS Classification	Graphic	Well Diagram	Unconfined Comp. Strength (Q_u or Q_p) (tsf)	Liquid Limit	Plasticity Index	Moisture Content (%)	Comments
SS - 1	18	7 8 8 5	16			TOPSOIL (3.5-inches) 0.3 (914.8) LEAN CLAY, brown, moist, trace sand and gravel (FILL)					24	11	11.1	Driller noted 2-inches frost.
SS - 2	10	2 2 3 3	5			2.5 (912.6) LEAN CLAY, brown with dark gray and black mottles, moist, possible buried topsoil on top of sample (FILL) 3.4 (911.7) LEAN CLAY, brown with gray, moist, stiff							22.8	
SS - 3	15	1 3 4 5	7	5	910.0		CL			1.25			21.1	
SS - 4	17	4 7 9 23	16			6.5 (908.6) SILTY SAND, brown, moist, medium dense to dense, trace gravel								
SS - 5	5	18 19 20 18	39				SM							
						with limestone chips in SS-5								
				10	905.0	10 (905.1) End of Boring at 10.0 ft.								
				15										

WATER & CAVE-IN OBSERVATION DATA

▽	WATER ENCOUNTERED DURING DRILLING: NE ft.		CAVE DEPTH AT COMPLETION: NMR	WET ☐ DRY ☐
▼	WATER LEVEL AT COMPLETION: NE		CAVE DEPTH AFTER 0 HOURS: NMR	WET ☐ DRY ☐
▼	WATER LEVEL AFTER 0 HOURS: NMR			

NOTE: Stratification lines between soil types represent the approximate boundary; gradual transition between in-situ soil layers should be expected.

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SOIL BORING LOG

PROJECT NAME	Waukesha Memorial Boulevard
PROJECT LOCATION	Waukesha, Wisconsin
DATE DRILLING STARTED	2/8/2022
DATE DRILLING ENDED	2/8/2022
BORING NUMBER	SB-3
PROJECT NUMBER	22009-10
DRILLING RIG	Diedrich D50 ATV
BORING DRILLED BY	FIRM: GESTRA CREW CHIEF: D. Harris
FIELD LOG	P. Chavez
LAB LOG / QC	T. Tran
NORTHING	374255
EASTING	2438324
DRILLING METHOD	3¼" HSA
SURFACE ELEVATION	913.7 ft

Number and Type	Recovery (in)	Blow Counts	N - Value	Depth (ft) / Elevation	Soil Description and Geological Origin for Each Major Unit	USCS Classification	Graphic	Well Diagram	Unconfined Comp. Strength (Q_u or Q_p) (tsf)	Liquid Limit	Plasticity Index	Moisture Content (%)	Comments
SS - 1	18	12 20 34 18	54		TOPSOIL (12-inches) 1 (912.7)								Boring was offset 12' east from planned location due to tree. Driller noted 11-inches frost.
					LEAN CLAY WITH SAND, brown, moist, trace gravel and roots, with topsoil mixed in the sample (FILL) 2 (911.7)							14.3	
SS - 2	12	2 5 6 8	11	910.0	SILTY SAND WITH GRAVEL, dark brown/black, moist (FILL-Possible foundry sand) 4.5 (909.2)								LOI = 5.4%
SS - 3	6	4 3 4 4	7	5	SANDY LEAN CLAY, brown, dark brown, moist, stiff, trace gravel (FILL) 6.5 (907.2)							14.7	LOI = 3.7%
SS - 4	11	1 2 2 3	4		LEAN CLAY, gray, moist, medium stiff, trace gravel (possible FILL or soil disturbed by root zone)	CL			0.75			26	
SS - 5	12	3 3 2 3	5	905.0	gray, black, large gravel in SS-5 10 (903.7)				0.5			26	
				10	End of Boring at 10.0 ft.								
				900.0									
				15									

WATER & CAVE-IN OBSERVATION DATA

▽	WATER ENCOUNTERED DURING DRILLING: NE ft.		CAVE DEPTH AT COMPLETION: NMR	WET ☐ DRY ☐
▼	WATER LEVEL AT COMPLETION: NE		CAVE DEPTH AFTER 0 HOURS: NMR	WET ☐ DRY ☐
▼	WATER LEVEL AFTER 0 HOURS: NMR			

NOTE: Stratification lines between soil types represent the approximate boundary; gradual transition between in-situ soil layers should be expected.

SOIL BORING LOG

GESTRA Engineering Inc.
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Milwaukee, WI 53207
Phone: 414-933-7444, Fax: 414-933-7844

PROJECT NAME: Waukesha Memorial Boulevard		DATE DRILLING STARTED: 2/7/2022	PAGE NUMBER: 1 of 1
PROJECT LOCATION: Waukesha, Wisconsin		DATE DRILLING ENDED: 2/7/2022	BORING NUMBER: SB-4
BORING DRILLED BY: FIRM: GESTRA CREW CHIEF: D. Harris	FIELD LOG: P. Chavez LAB LOG / QC: T. Tran	NORTHING: 374137 EASTING: 2438358	PROJECT NUMBER: 22009-10 DRILLING RIG: Diedrich D50 ATV DRILLING METHOD: 3¼" HSA SURFACE ELEVATION: 916.8 ft

Number and Type	Recovery (in)	Blow Counts	N - Value	Depth (ft) / Elevation	Soil Description and Geological Origin for Each Major Unit	USCS Classification	Graphic	Well Diagram	Unconfined Comp. Strength (Q_u or Q_p) (tsf)	Liquid Limit	Plasticity Index	Moisture Content (%)	Comments
SS - 1	18	11 38 21 8	59		TOPSOIL (12-inches) 1 (915.8) SILTY, CLAYEY GRAVEL WITH SAND, brown, moist (FILL)								Driller noted 8-inches frost.
				915.0	1.8 (915) SANDY LEAN CLAY, brown, moist, trace gravel (FILL)								
SS - 2	15	4 4 5 12	9									14.8	
SS - 3	18	6 5 7 7	12	5	5 (911.8) LEAN CLAY, dark brown, moist, trace sand and gravel (FILL)							16.7	LOI = 5%
SS - 4	9	5 9 13 13	22	910.0	7.5 (909.3) SILTY SAND, brown, moist, medium dense, trace gravel	SM							
SS - 5	18	10 11 7 7	18		8 (908.8) SILTY SAND WITH GRAVEL, brown, moist, medium dense	SM							
				10	10 (906.8) End of Boring at 10.0 ft.								
				905.0									
				15									

WATER & CAVE-IN OBSERVATION DATA

▽	WATER ENCOUNTERED DURING DRILLING: NE ft.		CAVE DEPTH AT COMPLETION: NMR	WET ☐ DRY ☐
▼	WATER LEVEL AT COMPLETION: NE		CAVE DEPTH AFTER 0 HOURS: NMR	WET ☐ DRY ☐
▼	WATER LEVEL AFTER 0 HOURS: NMR			

NOTE: Stratification lines between soil types represent the approximate boundary; gradual transition between in-situ soil layers should be expected.

SOIL BORING LOG

GESTRA Engineering Inc.
191 W Edgerton Avenue
Milwaukee, WI 53207
Phone: 414-933-7444, Fax: 414-933-7844

PROJECT NAME: Waukesha Memorial Boulevard		DATE DRILLING STARTED: 2/7/2022	PAGE NUMBER: 1 of 1
PROJECT LOCATION: Waukesha, Wisconsin		DATE DRILLING ENDED: 2/7/2022	BORING NUMBER: SB-5
BORING DRILLED BY: FIRM: GESTRA CREW CHIEF: D. Harris	FIELD LOG: P. Chavez LAB LOG / QC: T. Tran	NORTHING: 374097 EASTING: 2438419	PROJECT NUMBER: 22009-10 DRILLING RIG: Diedrich D50 ATV DRILLING METHOD: 3¼" HSA SURFACE ELEVATION: 921.9 ft

Number and Type	Recovery (in)	Blow Counts	N - Value	Depth (ft) / Elevation	Soil Description and Geological Origin for Each Major Unit	USCS Classification	Graphic	Well Diagram	Unconfined Comp. Strength (Q_u or Q_p) (tsf)	Liquid Limit	Plasticity Index	Moisture Content (%)	Comments
SS - 1	10	8 14 8 6	22		TOPSOIL (10-inches) 0.8 (921.1) LEAN CLAY, brown, moist, trace sand, gravel and roots hair (FILL) 1.4 (920.5)							22.5	Driller noted 9-inches frost.
SS - 2	13	3 2 8 10	10	**920.0**	GRAVEL, ASPHALT WITH SAND AND CLAY, brown, black, moist, trace roots (FILL) 3.5 (918.4) GRAVEL WITH SAND AND CLAY, brown, moist (FILL)								
SS - 3	12	8 7 20 8	27	**5** **915.0**	5.5 (916.4) SILTY SAND, brown, moist, medium dense, trace gravel	SM							
SS - 4	16	4 7 7 10	14										Gravel = 14.3%, Sand = 46.2%, Silt = 24.5%, Clay = 15%
SS - 5	15	3 7 8 10	15	**10**									
SS - 6	15	3 4 7 6	11	**910.0**	trace large gravel in SS-6 12 (909.9) End of Boring at 12.0 ft.								
				15									

WATER & CAVE-IN OBSERVATION DATA

▽	WATER ENCOUNTERED DURING DRILLING: NE ft.		CAVE DEPTH AT COMPLETION: NMR	WET ☐ DRY ☐
▼	WATER LEVEL AT COMPLETION: NE		CAVE DEPTH AFTER 0 HOURS: NMR	WET ☐ DRY ☐
▼	WATER LEVEL AFTER 0 HOURS: NMR			

NOTE: Stratification lines between soil types represent the approximate boundary; gradual transition between in-situ soil layers should be expected.

SOIL BORING LOG

GESTRA Engineering Inc.
191 W Edgerton Avenue
Milwaukee, WI 53207
Phone: 414-933-7444, Fax: 414-933-7844

PROJECT NAME: Waukesha Memorial Boulevard		DATE DRILLING STARTED: 2/7/2022	PAGE NUMBER: 1 of 1
PROJECT LOCATION: Waukesha, Wisconsin		DATE DRILLING ENDED: 2/7/2022	BORING NUMBER: SB-6
BORING DRILLED BY: FIRM: GESTRA CREW CHIEF: D. Harris	FIELD LOG: P. Chavez LAB LOG / QC: T. Tran	NORTHING: 374007 EASTING: 2438383	PROJECT NUMBER: 22009-10 DRILLING RIG: Diedrich D50 ATV DRILLING METHOD: 3¼" HSA SURFACE ELEVATION: 925.6 ft

Number and Type	Recovery (in)	Blow Counts	N - Value	Depth (ft) / Elevation	Soil Description and Geological Origin for Each Major Unit	USCS Classification	Graphic	Well Diagram	Unconfined Comp. Strength (Q_u or Q_p) (tsf)	Liquid Limit	Plasticity Index	Moisture Content (%)	Comments
SS - 1	12	24 17 13 10	30	925.0	TOPSOIL (8-inches) 0.7 (924.9) CLAYEY SAND, brown, moist, trace gravel and roots hair (FILL)					34	16	15.8	Boring was offset 16' east from planned location due to tree. Driller noted 4-inches frost. P200 = 43.5%
SS - 2	18	7 3 4 4	7		possible slag pieces in SS-2							11.9	Atterberg limits and P200 were performed on combined sample SS-1 and SS-2.
SS - 3	0	6 8 11 14	19	5 920.0	6 (919.6)								Pushed stone during sampling. No sample recovery.
SS - 4	18	8 12 12 12	24		SILTY SAND, brown, moist, medium dense to very dense, trace gravel	SM				11	0		Atterberg limits test performed on P40 material.
SS - 5	18	9 17 12 33	29	10	with limestone chips in SS-5								
SS - 6	18	5 25 27 19	52	915.0	11 (914.6) SAND WITH SILT AND GRAVEL, gray, brown, moist, very dense 12 (913.6)	SP-SM							
				15	End of Boring at 12.0 ft.								

WATER & CAVE-IN OBSERVATION DATA

▽	WATER ENCOUNTERED DURING DRILLING: NE ft.		CAVE DEPTH AT COMPLETION: NMR	WET ☐ DRY ☐
▼	WATER LEVEL AT COMPLETION: NE		CAVE DEPTH AFTER 0 HOURS: NMR	WET ☐ DRY ☐
▼	WATER LEVEL AFTER 0 HOURS: NMR			

NOTE: Stratification lines between soil types represent the approximate boundary; gradual transition between in-situ soil layers should be expected.

SOIL BORING LOG

GESTRA Engineering Inc.
191 W Edgerton Avenue
Milwaukee, WI 53207
Phone: 414-933-7444, Fax: 414-933-7844

PAGE NUMBER: 1 of 1

PROJECT NAME	Waukesha Memorial Boulevard
PROJECT LOCATION	Waukesha, Wisconsin
DATE DRILLING STARTED	2/8/2022
DATE DRILLING ENDED	2/8/2022
BORING NUMBER	SB-7
PROJECT NUMBER	22009-10
DRILLING RIG	Diedrich D50 ATV
BORING DRILLED BY	FIRM: GESTRA CREW CHIEF: D. Harris
FIELD LOG	P. Chavez
LAB LOG / QC	T. Tran
NORTHING	374005
EASTING	2438542
DRILLING METHOD	3¼" HSA
SURFACE ELEVATION	930.4 ft

Number and Type	Recovery (in)	Blow Counts	N - Value	Depth (ft) / Elevation	Soil Description and Geological Origin for Each Major Unit	USCS Classification	Graphic	Well Diagram	Unconfined Comp. Strength (Q_u or Q_p) (tsf)	Liquid Limit	Plasticity Index	Moisture Content (%)	Comments
SS - 1	24	23 18 23 29	41	930.0	TOPSOIL (4-inches)								Driller noted 9-inches frost.
					0.3 (930.1) SITLTY SAND WITH GRAVEL, brown, moist (FILL)								
SS - 2	11	2 4 5 8	9		2.5 (927.9) SILTY SAND, brown, moist, loose to medium dense, trace gravel	SM							
SS - 3	15	3 4 6 14	10	5 925.0	5.6 (924.8) SILTY SAND WITH GRAVEL, brown, moist, dense to very dense								
SS - 4	24	8 20 24 24	44			SM							
SS - 5	24	9 25 29 30	54	10 920.0	10 (920.4) End of Boring at 10.0 ft.								
				15									

WATER & CAVE-IN OBSERVATION DATA

▽	WATER ENCOUNTERED DURING DRILLING: NE ft.		CAVE DEPTH AT COMPLETION: NMR	WET ☐ DRY ☐
▼	WATER LEVEL AT COMPLETION: NE		CAVE DEPTH AFTER 0 HOURS: NMR	WET ☐ DRY ☐
▼	WATER LEVEL AFTER 0 HOURS: NMR			

NOTE: Stratification lines between soil types represent the approximate boundary; gradual transition between in-situ soil layers should be expected.

SOIL BORING LOG

GESTRA Engineering Inc.
191 W Edgerton Avenue
Milwaukee, WI 53207
Phone: 414-933-7444, Fax: 414-933-7844

PROJECT NAME: Waukesha Memorial Boulevard		DATE DRILLING STARTED: 2/7/2022	PAGE NUMBER: 1 of 1
PROJECT LOCATION: Waukesha, Wisconsin		DATE DRILLING ENDED: 2/7/2022	BORING NUMBER: SB-8
BORING DRILLED BY: FIRM: GESTRA CREW CHIEF: D. Harris	FIELD LOG: P. Chavez LAB LOG / QC: T. Tran	NORTHING: 374006 EASTING: 2438430	PROJECT NUMBER: 22009-10 DRILLING RIG: Diedrich D50 ATV DRILLING METHOD: 3¼" HSA SURFACE ELEVATION: 926.4 ft

Number and Type	Recovery (in)	Blow Counts	N - Value	Depth (ft) / Elevation	Soil Description and Geological Origin for Each Major Unit	USCS Classification	Graphic	Well Diagram	Unconfined Comp. Strength (Q_u or Q_p) (tsf)	Liquid Limit	Plasticity Index	Moisture Content (%)	Comments
					TOPSOIL (6-inches) 0.5 (925.9)								Frost depth was not recorded on field log.
SS - 1	14	17 16 8 9	24	925.0	GRAVEL WITH SAND AND CLAY, brown, moist, trace roots hair (FILL) 2 (924.4)								
SS - 2	3	3 4 10 8	14		LEAN CLAY WITH SAND, dark brown, moist, trace gravel and wood pieces (FILL)							16	Auger refusal at 2 feet. Boring was offset 4' south and continued sampling.
SS - 3	10	2 38 50/3"	R	5	5.5 (920.9)								
					CONCRETE PIECES WITH SAND AND CLAY, brown, dark brown, moist, steel wires present (FILL)								
				920.0	6.5 (919.9)								
SS - 4	18	10 8 7 10	15		SILTY SAND, brown, moist, medium dense to very dense, trace gravel								
SS - 5	18	5 12 18 19	30	10		SM							
SS - 6	18	19 24 31 50/4"	55	915.0	12 (914.4)								
					End of Boring at 12.0 ft.								
				15									

WATER & CAVE-IN OBSERVATION DATA

▽	WATER ENCOUNTERED DURING DRILLING: NE ft.		CAVE DEPTH AT COMPLETION: NMR	WET ☐ DRY ☐
▼	WATER LEVEL AT COMPLETION: NE		CAVE DEPTH AFTER 0 HOURS: NMR	WET ☐ DRY ☐
▼	WATER LEVEL AFTER 0 HOURS: NMR			

NOTE: Stratification lines between soil types represent the approximate boundary; gradual transition between in-situ soil layers should be expected.

SOIL BORING LOG

GESTRA Engineering Inc.
191 W Edgerton Avenue
Milwaukee, WI 53207
Phone: 414-933-7444, Fax: 414-933-7844

PROJECT NAME: Waukesha Memorial Boulevard		DATE DRILLING STARTED: 2/7/2022	PAGE NUMBER: 1 of 1
PROJECT LOCATION: Waukesha, Wisconsin		DATE DRILLING ENDED: 2/7/2022	BORING NUMBER: SB-9
BORING DRILLED BY: FIRM: GESTRA CREW CHIEF: D. Harris	FIELD LOG: P. Chavez LAB LOG / QC: T. Tran	NORTHING: 374210 EASTING: 2438297	PROJECT NUMBER: 22009-10 DRILLING RIG: Diedrich D50 ATV DRILLING METHOD: 3¼" HSA SURFACE ELEVATION: 911.2 ft

Number and Type	Recovery (in)	Blow Counts	N - Value	Depth (ft) / Elevation	Soil Description and Geological Origin for Each Major Unit	USCS Classification	Graphic	Well Diagram	Unconfined Comp. Strength (Q_u or Q_p) (tsf)	Liquid Limit	Plasticity Index	Moisture Content (%)	Comments
SS - 1	18	8 6 7 6	13	910.0	TOPSOIL, lean clay, black, moist, trace gravel, trace roots							28.3	Boring was offset 12' north from planned location due to tree. Driller noted 8-inches frost. LOI = 5.6%
SS - 2	5	5 5 5 9	10	3.2 (908)	LEAN CLAY, gray with brown mottling, moist, very stiff, trace root hairs							24.7	
SS - 3	12	4 4 5 6	9	5		CL			3.0	48	27	23.8	
				905.0									
SS - 4	18	3 3 6 7	9	7 (904.2)	LEAN CLAY WITH SAND, gray with brown, moist, very stiff	CL			2.75			16.7	
SS - 5	18	4 3 3 7	6	▽ 9 (902.2)	CLAYEY SAND, gray with brown, wet, loose	SC							
				10 (901.2)	End of Boring at 10.0 ft.								
				10									
				900.0									
				15									

WATER & CAVE-IN OBSERVATION DATA

▽	WATER ENCOUNTERED DURING DRILLING: 9 ft.		CAVE DEPTH AT COMPLETION: NMR	WET ☐ DRY ☐
▼	WATER LEVEL AT COMPLETION: NE		CAVE DEPTH AFTER 0 HOURS: NMR	WET ☐ DRY ☐
▼	WATER LEVEL AFTER 0 HOURS: NMR			

NOTE: Stratification lines between soil types represent the approximate boundary; gradual transition between in-situ soil layers should be expected.

SOIL BORING LOG

GESTRA Engineering Inc.
191 W Edgerton Avenue
Milwaukee, WI 53207
Phone: 414-933-7444, Fax: 414-933-7844

PROJECT NAME: Waukesha Memorial Boulevard		DATE DRILLING STARTED: 2/7/2022	PAGE NUMBER: 1 of 1
PROJECT LOCATION: Waukesha, Wisconsin		DATE DRILLING ENDED: 2/7/2022	BORING NUMBER: SB-10
BORING DRILLED BY: FIRM: GESTRA CREW CHIEF: D. Harris	FIELD LOG: P. Chavez LAB LOG / QC: T. Tran	NORTHING: 374295 EASTING: 2438291	PROJECT NUMBER: 22009-10 DRILLING RIG: Diedrich D50 ATV DRILLING METHOD: 3¼" HSA SURFACE ELEVATION: 913.6 ft

Number and Type	Recovery (in)	Blow Counts	N - Value	Depth (ft) / Elevation	Soil Description and Geological Origin for Each Major Unit	USCS Classification	Graphic	Well Diagram	Unconfined Comp. Strength (Q_u or Q_p) (tsf)	Liquid Limit	Plasticity Index	Moisture Content (%)	Comments
SS - 1	18	16 16 10 7	26		TOPSOIL (12-inches)								Driller noted 8-inches frost. Topsoil thickness was not recorded on field log.
					1 (912.6) LEAN CLAY WITH SAND, dark brown, moist, trace gravel and asphalt pieces (FILL)							15.9	
SS - 2	12	4 5 4 4	9		brown, dark brown, trace gravel and concrete pieces in SS-2							21.1	
				910.0	3.5 (910.1) LEAN CLAY, black, moist, trace gravel (possible buried TOPSOIL)								
SS - 3	18	2 3 3 4	6	5								32.9	LOI = 7%
SS - 4	18	2 3 4 4	7		7 (906.6) LEAN CLAY, gray with brown, moist, stiff to very stiff	CL			2.0			23.7	
				905.0	8.8 (904.8)								
SS - 5	18	3 4 4 5	8		SILT, gray with brown, moist, loose	ML						21.2	
				10	10 (903.6) End of Boring at 10.0 ft.								
				900.0									
				15									

WATER & CAVE-IN OBSERVATION DATA

▽	WATER ENCOUNTERED DURING DRILLING: NE ft.		CAVE DEPTH AT COMPLETION: NMR	WET ☐ DRY ☐
▼	WATER LEVEL AT COMPLETION: NE		CAVE DEPTH AFTER 0 HOURS: NMR	WET ☐ DRY ☐
▼	WATER LEVEL AFTER 0 HOURS: NMR			

NOTE: Stratification lines between soil types represent the approximate boundary; gradual transition between in-situ soil layers should be expected.

1002-CPS-23
Division of Industry Services
P. O. Box 2658
Madison, Wisconsin 53701
Scott Walker, Governor
Laura Gutierrez, Secretary

SOIL AND SITE EVALUATION – STORM

In accordance with SPS 382.365, 385, Wis. Adm. Code, and WDNR Standard 1002

Attach a complete site plan on paper not less than 8 ½ x 11 inches in size. Plan must include, but not limited to: vertical and horizontal reference point (BM), direction and percent of slope, scale or dimensions, north arrow, and BM referenced to nearest road

Please print all information

Personal information you provide may be used for secondary purposes [Privacy Law, s. 15.04(1)(m)]

County: Waukesha

Parcel I.D.:

Reviewed by: T. Tran
Date: 2/28/2022

Property Owner: Waukesha Memorial Hospital, Inc.

Property Location: Govt. Lot ¼ SW ¼ NW S 3 T 6 N R 19 ☑ E (or) ☐ W

Property Owner' Mail Address: 725 American Avenue

Lot # | Block # | Subd. Name or CSM #

City: Waukesha State: WI Zip Code: 53188 Phone Number:

☐ City ☐ Village ☐ Town Nearest Road

Drainage area _____ ☐ sq .ft ☐ acres

Test site suitable for (check all that apply): ☐ Site not suitable;

☐ Bioretention; ☐ Subsurface Dispersal System;

☐ Reuse; ☐ Irrigation; ☐ Other _____

Hydraulic Application Test Method

■ Morphological Evaluation
☐ Double Ring Infiltrometer

☐ Other: (specify) _____

Soil Moisture
Date of soil borings: _____

USDA-NRCS WETS Value:
☐ Dry =1;
☐ Normal = 2;
☐ Wet = 3.

SB-1 #OBS. ☐ Pit ■ Boring Ground surface elevation. 914.6 ft. Elevation of limiting factor -- ft.

Horizon	Depth ft.	Dominant Color Munsell	Redox Description Qu. Sz. Cont. Color	Texture	Structure Gr. Sz. Sh.	Consistence	Boundary	% Rock Frags.	% Fines	Hydraulic App Rate Inches/Hr
*FILL	2.5	10 YR 3/2	--	GRSC	1, VF, SBK	MFR	--	20-30	--	0.04
FILL	4.0	10 YR 2/1	--	GRS**	0, SG	MLO	--	<25	--	3.60
FILL	5.5	10 YR 5/1	--	SC	0,M	MFR	--	<15	--	0.04
FILL	6	10 YR 6/1 & 6/4	--	SL	0, SG	MLO	--	<5	--	0.50
FILL	8.5	10 YR 3/2	--	GRSC	1, VF, SBK	MFR	--	<20	--	0.04
C	9.8	10 YR 6/2 & 4/4	--	SIC	0, M	MVFI	--	<15	--	0.07
C	12	10 YR 6/2	--	SIL	0, SG	MLO	--	--	--	0.13

Comments:
*Topsoil (10-inches) sample not available for review. ** trace concrete pieces, trace wood pieces

SB-2 #OBS. ☐ Pit ■ Boring Ground surface elevation. 915.1 ft. Elevation of limiting factor _____ ft.

Horizon	Depth ft.	Dominant Color Munsell	Redox Description Qu. Sz. Cont. Color	Texture	Structure Gr. Sz. Sh.	Consistence	Boundary	% Rock Frags.	% Fines	Hydraulic App Rate Inches/Hr
A	0.3	10 YR 3/2	--	C	1, VF, SBK	MFR	--	--	--	0.07
FILL	2.5	10 YR 4/4	--	C	0, M	MVFI	--	<5	--	0.07
A/FILL	3.4	10YR 5/3 & 4/3*	--	C	0, M	MFR	--	--	--	0.07
C	6.5	10 YR 6/3 & 6/1	--	C	0, M	MFI	--	<5	--	0.07
C	7.7	10 YR 6/3	--	SCL	0, M	MFR	--	--	--	0.11
C	10	10 YR 6/3	--	GRSCL	0, M	MFR	--	<30	--	0.11

Comments:
* presence of 10YR 2/1 Organic clay layer

Name (Please Print): Razaul Haque, PE

Signature: Razaul Haque

Credential Number: 42045-6

Address: 191 W. Edgerton Avenue, Milwaukee WI 53207

Date Evaluation Conducted: 02/28/2022

Telephone Number: (414) 933-7444

SBD-10793 (R01/17)

WDNR
September 2017

SB-3 #OBS. ☐ Pit ■ Boring Ground surface elevation. 913.7 ft. Elevation of limiting factor -- ft.

Horizon	Depth ft.	Dominant Color Munsell	Redox Description Qu. Sz. Cont. Color	Texture	Structure Gr. Sz. Sh.	Consistence	Boundary	% Rock Frags.	% Fines	Hydraulic App Rate Inches/Hr
A	1.0	10 YR 2/1	--	SCL	0, SG	MFR	--	--	--	0.11
FILL	2.0	10 YR 4/3 & 2/1	--	SC	0, SG	MFR	--	--	--	0.04
FILL	4.5	10 YR 3/1	--	GRSL*	0, SG	MLO	--	--	--	0.50
FILL	6.5	10 YR 4/6 &2/1	--	SC	0, M	MFI	--	<5	--	0.04
C/FILL	7.5	10 YR 4/1 & 4/3	--	C	0, M	MFR	--	<5	--	0.07
C/FILL	10	10 YR 6/1 & 2/1	--	C	0, M	MFR	--	<5	--	0.07

Comments:
*Trace possible foundry materials

SB-4 #OBS. ☐ Pit ■ Boring Ground surface elevation. 916.8 ft. Elevation of limiting factor -- ft.

Horizon	Depth ft.	Dominant Color Munsell	Redox Description Qu. Sz. Cont. Color	Texture	Structure Gr. Sz. Sh.	Consistence	Boundary	% Rock Frags.	% Fines	Hydraulic App Rate Inches/Hr
*FILL	1.8	10 YR 3/2	--	L	0, SG	MLO	--	<35	--	0.24
FILL	5.0	10 YR 4/3 & 2/1	--	SC	0, M	MFI	--	<5	--	0.04
FILL	7.5	10 YR 3/2	--	C	0, M	MVFI	--	<5	--	0.07
C	10	10 YR 6/3	--	GRSL	0, SG	MLO	--	15-20	--	0.50

Comments:
*Topsoil (12-inches) sample not available for review.

SB-5 #OBS. ☐ Pit ■ Boring Ground surface elevation. 921.9 ft. Elevation of limiting factor -- ft.

Horizon	Depth ft.	Dominant Color Munsell	Redox Description Qu. Sz. Cont. Color	Texture	Structure Gr. Sz. Sh.	Consistence	Boundary	% Rock Frags.	% Fines	Hydraulic App Rate Inches/Hr
*FILL	1.4	10 YR 3/3	--	C	0, M	MVFI	--	<5	--	0.07
FILL	3.5	10 YR 2/1	--	VGRLS**	0, SG	MLO	--	50-60	--	1.63
FILL	5.5	10 YR 4/2 & 2/1	--	XGRSL	0, SG	MLO	--	65-70	--	0.50
C	12	10 YR 6/4	--	SL	0, M	MFI	--	5-<15	39.5	0.50

Comments:
*Topsoil (10-inches) sample not available for review;** trace asphalt, root hairs

SB-6 #OBS. ☐ Pit ■ Boring Ground surface elevation. 925.6 ft. Elevation of limiting factor -- ft.

Horizon	Depth ft.	Dominant Color Munsell	Redox Description Qu. Sz. Cont. Color	Texture	Structure Gr. Sz. Sh.	Consistence	Boundary	% Rock Frags.	% Fines	Hydraulic App Rate Inches/Hr
*FILL	6	10 YR 3/2**	--	SC	2, F, SBK	MFR	--	<15	--	0.04
C	7.8	10 YR 6/4	--	SL	0, M	MFR	--	<5	43.5	0.50
C	11	10 YR 6/4	--	GRSL	0, M	MFR	--	15-20	--	0.50
C	12	10 YR 5/1	--	VGRS	0, SG	MLO	--	40-50	--	3.60

Comments:
*Topsoil (8-inches) sample not available for review;** trace 10 YR4/3 between 2-feet and 4-feet, pushed stone no recovery from 4 to 6 feet

Overall Site Comments: _____

SB-7 #OBS. ☐ Pit ■ Boring Ground surface elevation. 930.4 ft. Elevation of limiting factor -- ft.

Horizon	Depth ft.	Dominant Color Munsell	Redox Description Qu. Sz. Cont. Color	Texture	Structure Gr. Sz. Sh.	Consistence	Boundary	% Rock Frags.	% Fines	Hydraulic App Rate Inches/Hr
A	0.3	10 YR 2/1	--	C	0, M	MFR	--	--	--	0.07
FILL	2.5	10 YR 3/2	--	GRLS	0, SG	MLO	--	20-25	--	1.63
C	5.6	10 YR 6/3	--	SL	0, SG	0, M	--	<5	--	0.50
C	10	10 YR 5/4	--	GRSL	0, SG	0, M	--	20-30	--	0.50

Comments:

SB-8 #OBS. ☐ Pit ■ Boring Ground surface elevation. 926.4 ft. Elevation of limiting factor -- ft.

Horizon	Depth ft.	Dominant Color Munsell	Redox Description Qu. Sz. Cont. Color	Texture	Structure Gr. Sz. Sh.	Consistence	Boundary	% Rock Frags.	% Fines	Hydraulic App Rate Inches/Hr
*FILL	2.0	10 YR 4/3	--	VGRSL	0, SG	MLO	--	40-50	--	0.50
FILL	5.5	10 YR 4/3	--	SC	2, VF, SBK	MFR	--	<15	--	0.04
FILL	6.5	--**	--	--	--	--	--	--	--	--
C	12	10 YR 4/3	--	SL	0, M	MFR	--	<15	--	0.50

Comments:
*Topsoil (6-inches) sample not available for review;**Concrete pieces in sample Jar

SB-9 #OBS. ☐ Pit ■ Boring Ground surface elevation. 911.2 ft. Elevation of limiting factor 902.2 ft.

Horizon	Depth ft.	Dominant Color Munsell	Redox Description Qu. Sz. Cont. Color	Texture	Structure Gr. Sz. Sh.	Consistence	Boundary	% Rock Frags.	% Fines	Hydraulic App Rate Inches/Hr
A	3.2	10 YR 2/1	--	C	0, M	MFI	--	--	--	0.07
C	7	10 YR 5/1 & 4/6	--	C	0, M	MVFI	--	--	--	0.07
C	9	10 YR 5/1 &4/6	--	SC	0, M	MFR	--	--	--	0.04
C	10	10 YR 6/3	--	SL	0, M	MFR	--	--	--	0.50

Comments:
Water encountered at 9-feet bgs during drilling

SB-10 #OBS. ☐ Pit ■ Boring Ground surface elevation. 913.6 ft. Elevation of limiting factor -- ft.

Horizon	Depth ft.	Dominant Color Munsell	Redox Description Qu. Sz. Cont. Color	Texture	Structure Gr. Sz. Sh.	Consistence	Boundary	% Rock Frags.	% Fines	Hydraulic App Rate Inches/Hr
*FILL	3.5**	10 YR 3/2 &2/1	--	SC	0, M	MFR	--	<15	--	0.04
A/FILL	7	10 YR 2/1	--	C	0, M	MFR	--	<10	--	0.07
C	8.8	10 YR 5/1 & 4/6	--	C	0, M	MFR	--	<5	--	0.07
C	10	10 YR 7/1	--	SIL	0, SG	MLO	--	<5	--	0.13

Comments:
*Topsoil (12-inches) sample not available for review; trace concrete pieces in sample SS-2 between 2-feet and 4-feet

Overall Site Comments: _____

GENERAL NOTES

DRILLING AND SAMPLING SYMBOLS

SYMBOL	DEFINITION
HSA	Hollow Stem Auger
HSA w/ RW	Hollow Stem Auger converted to Rotary Wash Boring (initiated with Mudding Fluid)
SS	2" O.D. Split Spoon Sample – (ASTM D 1586)
SH	3" Thin-Walled Tube Sample (Shelby Tube) – (ASTM D 1587)
AU	Solid Stem Auger Sample
CA	Modified California Sample – (ASTM D 3550)
RC	Rock Core Sample – (ASTM D 2113)
HA	Hand Auger Sample
GB	Grab Bag Sample
R	SPT Refusal (N-value of 50 blows for less than 6 inches of penetration)
NMR	No Measurement Recorded
NE	Not Encountered

TEST SYMBOLS

SYMBOL	DEFINITION
MC	Moisture Content (%) – (ASTM D 2216)
LOI	Organic Content (Loss on Ignition) (%) – (ASTM D 2974)
Qp	Hand Penetrometer Reading (tsf)
Qu	Unconfined Comp. Strength (tsf) – (ASTM D 2166)
γ_d	Dry Density (pcf) – (ASTM D 7263)
γ_T	Total (Moist) Density (pcf)
LL, PL	Liquid and Plastic Limit (%) – (ASTM D 4318)
PI	Plasticity Index (%)
P200	Percent passing the #200 Sieve – (ASTM D 1140)
Ts	Hand Torvane Reading (tsf)
SG	Specific Gravity – (ASTM D854)
pH	Hydrogen Ion Content – (ASTM D4972)
RQD	Rock Quality Designation (%) – (ASTM D6032)

WATER LEVEL

Water levels shown on the boring logs are the levels measured in the borings at the time and under the conditions indicated. In some soils, it may not be possible to determine the groundwater level within the normal time required for test borings and an extended period of time may be necessary to reach equilibrium. Therefore, the position of the water level symbol may not indicate the true level of the groundwater table. Perched water refers to water above an impervious layer, thus impeded in reaching the water table. The available water level information is given at the bottom of the respective boring log sheet.

DESCRIPTIVE TERMINOLOGY

DENSITY TERM	SPT N-VALUE
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	Over 50

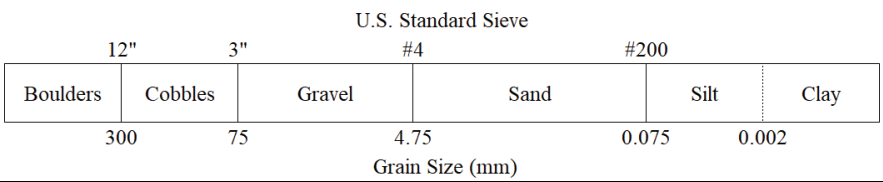
CONSISTENCY TERM	Unconfined Compressive Strength, (tsf)	SPT N-VALUE
Very Soft	<0.25	0 - 2
Soft	0.25 - 0.49	2 - 4
Medium Stiff	0.50 - 0.99	4 - 8
Stiff	1.00 - 1.99	8 - 16
Very Stiff	2.00 - 3.99	16 - 30
Hard	4.0+	Over 30

Lamination	Up to 1/2" thick horizontal stratum
Layer	1/2" thick or greater horizontal stratum
Lens	1/2" to 6" discontinuous horizontal stratum
Varved	Alternating laminations
Dry	Powdery, dusty
Moist	Damp, below saturation
Wet	Saturated, above liquid limit

Standard Penetration Test N-Value: Blows per Foot of a 140 Pound Hammer Falling 30 inches on a 2-inch OD Split Barrel Sampler

Note: If unconfined compressive strength data is not available, then N-value should be used to describe consistency term

RELATIVE SIZES



SOILS CLASSIFICATION FOR ENGINEERING PURPOSES

ASTM Designation: D 2487 - 83

(Based on Unified Soil Classification System)

SOIL ENGINEERING

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

[A] Based on the material passing the 3-in (75- mm) sieve

[B] If field sample contained cobbles or boulders, or both, add with cobbles and/or boulders after group name

[C] Gravels with 5 to 12 % fines require dual symbols:
GW - GM (well-graded gravel with silt)
GW - GC (well-graded gravel with clay)
GP - GM (poorly-graded gravel with silt)
GP - GC (poorly-graded gravel with clay)

[D] Sands with 5 to 12 % fines require dual symbols:
SW -SM (well-graded sand with silt)
SW - SC (well-graded sand with clay)
SP - SM (poorly-graded sand with silt)
SP - SC (poorly-graded sand with clay)

[E] $Cu = \frac{D_{60}}{D_{10}}$ $\quad C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" after group name

[G] If fines classify as CL-ML, use dual symbol GC-GM. or SC-SM

[H] If soil contains ≥ 15% gravel, add "with gravel" after group name.

[I] If Atterberg limits plot in hatched area, soil is a CL-ML (silty clay)

[J] If soil contains 15 to 29% plus No. 200, add, "with sand" or " with gravel", whichever is predominant

[K] If soil contains ≥ 30% plus No.200, and predominantly sand, add "sandy" before the group name

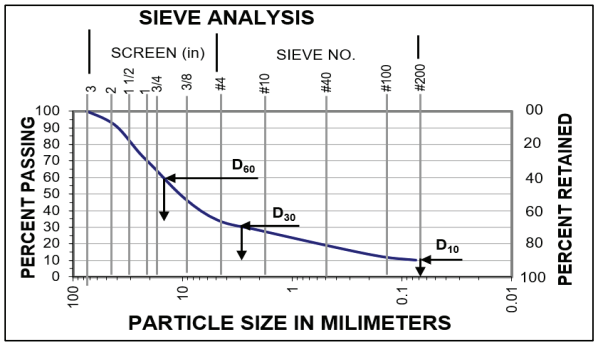
[L] If soil contains ≥ 30% plus No.200, and predominantly gravel, add "gravelly" before the group name

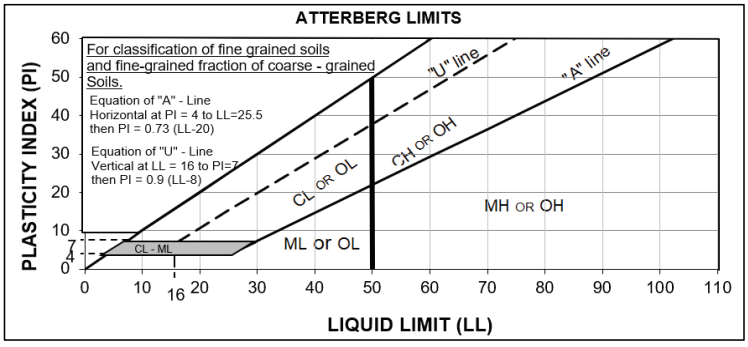
[M] PI ≥ 4 and plots on or above "A" Line

[N] PI < 4 or plots below "A" Line

[O] PI plots on or above "A" Line

[P] PI plots below "A" Line





APPENDIX II

LABORATORY TEST RESULTS

GESTRA Engineering, Inc
191 W. Edgerton Ave
Milwaukee, WI 53207
Phone: (414) 933-7444; Fax: (414) 933-7844

Laboratory Test Results of Atterberg Limits of Soil

Project Name:	Waukesha Memorial Boulevard	Date:	February 21, 2022
Project Number:	22009-10	Client:	The Sigma Group
Project Location:	Waukesha, WI		
ASTM Designation:	**D4318**		

Sample Information

Type of Sample	Split Spoon
Boring Number	SB-2
Sample Number	1
Depth of Sample	0' - 2'

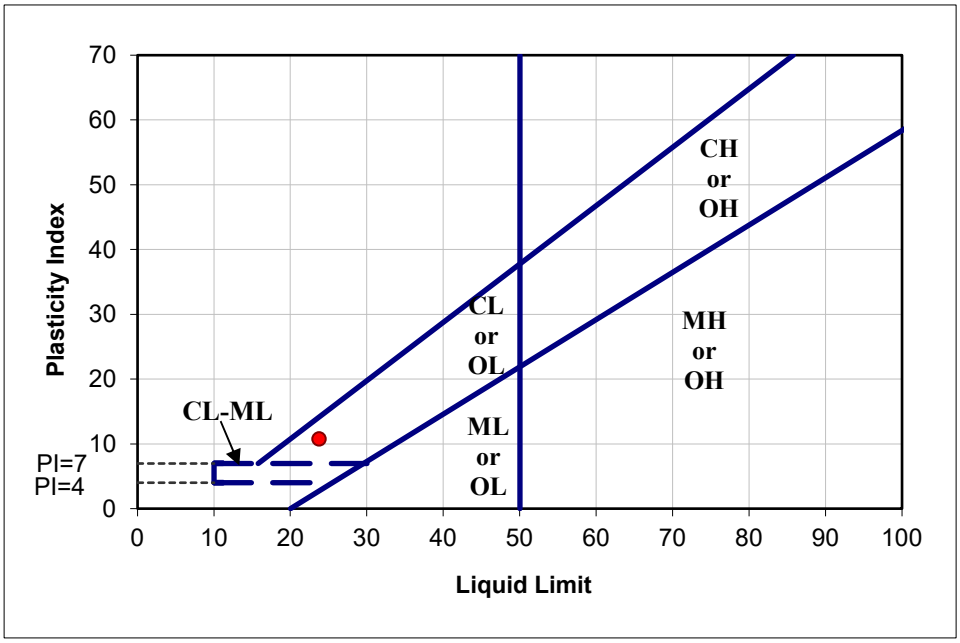
Determination of Liquid Limit

Cup Number	J11	113	95
Weight of Cup (g)	19.32	19.54	18.76
Weight of Wet Soil and Cup (g)	33.13	37.12	38.54
Weight of Dry Soil and Cup (g)	30.60	33.80	34.55
Moisture Content (%)	22.4	23.3	25.3
Blow Counts	34	28	15

Determination of Plastic Limit

Cup Number	D5	D12
Weight of Cup (g)	7.25	7.22
Weight of Wet Soil and Cup (g)	14.39	14.79
Weight of Dry Soil and Cup (g)	13.55	13.90
Moisture Content (%)	13.3	13.3

Compilation of Test Results



Liquid Limit	24
Plastic Limit	13
Plasticity Index	11
USCS Symbol	**CL**

Performed by: B. Bills

Reviewed By: T. Stevens

GESTRA Engineering, Inc.

GESTRA Engineering, Inc
191 W. Edgerton Ave
Milwaukee, WI 53207
Phone: (414) 933-7444; Fax: (414) 933-7844

Laboratory Test Results of
Mechanical Analysis & Hydrometer of Soil or Aggregate

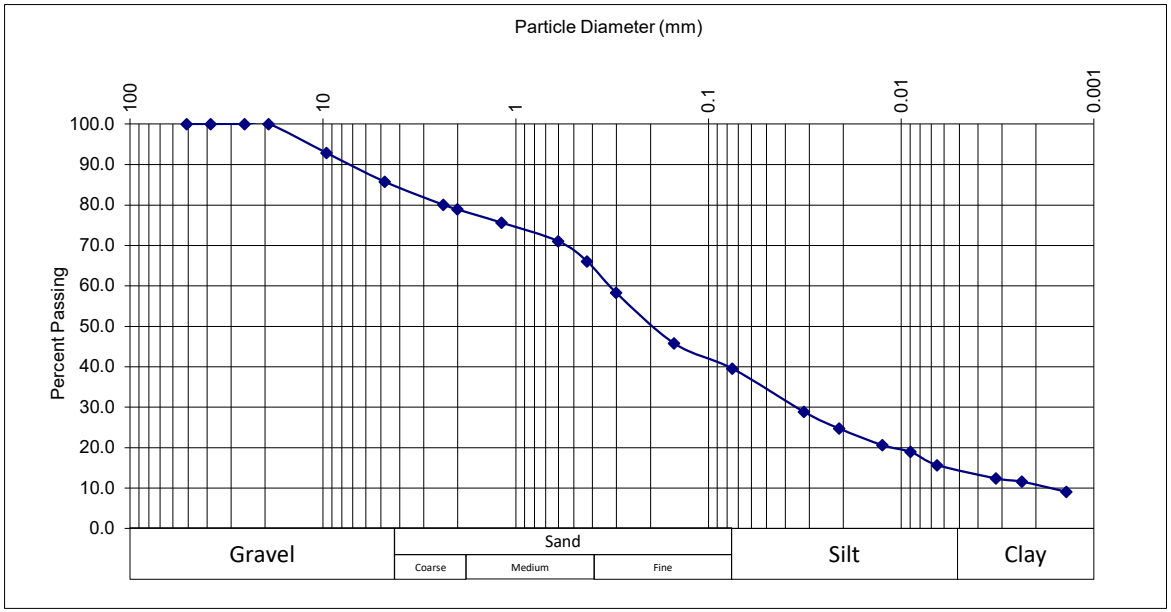
Project Name:	Waukesha Memorial Boulevard	Date:	February 24, 2022
Project Number:	22009-10	Reported To:	The SIGMA Group
Project Location:	Waukesha, WI		
ASTM Designation:	**D422**		

Sample Information

Type of Sample:	Split Spoon	Sample Number:	4
Boring Number:	SB-5	Depth of Sample:	6'-8'

Mechanical Analysis Data

Sieve	Sieve Opening (mm)	Percent Passing (%)
2 in.	50.800	100
1 1/2 in.	38.100	100
1 in.	25.400	100
3/4 in.	19.050	100
3/8 in.	9.525	92.8
#4	4.750	85.7
#8	2.360	80.0
#10	2.000	78.9
#16	1.180	75.6
#30	0.600	71.0
#40	0.425	66.0
#50	0.300	58.2
#100	0.150	45.7
#200	0.075	39.5



Graph of size distrubution based on AASHTO Classification

Remarks:						
	Gravel	14.3	%	Sand	46.2	%
	Silt	24.5	%	Clay	15.0	%

Performed by: B. Bills

Reviewed by: T. Stevens
GESTRA Engineering, Inc.

GESTRA Engineering, Inc
191 W. Edgerton Ave
Milwaukee, WI 53207
Phone: (414) 933-7444; Fax: (414) 933-7844

Laboratory Test Results of Atterberg Limits of Soil

Project Name:	Waukesha Memorial Boulevard	Date:	February 21, 2022
Project Number:	22009-10	Client:	The Sigma Group
Project Location:	Waukesha, WI		
ASTM Designation:	**D4318**		

Sample Information

Type of Sample	Split Spoon
Boring Number	SB-6
Sample Number	SS-1 & SS-2
Depth of Sample	0-4'

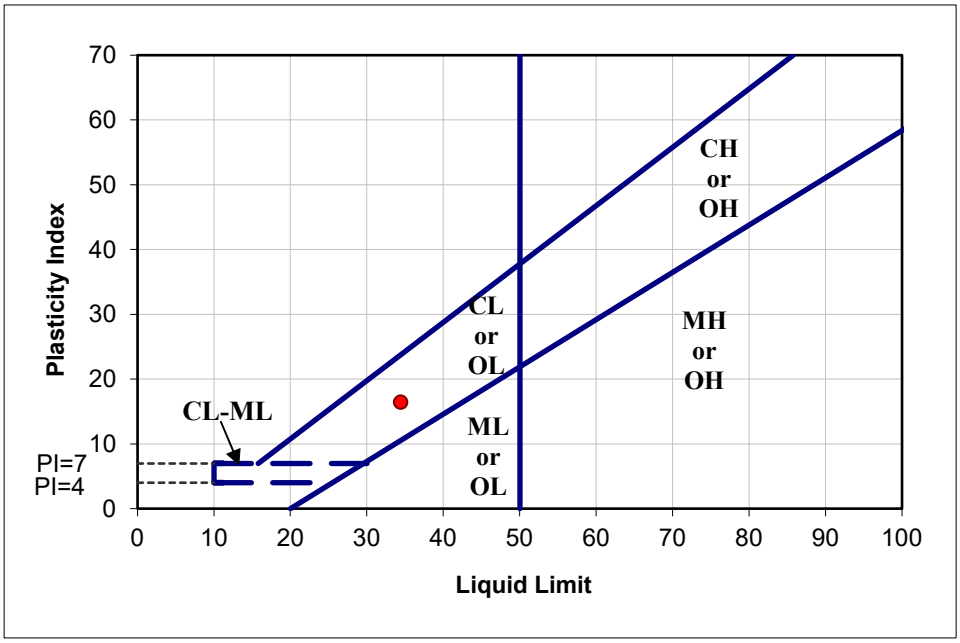
Determination of Liquid Limit

Cup Number	69	J10	143
Weight of Cup (g)	18.90	18.95	18.87
Weight of Wet Soil and Cup (g)	36.30	38.03	42.99
Weight of Dry Soil and Cup (g)	32.05	33.15	36.50
Moisture Content (%)	32.3	34.4	36.8
Blow Counts	35	24	15

Determination of Plastic Limit

Cup Number	T9	D24
Weight of Cup (g)	7.20	7.21
Weight of Wet Soil and Cup (g)	14.72	14.84
Weight of Dry Soil and Cup (g)	13.55	13.67
Moisture Content (%)	18.4	18.1

Compilation of Test Results



Liquid Limit	34
Plastic Limit	18
Plasticity Index	16
USCS Symbol	**CL**

Performed by: B. Bills

Reviewed By: T. Stevens

GESTRA Engineering, Inc.

GESTRA Engineering, Inc
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Milwaukee, WI 53207
Phone: (414) 933-7444; Fax: (414) 933-7844

Laboratory Test Results of Atterberg Limits of Soil

Project Name:	Waukesha Memorial Boulevard	Date:	February 21, 2022
Project Number:	22009-10	Client:	The Sigma Group
Project Location:	Waukesha, WI		
ASTM Designation:	**D4318**		

Sample Information

Type of Sample	Split Spoon
Boring Number	SB-6
Sample Number	4
Depth of Sample	6' - 8'

Non Plastic

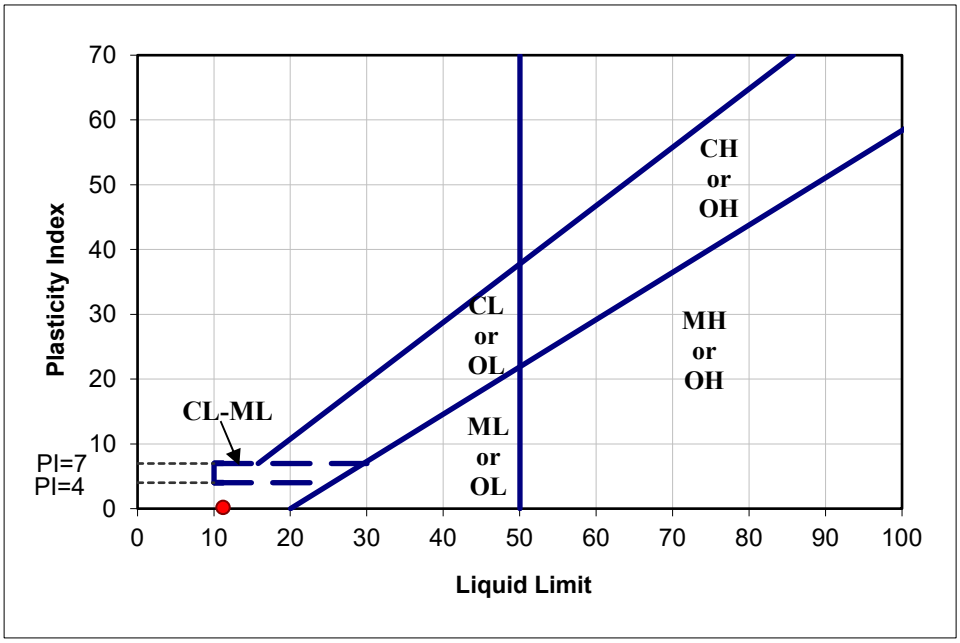
Determination of Liquid Limit

Cup Number	135	J4	J16
Weight of Cup (g)	18.78	20.75	18.53
Weight of Wet Soil and Cup (g)	35.42	31.71	33.70
Weight of Dry Soil and Cup (g)	33.86	30.55	32.01
Moisture Content (%)	10.3	11.8	12.5
Blow Counts	30	22	16

Determination of Plastic Limit

Cup Number	D16	T48
Weight of Cup (g)	7.32	7.27
Weight of Wet Soil and Cup (g)	13.52	13.79
Weight of Dry Soil and Cup (g)	12.93	13.17
Moisture Content (%)	10.5	10.5

Compilation of Test Results



Liquid Limit	11
Plastic Limit	11
Plasticity Index	0
USCS Symbol	**NP**

Performed by: B. Bills

Reviewed By: T. Stevens

GESTRA Engineering, Inc.

GESTRA Engineering, Inc
191 W. Edgerton Ave
Milwaukee, WI 53207
Phone: (414) 933-7444; Fax: (414) 933-7844

Laboratory Test Results of Atterberg Limits of Soil

Project Name:	Waukesha Memorial Boulevard	Date:	February 21, 2022
Project Number:	22009-10	Client:	The Sigma Group
Project Location:	Waukesha, WI		
ASTM Designation:	**D4318**		

Sample Information

Type of Sample	Split Spoon
Boring Number	SB-9
Sample Number	3
Depth of Sample	4' - 6'

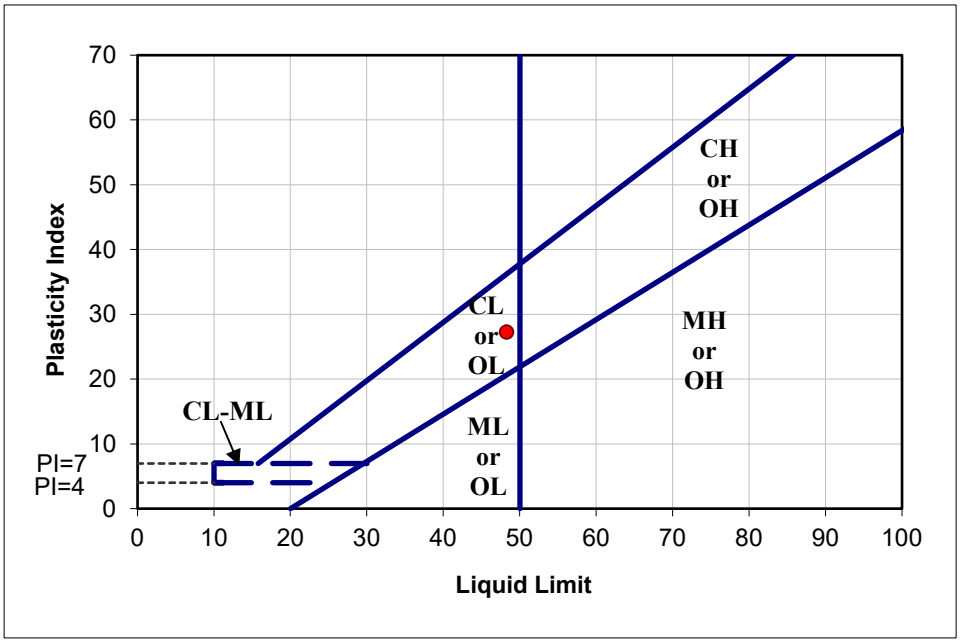
Determination of Liquid Limit

Cup Number	71	92	34
Weight of Cup (g)	18.69	18.69	18.82
Weight of Wet Soil and Cup (g)	37.05	39.87	35.25
Weight of Dry Soil and Cup (g)	31.18	33.01	29.73
Moisture Content (%)	47.0	47.9	50.6
Blow Counts	32	24	16

Determination of Plastic Limit

Cup Number	D13	T45
Weight of Cup (g)	7.19	7.23
Weight of Wet Soil and Cup (g)	13.84	13.37
Weight of Dry Soil and Cup (g)	12.70	12.30
Moisture Content (%)	20.7	21.1

Compilation of Test Results



Liquid Limit	48
Plastic Limit	21
Plasticity Index	27
USCS Symbol	**CL**

Performed by: B. Bills

Reviewed By: T. Stevens

GESTRA Engineering, Inc.

APPENDIX III

WEB SOIL SURVEY

Soil Map—Milwaukee and Waukesha Counties, Wisconsin

Map Scale: 1:1,170 if printed on A portrait (8.5" x 11") 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 Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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 17, Sep 10, 2021

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

Date(s) aerial images were photographed: May 20, 2020—Aug 20, 2020

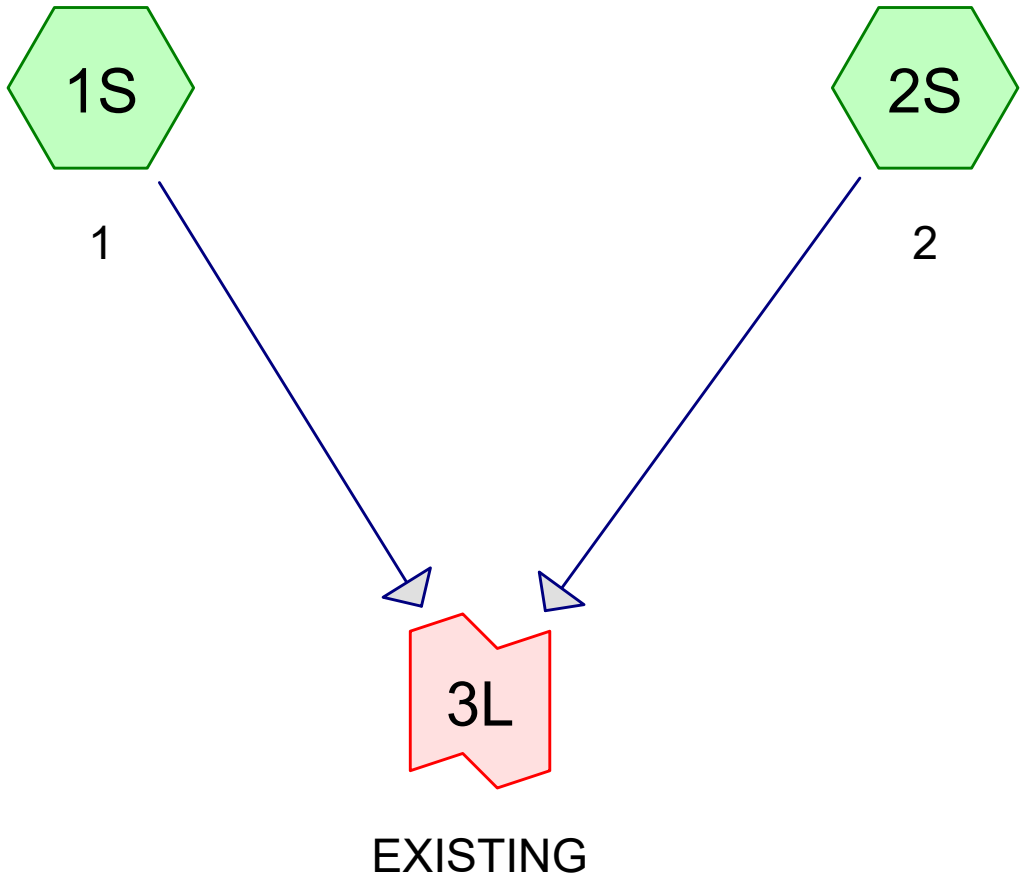
The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
HmB	Hochheim loam, 2 to 6 percent slopes	1.7	33.9%
HmC2	Hochheim loam, 6 to 12 percent slopes, eroded	3.2	66.1%
Totals for Area of Interest		**4.9**	**100.0%**

Appendix C

Stormwater Quantity (HydroCAD) and Quality (WinSLAMM) Modeling



Subcat Reach Pond Link

Routing Diagram for 20411 - HYDROCAD - EXISTING CONDITIONS
Prepared by {enter your company name here}, Printed 1/18/2022

Project Notes

Rainfall events imported from "NRCS-Rain.txt" for 9209 WI Waukesha

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-Year	MSE 24-hr	3	Default	24.00	1	2.42	2
2	2-Year	MSE 24-hr	3	Default	24.00	1	2.72	2
3	10-Year	MSE 24-hr	3	Default	24.00	1	3.83	2
4	100-Year	MSE 24-hr	3	Default	24.00	1	6.18	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
3.171	83	1/4 acre lots, 38% imp, HSG C (1S, 2S)
0.010	74	>75% Grass cover, Good, HSG C (2S)
0.572	98	Paved parking, HSG C (2S)
0.134	98	Unconnected pavement, HSG C (2S)
3.888	**86**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
3.888	HSG C	1S, 2S
0.000	HSG D	
0.000	Other	
3.888		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	3.171	0.000	0.000	3.171	1/4 acre lots, 38% imp	1S, 2S
0.000	0.000	0.010	0.000	0.000	0.010	>75% Grass cover, Good	2S
0.000	0.000	0.572	0.000	0.000	0.572	Paved parking	2S
0.000	0.000	0.134	0.000	0.000	0.134	Unconnected pavement	2S
0.000	**0.000**	**3.888**	**0.000**	**0.000**	**3.888**	**TOTAL AREA**	

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: 1 Runoff Area=67,257 sf 38.00% Impervious Runoff Depth>0.95"
Tc=6.0 min CN=83 Runoff=2.76 cfs 0.122 af

Subcatchment2S: 2 Runoff Area=102,093 sf 56.52% Impervious Runoff Depth>1.19"
Tc=6.0 min CN=87 Runoff=5.22 cfs 0.233 af

Link 3L: EXISTING Inflow=7.98 cfs 0.355 af
Primary=7.98 cfs 0.355 af

Total Runoff Area = 3.888 ac Runoff Volume = 0.355 af Average Runoff Depth = 1.09"
50.83% Pervious = 1.976 ac 49.17% Impervious = 1.911 ac

Summary for Subcatchment 1S: 1

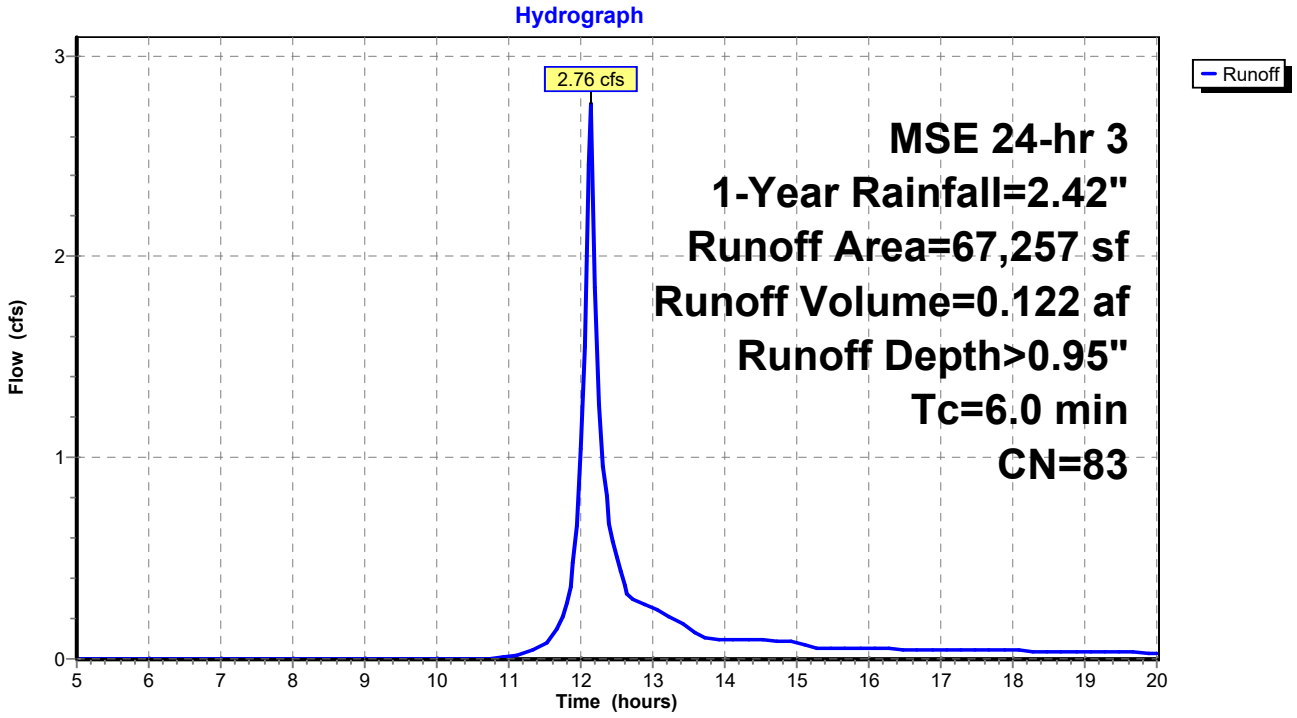
Runoff = 2.76 cfs @ 12.14 hrs, Volume= 0.122 af, Depth> 0.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-Year Rainfall=2.42"

Area (sf)	CN	Description
67,257	83	1/4 acre lots, 38% imp, HSG C
41,699		62.00% Pervious Area
25,558		38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, PER TR-55**

Subcatchment 1S: 1



Summary for Subcatchment 2S: 2

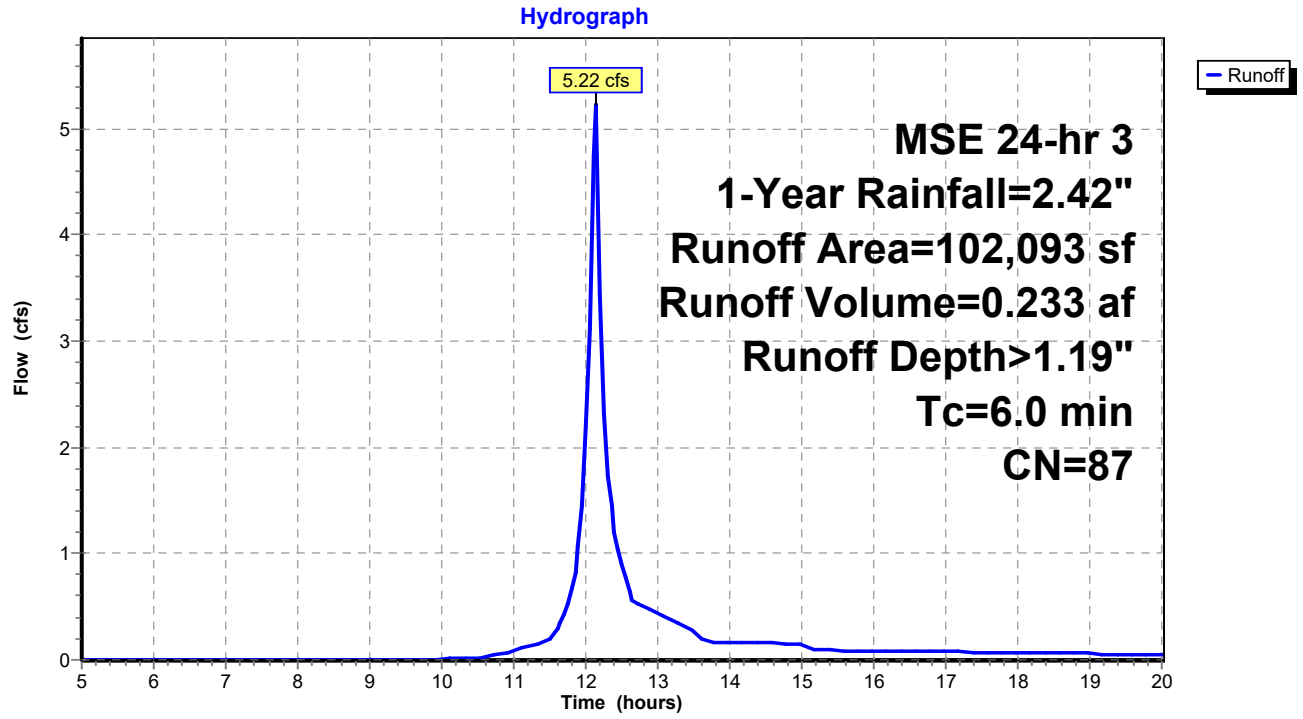
Runoff = 5.22 cfs @ 12.13 hrs, Volume= 0.233 af, Depth> 1.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-Year Rainfall=2.42"

Area (sf)	CN	Description
5,844	98	Unconnected pavement, HSG C
24,925	98	Paved parking, HSG C
70,889	83	1/4 acre lots, 38% imp, HSG C
435	74	>75% Grass cover, Good, HSG C
102,093	87	Weighted Average
44,386		43.48% Pervious Area
57,707		56.52% Impervious Area
5,844		10.13% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, PER TR-55**

Subcatchment 2S: 2

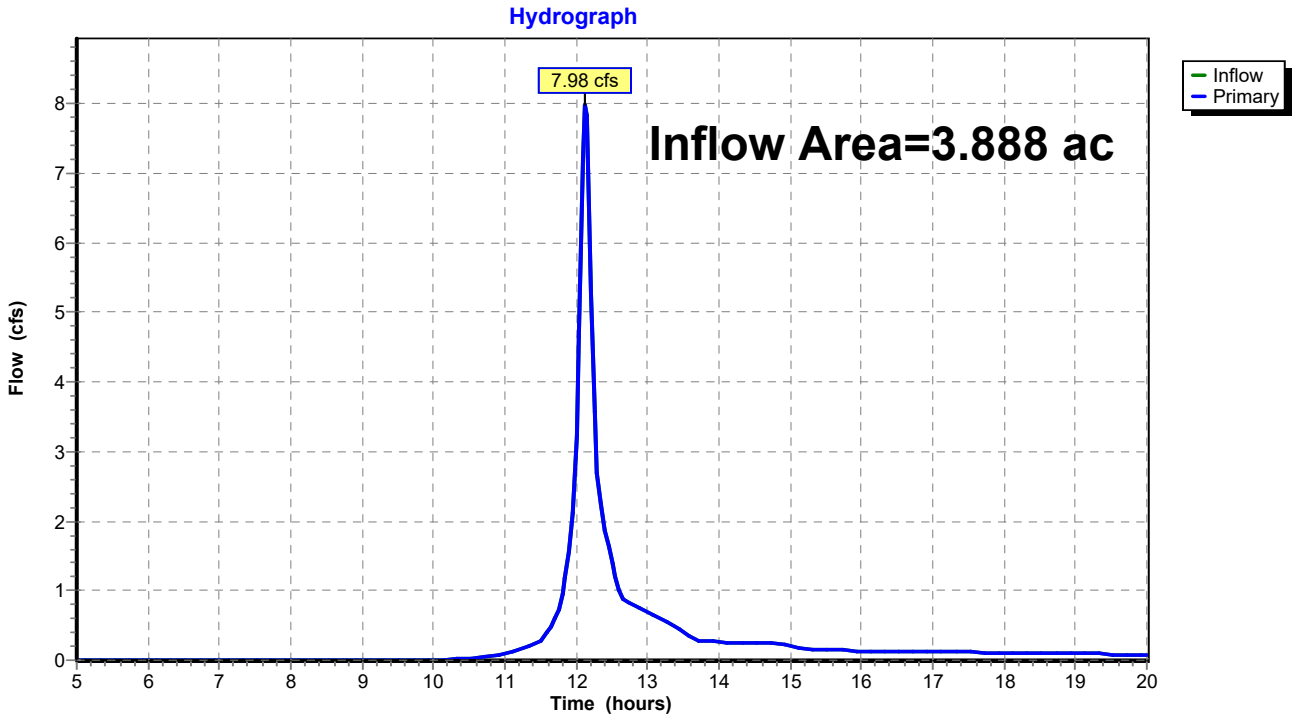


Summary for Link 3L: EXISTING

Inflow Area = 3.888 ac, 49.17% Impervious, Inflow Depth > 1.09" for 1-Year event
Inflow = 7.98 cfs @ 12.13 hrs, Volume= 0.355 af
Primary = 7.98 cfs @ 12.13 hrs, Volume= 0.355 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 3L: EXISTING



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: 1 Runoff Area=67,257 sf 38.00% Impervious Runoff Depth>1.17"
Tc=6.0 min CN=83 Runoff=3.40 cfs 0.150 af

Subcatchment2S: 2 Runoff Area=102,093 sf 56.52% Impervious Runoff Depth>1.44"
Tc=6.0 min CN=87 Runoff=6.26 cfs 0.280 af

Link 3L: EXISTING Inflow=9.65 cfs 0.431 af
Primary=9.65 cfs 0.431 af

Total Runoff Area = 3.888 ac Runoff Volume = 0.431 af Average Runoff Depth = 1.33"
50.83% Pervious = 1.976 ac 49.17% Impervious = 1.911 ac

Summary for Subcatchment 1S: 1

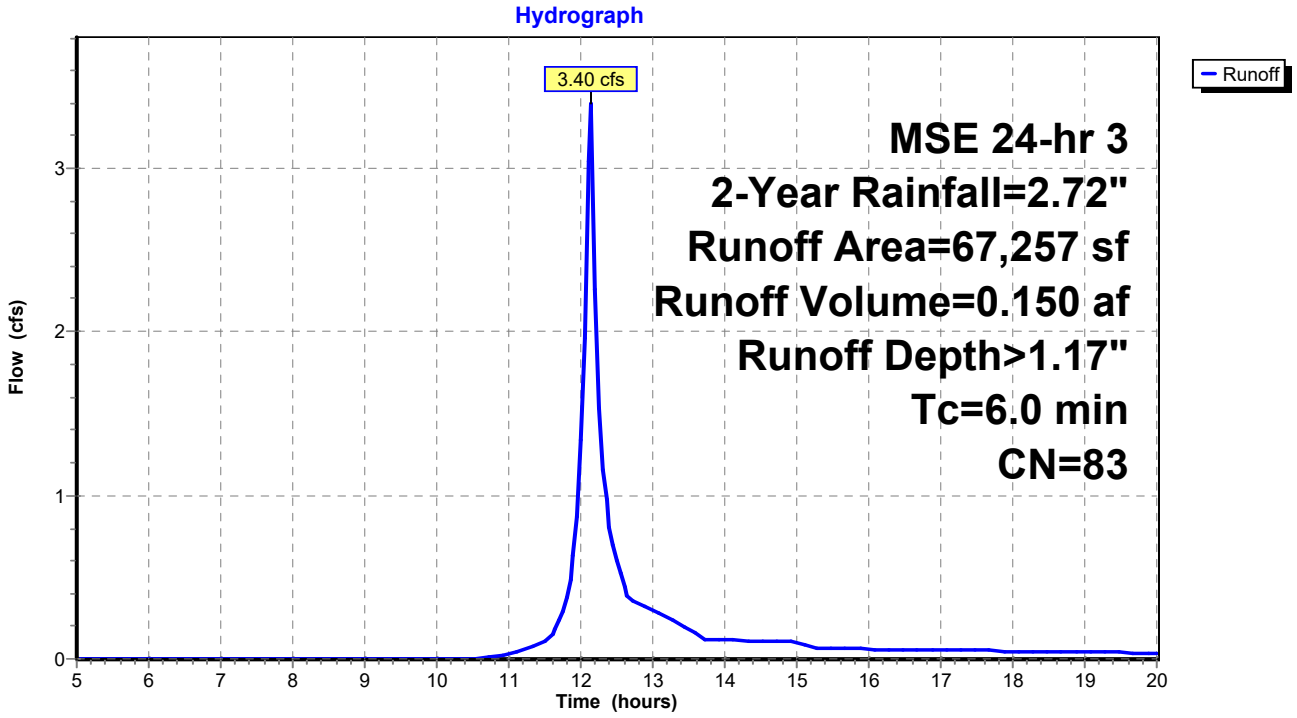
Runoff = 3.40 cfs @ 12.14 hrs, Volume= 0.150 af, Depth> 1.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-Year Rainfall=2.72"

Area (sf)	CN	Description
67,257	83	1/4 acre lots, 38% imp, HSG C
41,699		62.00% Pervious Area
25,558		38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, PER TR-55**

Subcatchment 1S: 1



Summary for Subcatchment 2S: 2

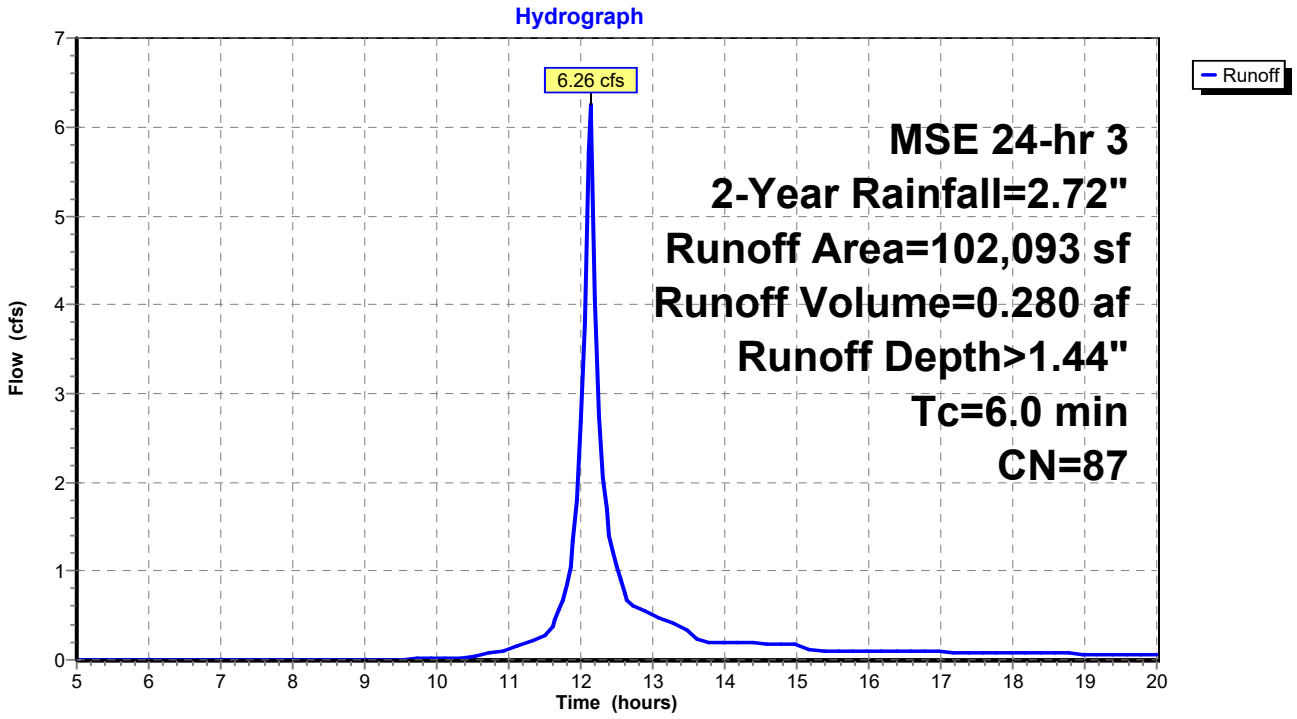
Runoff = 6.26 cfs @ 12.13 hrs, Volume= 0.280 af, Depth> 1.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-Year Rainfall=2.72"

Area (sf)	CN	Description
5,844	98	Unconnected pavement, HSG C
24,925	98	Paved parking, HSG C
70,889	83	1/4 acre lots, 38% imp, HSG C
435	74	>75% Grass cover, Good, HSG C
102,093	87	Weighted Average
44,386		43.48% Pervious Area
57,707		56.52% Impervious Area
5,844		10.13% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, PER TR-55**

Subcatchment 2S: 2

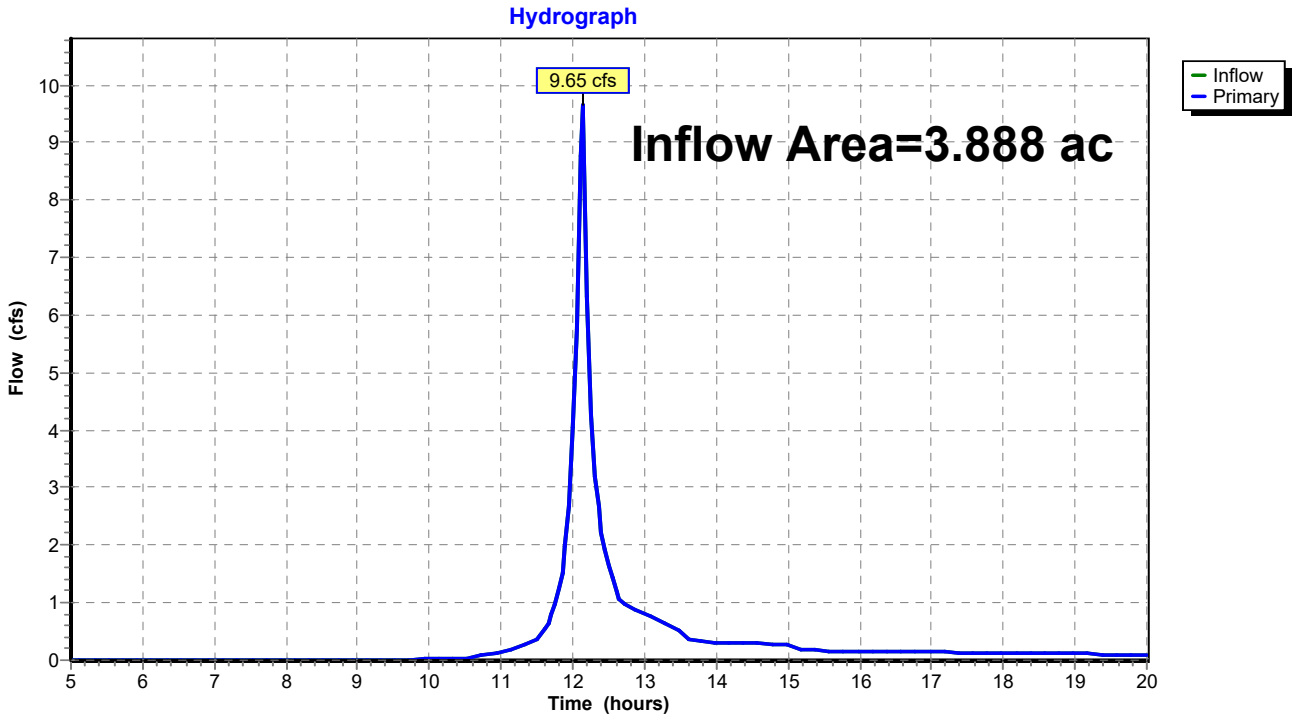


Summary for Link 3L: EXISTING

Inflow Area = 3.888 ac, 49.17% Impervious, Inflow Depth > 1.33" for 2-Year event
Inflow = 9.65 cfs @ 12.13 hrs, Volume= 0.431 af
Primary = 9.65 cfs @ 12.13 hrs, Volume= 0.431 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 3L: EXISTING



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: 1 Runoff Area=67,257 sf 38.00% Impervious Runoff Depth>2.05"
Tc=6.0 min CN=83 Runoff=5.88 cfs 0.264 af

Subcatchment2S: 2 Runoff Area=102,093 sf 56.52% Impervious Runoff Depth>2.39"
Tc=6.0 min CN=87 Runoff=10.17 cfs 0.466 af

Link 3L: EXISTING Inflow=16.05 cfs 0.730 af
Primary=16.05 cfs 0.730 af

Total Runoff Area = 3.888 ac Runoff Volume = 0.730 af Average Runoff Depth = 2.25"
50.83% Pervious = 1.976 ac 49.17% Impervious = 1.911 ac

Summary for Subcatchment 1S: 1

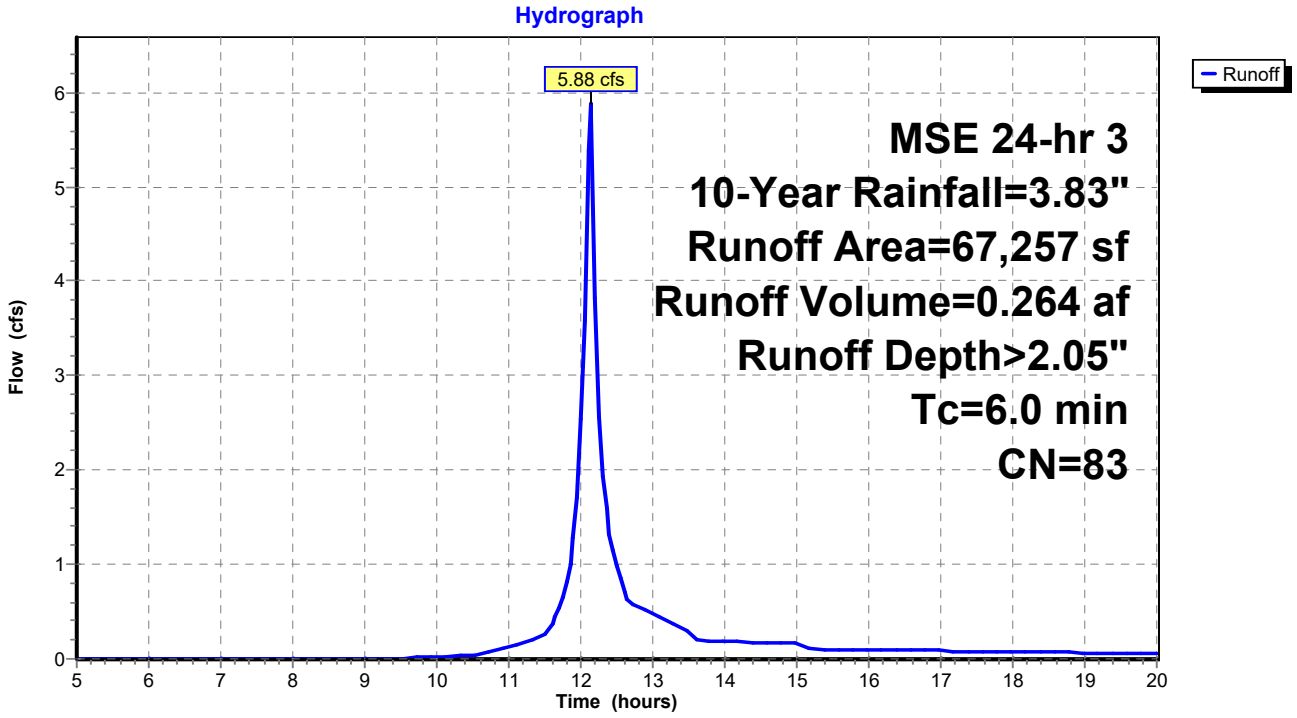
Runoff = 5.88 cfs @ 12.13 hrs, Volume= 0.264 af, Depth> 2.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-Year Rainfall=3.83"

Area (sf)	CN	Description
67,257	83	1/4 acre lots, 38% imp, HSG C
41,699		62.00% Pervious Area
25,558		38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, PER TR-55**

Subcatchment 1S: 1



Summary for Subcatchment 2S: 2

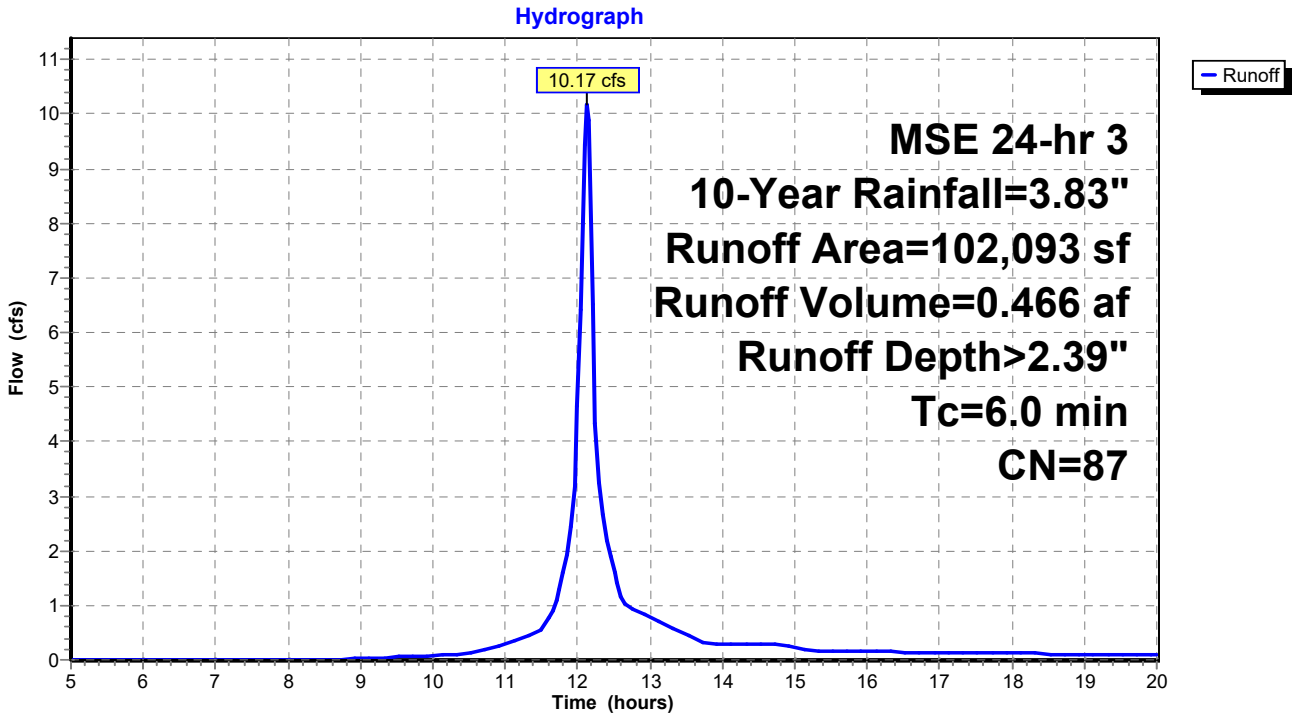
Runoff = 10.17 cfs @ 12.13 hrs, Volume= 0.466 af, Depth> 2.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-Year Rainfall=3.83"

Area (sf)	CN	Description
5,844	98	Unconnected pavement, HSG C
24,925	98	Paved parking, HSG C
70,889	83	1/4 acre lots, 38% imp, HSG C
435	74	>75% Grass cover, Good, HSG C
102,093	87	Weighted Average
44,386		43.48% Pervious Area
57,707		56.52% Impervious Area
5,844		10.13% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, PER TR-55**

Subcatchment 2S: 2

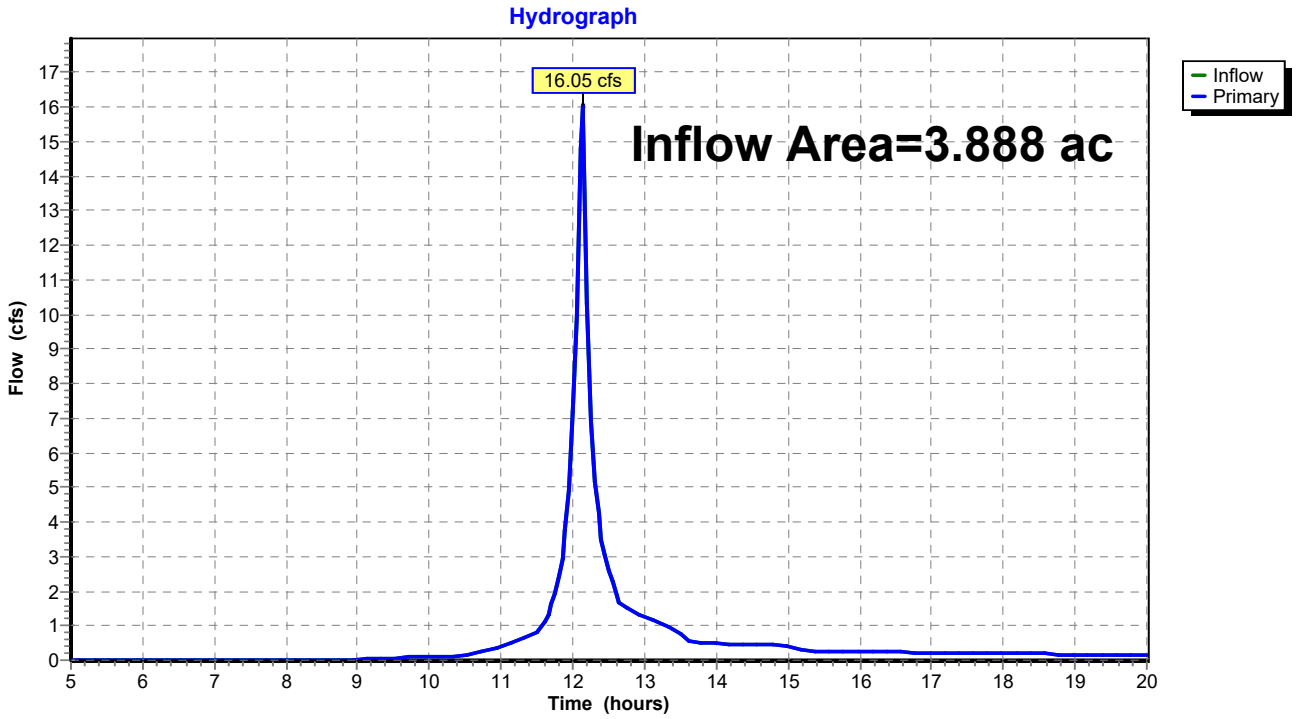


Summary for Link 3L: EXISTING

Inflow Area = 3.888 ac, 49.17% Impervious, Inflow Depth > 2.25" for 10-Year event
Inflow = 16.05 cfs @ 12.13 hrs, Volume= 0.730 af
Primary = 16.05 cfs @ 12.13 hrs, Volume= 0.730 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 3L: EXISTING



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: 1 Runoff Area=67,257 sf 38.00% Impervious Runoff Depth>4.10"
Tc=6.0 min CN=83 Runoff=11.37 cfs 0.528 af

Subcatchment2S: 2 Runoff Area=102,093 sf 56.52% Impervious Runoff Depth>4.53"
Tc=6.0 min CN=87 Runoff=18.55 cfs 0.885 af

Link 3L: EXISTING Inflow=29.92 cfs 1.413 af
Primary=29.92 cfs 1.413 af

Total Runoff Area = 3.888 ac Runoff Volume = 1.413 af Average Runoff Depth = 4.36"
50.83% Pervious = 1.976 ac 49.17% Impervious = 1.911 ac

Summary for Subcatchment 1S: 1

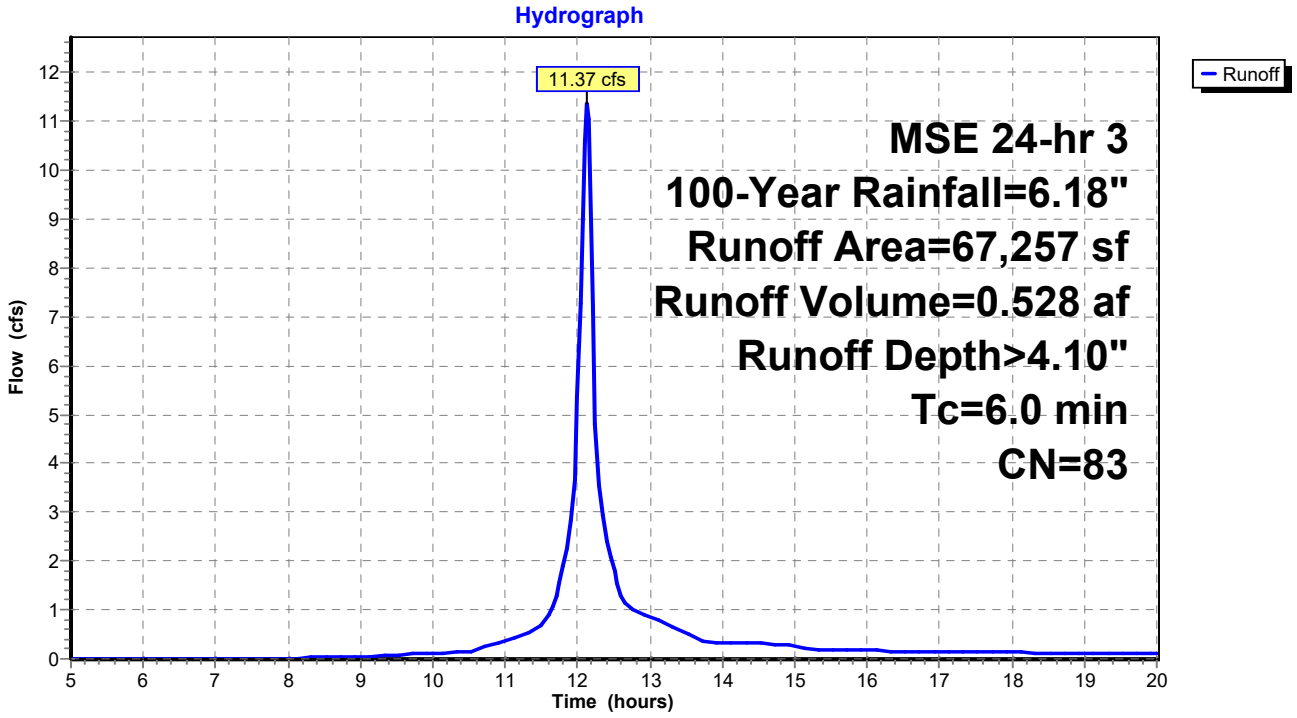
Runoff = 11.37 cfs @ 12.13 hrs, Volume= 0.528 af, Depth> 4.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-Year Rainfall=6.18"

Area (sf)	CN	Description
67,257	83	1/4 acre lots, 38% imp, HSG C
41,699		62.00% Pervious Area
25,558		38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, PER TR-55**

Subcatchment 1S: 1



Summary for Subcatchment 2S: 2

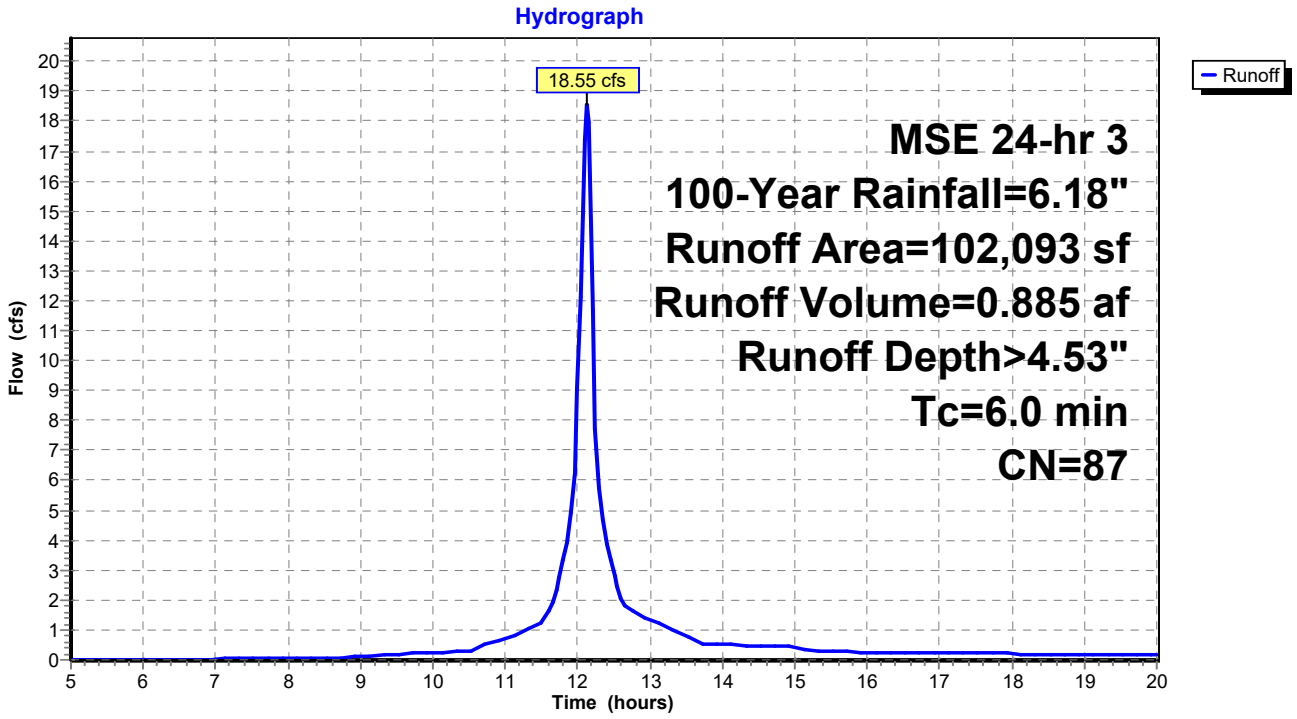
Runoff = 18.55 cfs @ 12.13 hrs, Volume= 0.885 af, Depth> 4.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-Year Rainfall=6.18"

Area (sf)	CN	Description
5,844	98	Unconnected pavement, HSG C
24,925	98	Paved parking, HSG C
70,889	83	1/4 acre lots, 38% imp, HSG C
435	74	>75% Grass cover, Good, HSG C
102,093	87	Weighted Average
44,386		43.48% Pervious Area
57,707		56.52% Impervious Area
5,844		10.13% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, PER TR-55**

Subcatchment 2S: 2

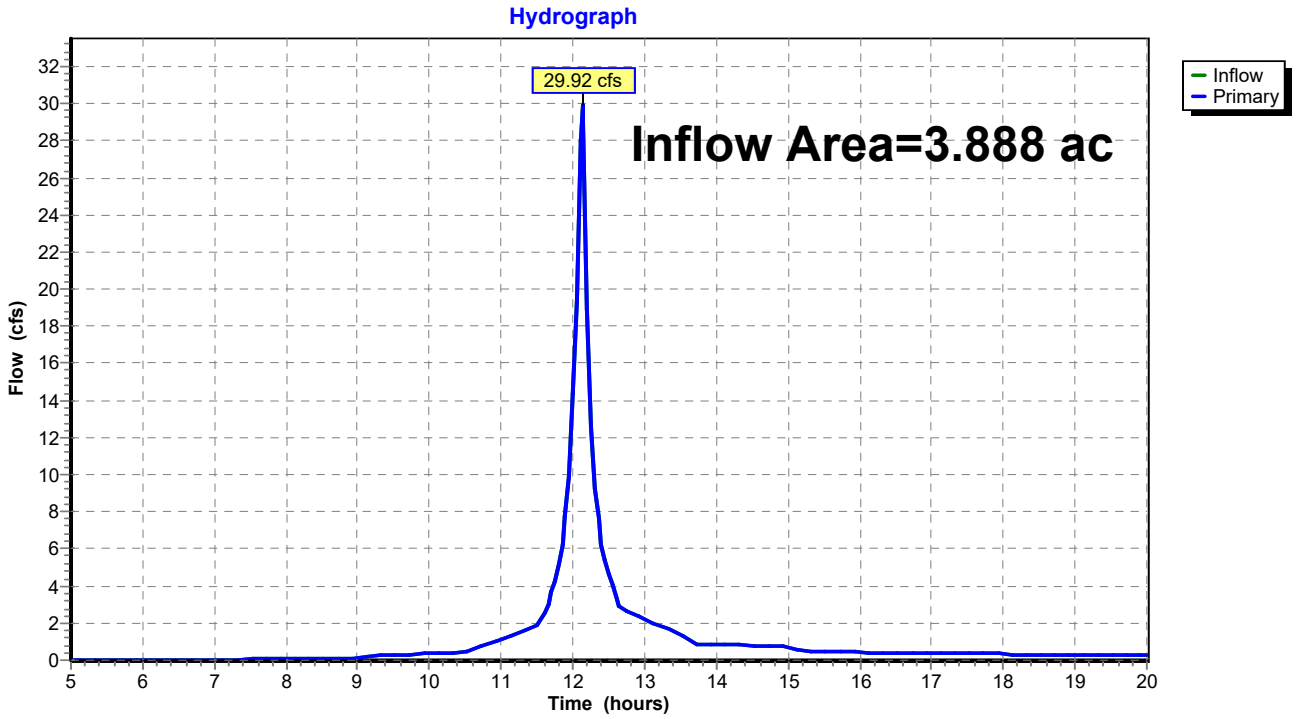


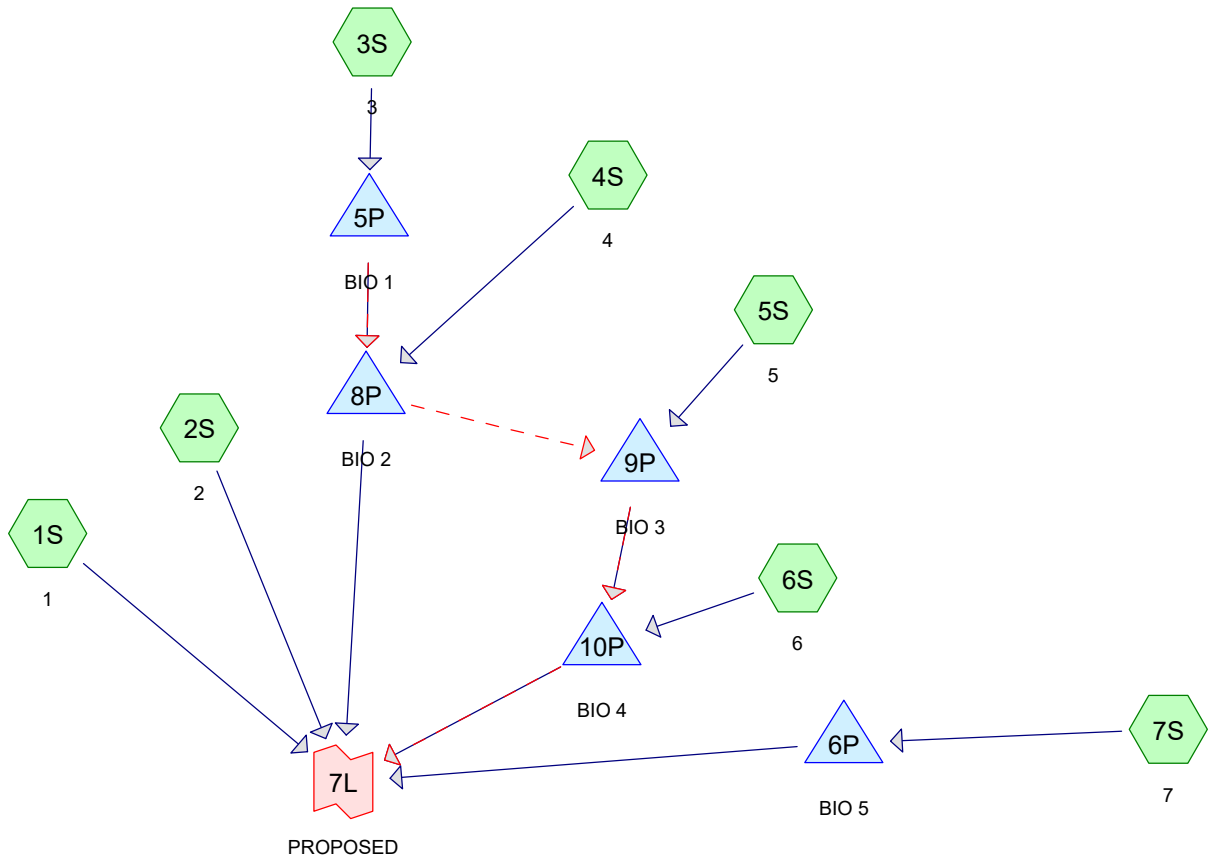
Summary for Link 3L: EXISTING

Inflow Area = 3.888 ac, 49.17% Impervious, Inflow Depth > 4.36" for 100-Year event
Inflow = 29.92 cfs @ 12.13 hrs, Volume= 1.413 af
Primary = 29.92 cfs @ 12.13 hrs, Volume= 1.413 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 3L: EXISTING





Subcat Reach Pond Link

Routing Diagram for 20411 - HYDROCAD - PROPOSED CONDITIONS
Prepared by {enter your company name here}, Printed 3/17/2022

Project Notes

Rainfall events imported from "NRCS-Rain.txt" for 9209 WI Waukesha

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-Year	MSE 24-hr	3	Default	24.00	1	2.42	2
2	2-Year	MSE 24-hr	3	Default	24.00	1	2.72	2
3	10-Year	MSE 24-hr	3	Default	24.00	1	3.83	2
4	100-Year	MSE 24-hr	3	Default	24.00	1	6.18	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.811	74	>75% Grass cover, Good, HSG C (1S, 2S, 3S, 4S, 5S, 6S, 7S)
0.070	89	Gravel roads, HSG C (2S, 6S)
1.007	98	Paved parking, HSG C (1S, 3S, 4S, 5S, 6S, 7S)
3.888	**80**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
3.888	HSG C	1S, 2S, 3S, 4S, 5S, 6S, 7S
0.000	HSG D	
0.000	Other	
3.888		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	2.811	0.000	0.000	2.811	>75% Grass cover, Good	1S, 2S, 3S, 4S, 5S, 6S, 7S
0.000	0.000	0.070	0.000	0.000	0.070	Gravel roads	2S, 6S
0.000	0.000	1.007	0.000	0.000	1.007	Paved parking	1S, 3S, 4S, 5S, 6S, 7S
0.000	**0.000**	**3.888**	**0.000**	**0.000**	**3.888**	**TOTAL AREA**	

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	6P	915.85	915.75	53.0	0.0019	0.010	6.0	0.0	0.0
2	10P	909.00	908.90	51.0	0.0020	0.011	12.0	0.0	0.0

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: 1 Runoff Area=8,335 sf 7.05% Impervious Runoff Depth>0.61"
Tc=6.0 min CN=76 Runoff=0.21 cfs 0.010 af

Subcatchment2S: 2 Runoff Area=84,555 sf 0.00% Impervious Runoff Depth>0.53"
Tc=6.0 min CN=74 Runoff=1.84 cfs 0.086 af

Subcatchment3S: 3 Runoff Area=14,755 sf 54.09% Impervious Runoff Depth>1.19"
Tc=6.0 min CN=87 Runoff=0.75 cfs 0.034 af

Subcatchment4S: 4 Runoff Area=9,802 sf 54.05% Impervious Runoff Depth>1.19"
Tc=6.0 min CN=87 Runoff=0.50 cfs 0.022 af

Subcatchment5S: 5 Runoff Area=14,045 sf 35.22% Impervious Runoff Depth>0.89"
Tc=6.0 min CN=82 Runoff=0.54 cfs 0.024 af

Subcatchment6S: 6 Runoff Area=10,785 sf 54.35% Impervious Runoff Depth>1.19"
Tc=6.0 min CN=87 Runoff=0.55 cfs 0.025 af

Subcatchment7S: 7 Runoff Area=27,088 sf 70.91% Impervious Runoff Depth>1.47"
Flow Length=300' Slope=0.0450 '/' Tc=18.5 min CN=91 Runoff=1.10 cfs 0.076 af

Pond 5P: BIO 1 Peak Elev=916.62' Storage=36 cf Inflow=0.75 cfs 0.034 af
Primary=0.75 cfs 0.033 af Secondary=0.00 cfs 0.000 af Outflow=0.75 cfs 0.033 af

Pond 6P: BIO 5 Peak Elev=918.26' Storage=866 cf Inflow=1.10 cfs 0.076 af
Outflow=0.63 cfs 0.073 af

Pond 8P: BIO 2 Peak Elev=915.22' Storage=138 cf Inflow=1.25 cfs 0.056 af
Primary=1.21 cfs 0.053 af Secondary=0.04 cfs 0.000 af Outflow=1.25 cfs 0.053 af

Pond 9P: BIO 3 Peak Elev=910.59' Storage=68 cf Inflow=0.58 cfs 0.024 af
Primary=0.54 cfs 0.024 af Secondary=0.00 cfs 0.000 af Outflow=0.54 cfs 0.024 af

Pond 10P: BIO 4 Peak Elev=910.44' Storage=97 cf Inflow=1.08 cfs 0.048 af
Primary=1.01 cfs 0.048 af Secondary=0.00 cfs 0.000 af Outflow=1.01 cfs 0.048 af

Link 7L: PROPOSED Inflow=4.56 cfs 0.269 af
Primary=4.56 cfs 0.269 af

Total Runoff Area = 3.888 ac Runoff Volume = 0.276 af Average Runoff Depth = 0.85"
74.09% Pervious = 2.881 ac 25.91% Impervious = 1.007 ac

Summary for Subcatchment 1S: 1

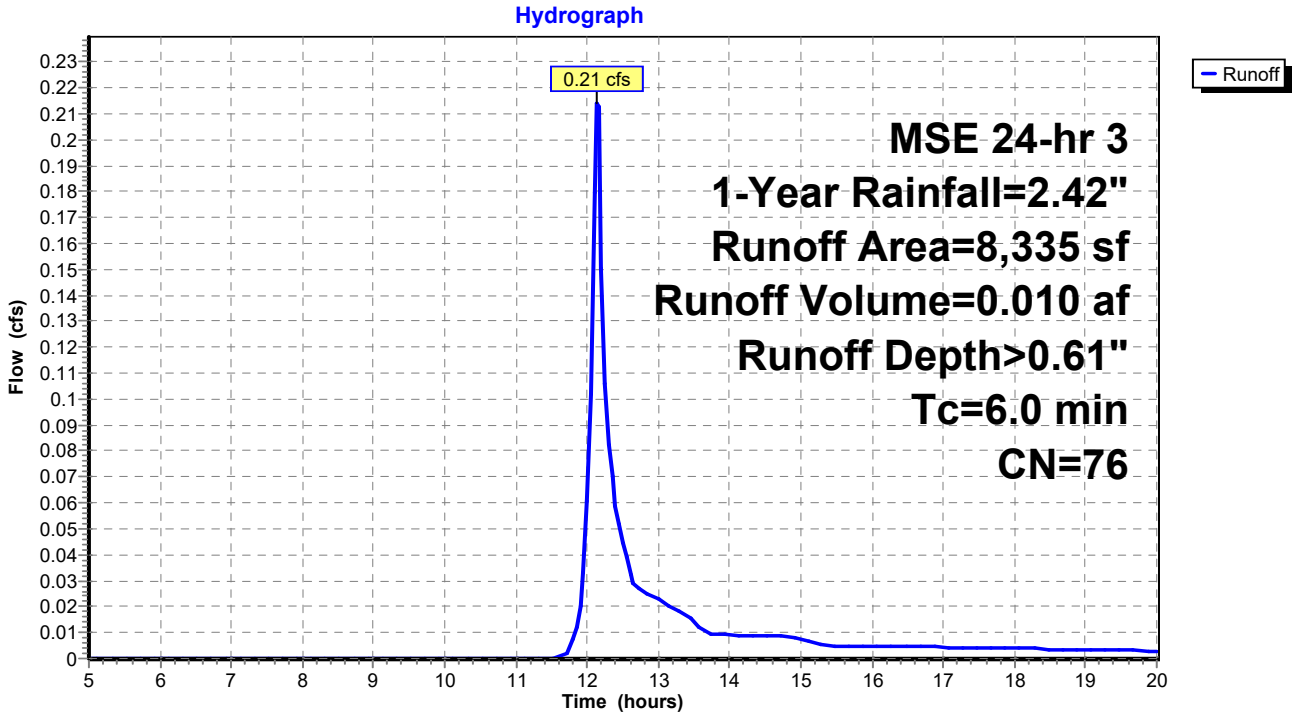
Runoff = 0.21 cfs @ 12.14 hrs, Volume= 0.010 af, Depth> 0.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-Year Rainfall=2.42"

Area (sf)	CN	Description
588	98	Paved parking, HSG C
7,747	74	>75% Grass cover, Good, HSG C
8,335	76	Weighted Average
7,747		92.95% Pervious Area
588		7.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, PER TR-55**

Subcatchment 1S: 1



Summary for Subcatchment 2S: 2

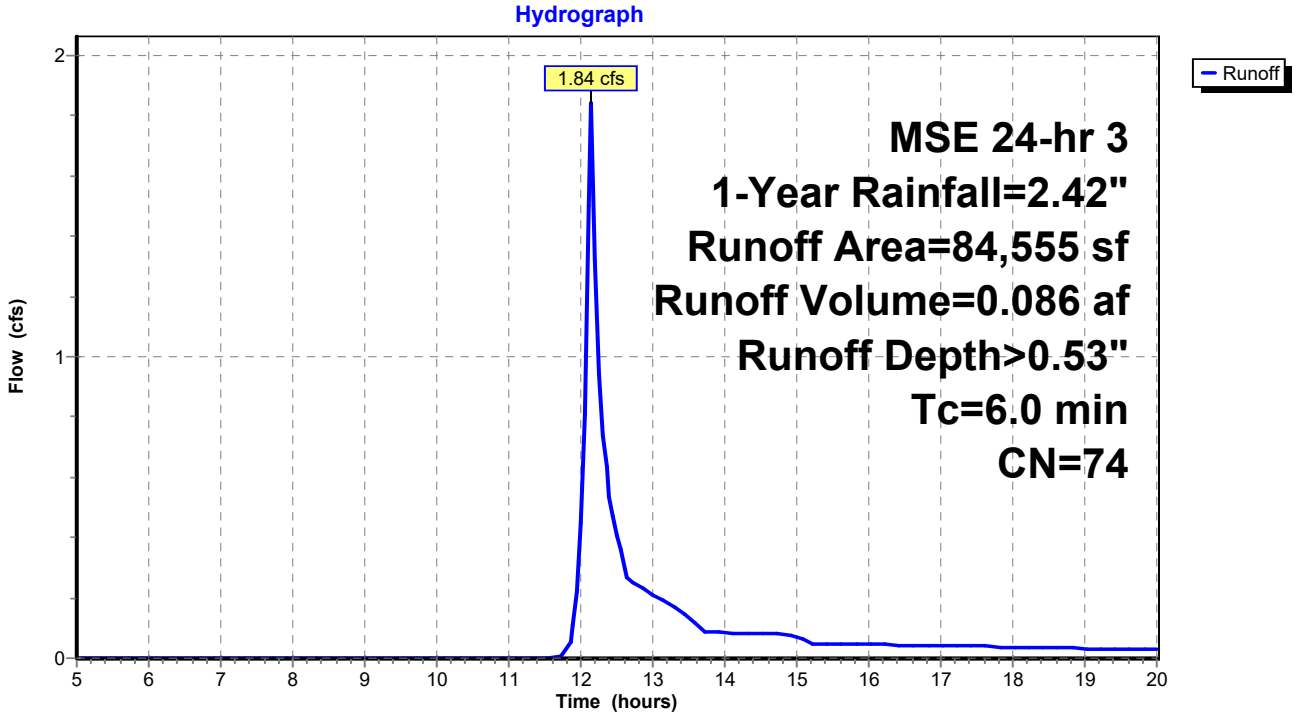
Runoff = 1.84 cfs @ 12.14 hrs, Volume= 0.086 af, Depth> 0.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-Year Rainfall=2.42"

Area (sf)	CN	Description
2,713	89	Gravel roads, HSG C
81,842	74	>75% Grass cover, Good, HSG C
84,555	74	Weighted Average
84,555		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, PER TR-55**

Subcatchment 2S: 2



Summary for Subcatchment 3S: 3

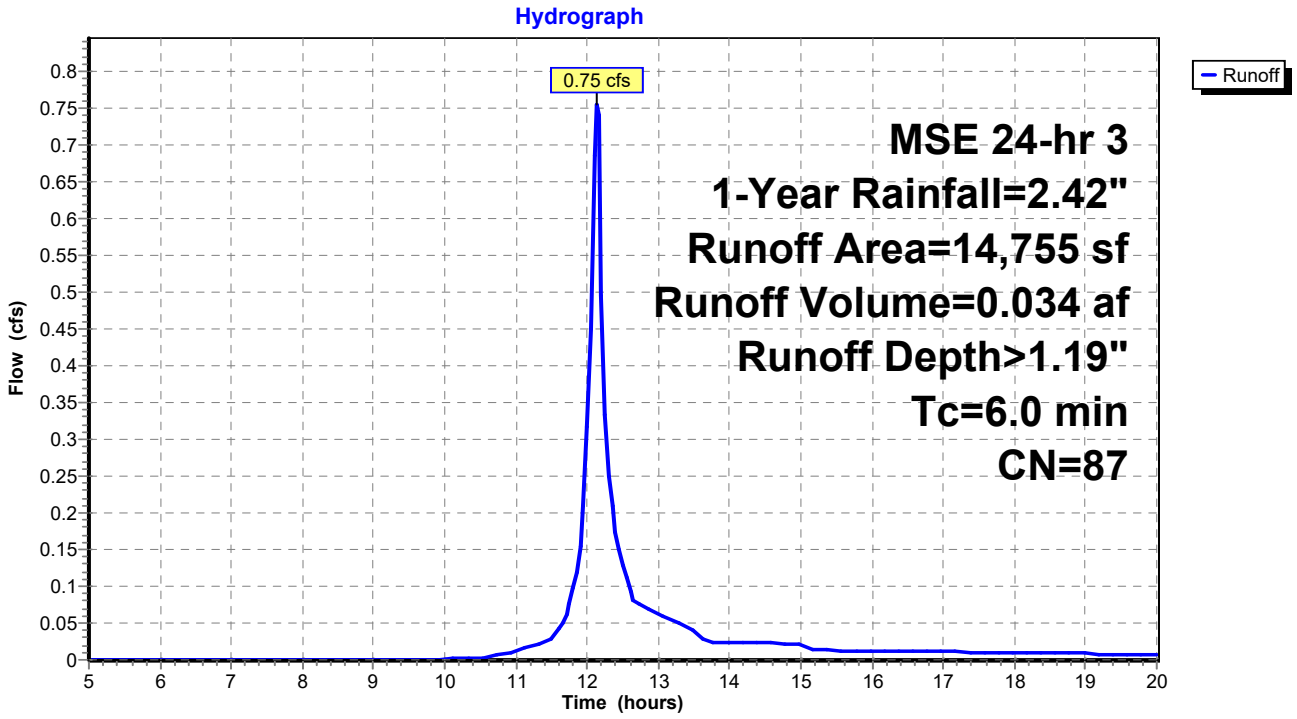
Runoff = 0.75 cfs @ 12.13 hrs, Volume= 0.034 af, Depth> 1.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-Year Rainfall=2.42"

Area (sf)	CN	Description
3,456	98	Paved parking, HSG C
2,817	98	Paved parking, HSG C
1,482	98	Paved parking, HSG C
226	98	Paved parking, HSG C
6,774	74	>75% Grass cover, Good, HSG C
14,755	87	Weighted Average
6,774		45.91% Pervious Area
7,981		54.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, PER TR-55**

Subcatchment 3S: 3



Summary for Subcatchment 4S: 4

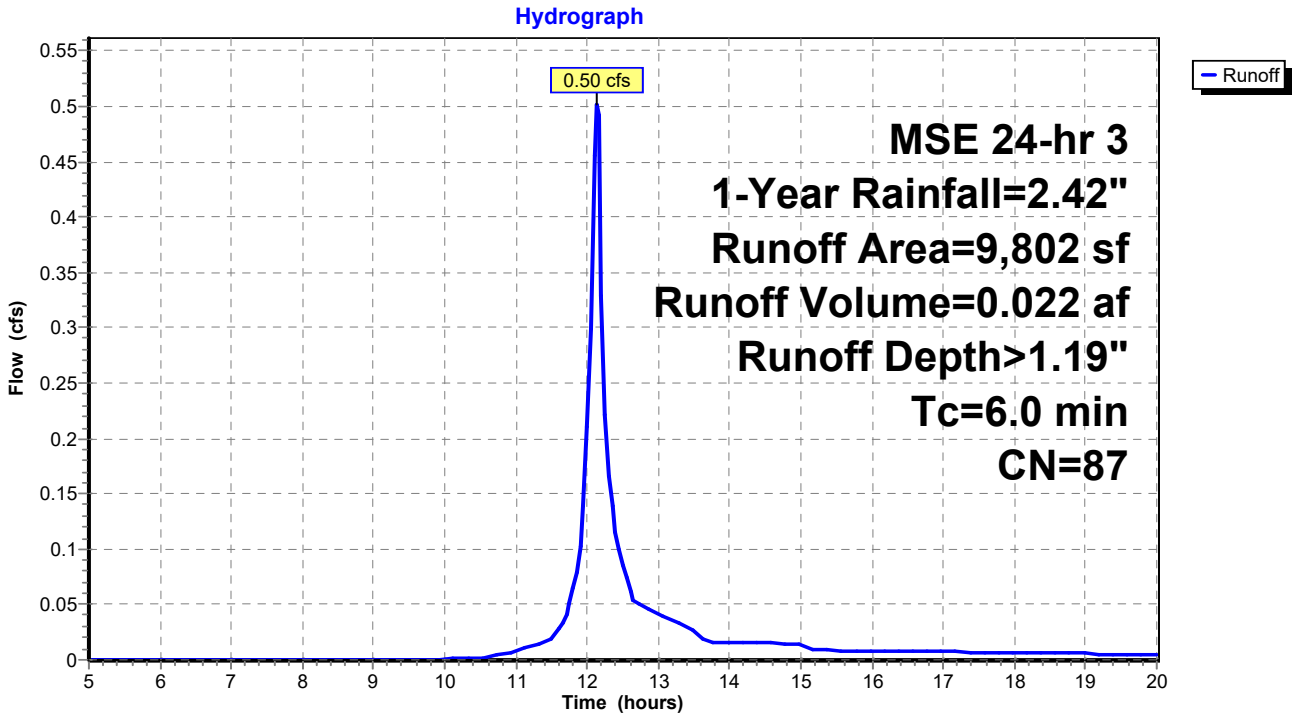
Runoff = 0.50 cfs @ 12.13 hrs, Volume= 0.022 af, Depth> 1.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-Year Rainfall=2.42"

Area (sf)	CN	Description
1,867	98	Paved parking, HSG C
1,687	98	Paved parking, HSG C
602	98	Paved parking, HSG C
1,142	98	Paved parking, HSG C
4,504	74	>75% Grass cover, Good, HSG C
9,802	87	Weighted Average
4,504		45.95% Pervious Area
5,298		54.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, PER TR-55**

Subcatchment 4S: 4



Summary for Subcatchment 5S: 5

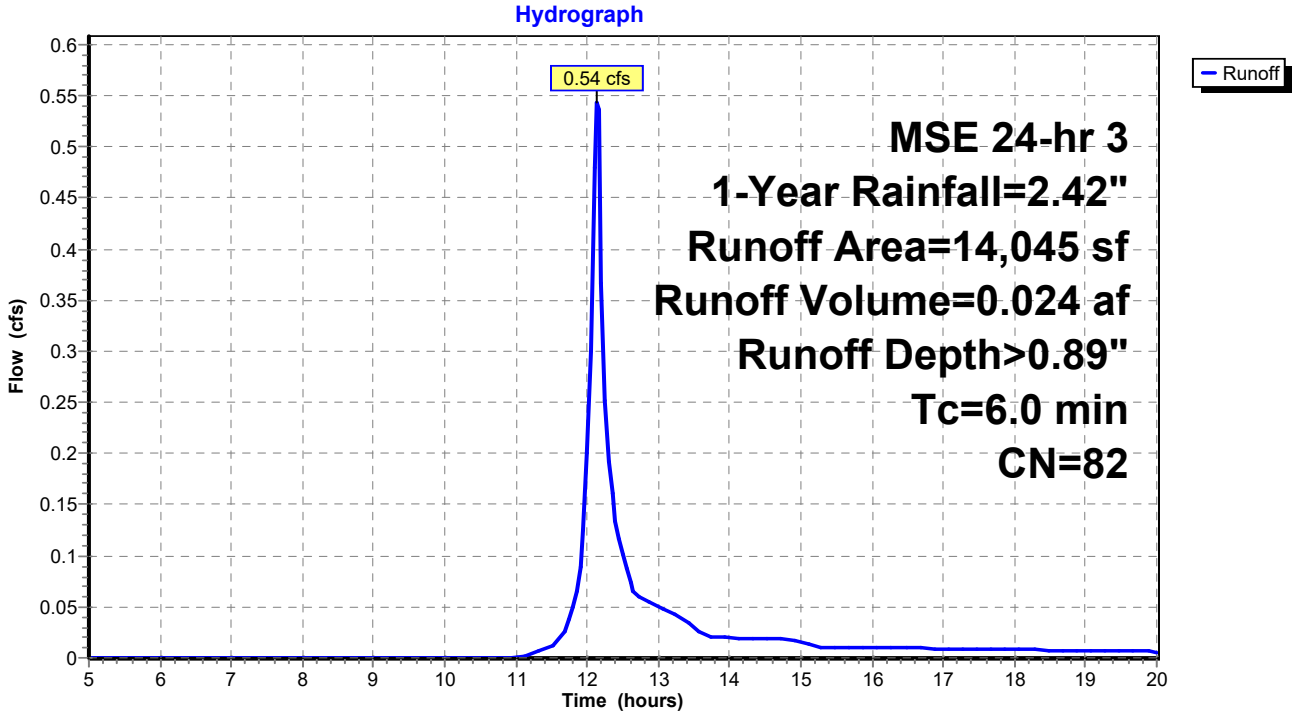
Runoff = 0.54 cfs @ 12.14 hrs, Volume= 0.024 af, Depth> 0.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-Year Rainfall=2.42"

Area (sf)	CN	Description
1,609	98	Paved parking, HSG C
2,002	98	Paved parking, HSG C
487	98	Paved parking, HSG C
849	98	Paved parking, HSG C
9,098	74	>75% Grass cover, Good, HSG C
14,045	82	Weighted Average
9,098		64.78% Pervious Area
4,947		35.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, PER TR-55**

Subcatchment 5S: 5



Summary for Subcatchment 6S: 6

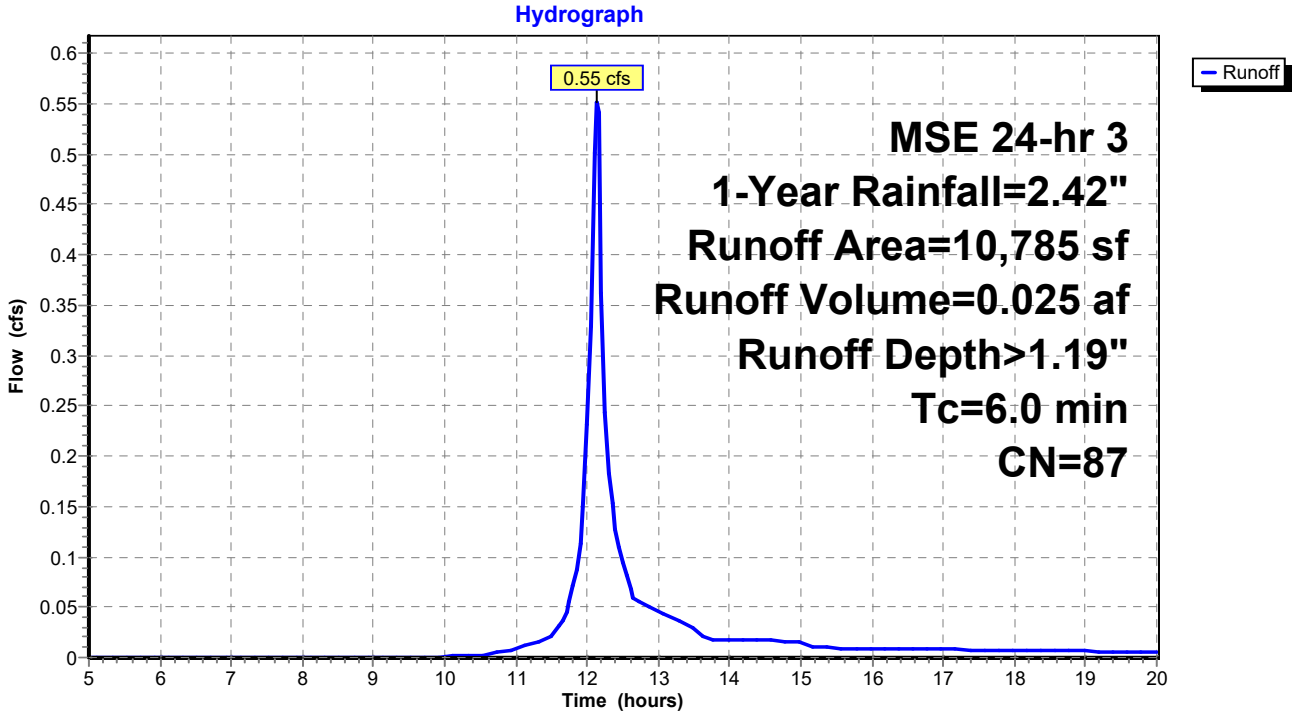
Runoff = 0.55 cfs @ 12.13 hrs, Volume= 0.025 af, Depth> 1.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-Year Rainfall=2.42"

Area (sf)	CN	Description
1,507	98	Paved parking, HSG C
2,759	98	Paved parking, HSG C
494	98	Paved parking, HSG C
1,102	98	Paved parking, HSG C
323	89	Gravel roads, HSG C
4,600	74	>75% Grass cover, Good, HSG C
10,785	87	Weighted Average
4,923		45.65% Pervious Area
5,862		54.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, PER TR-55**

Subcatchment 6S: 6



Summary for Subcatchment 7S: 7

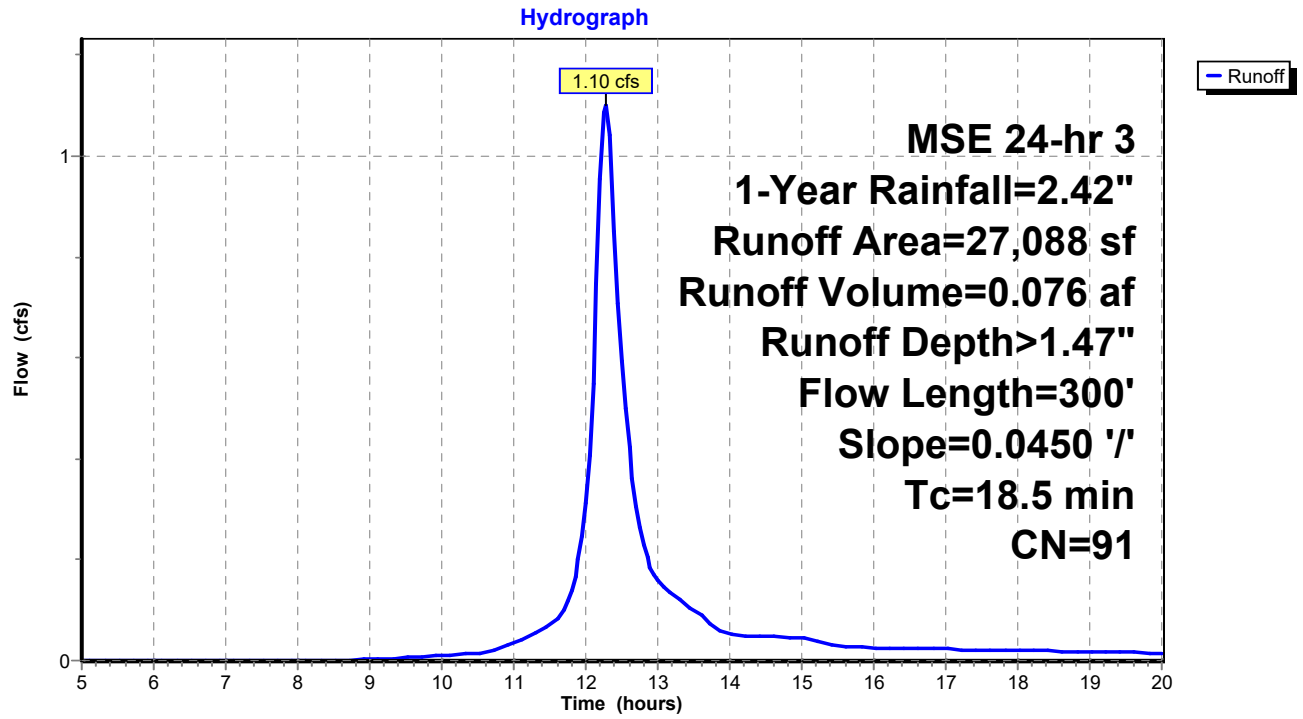
Runoff = 1.10 cfs @ 12.28 hrs, Volume= 0.076 af, Depth> 1.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-Year Rainfall=2.42"

Area (sf)	CN	Description
19,123	98	Paved parking, HSG C
85	98	Paved parking, HSG C
7,880	74	>75% Grass cover, Good, HSG C
27,088	91	Weighted Average
7,880		29.09% Pervious Area
19,208		70.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.5	300	0.0450	0.27		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.72"

Subcatchment 7S: 7



Summary for Pond 5P: BIO 1

Inflow Area = 0.339 ac, 54.09% Impervious, Inflow Depth > 1.19" for 1-Year event
Inflow = 0.75 cfs @ 12.13 hrs, Volume= 0.034 af
Outflow = 0.75 cfs @ 12.15 hrs, Volume= 0.033 af, Atten= 1%, Lag= 0.7 min
Primary = 0.75 cfs @ 12.15 hrs, Volume= 0.033 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 916.62' @ 12.15 hrs Surf.Area= 94 sf Storage= 36 cf

Plug-Flow detention time= 4.4 min calculated for 0.033 af (99% of inflow)
Center-of-Mass det. time= 1.7 min (785.7 - 784.0)

Volume	Invert	Avail.Storage	Storage Description
#1	915.50'	115 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

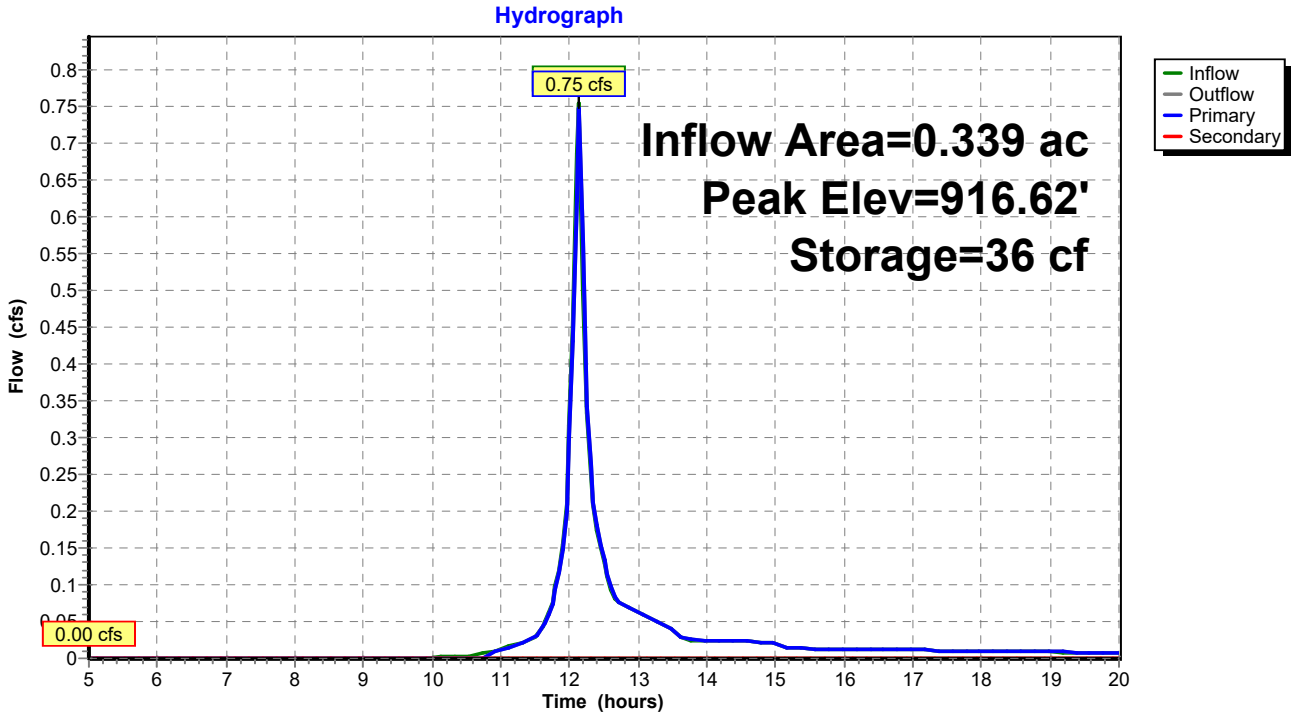
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
915.50	94	0.0	0	0
916.50	94	35.0	33	33
918.50	94	25.0	47	80
918.70	254	100.0	35	115

Device	Routing	Invert	Outlet Devices
#1	Primary	915.75'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	918.60'	**7.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=0.74 cfs @ 12.15 hrs HW=916.61' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 0.74 cfs @ 3.75 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=915.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 5P: BIO 1


Hydrograph
Inflow Area=0.339 ac
Peak Elev=916.62'
Storage=36 cf
0.75 cfs
0.00 cfs
Inflow
Outflow
Primary
Secondary
Flow (cfs)
Time (hours)
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
0.5
0.55
0.6
0.65
0.7
0.75
0.8
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Summary for Pond 6P: BIO 5

Inflow Area = 0.622 ac, 70.91% Impervious, Inflow Depth > 1.47" for 1-Year event
Inflow = 1.10 cfs @ 12.28 hrs, Volume= 0.076 af
Outflow = 0.63 cfs @ 12.49 hrs, Volume= 0.073 af, Atten= 43%, Lag= 12.6 min
Primary = 0.63 cfs @ 12.49 hrs, Volume= 0.073 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 918.26' @ 12.49 hrs Surf.Area= 1,133 sf Storage= 866 cf

Plug-Flow detention time= 34.7 min calculated for 0.073 af (96% of inflow)
Center-of-Mass det. time= 19.8 min (803.6 - 783.9)

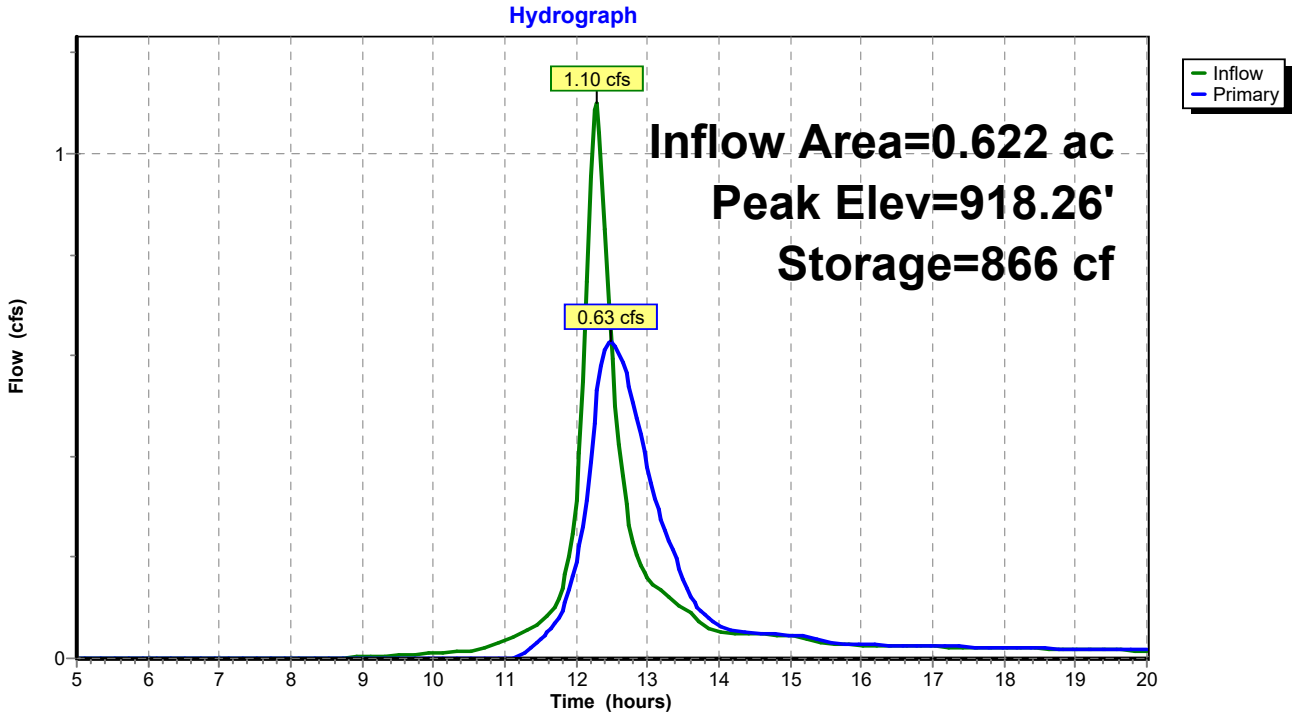
Volume	Invert	Avail.Storage	Storage Description
#1	915.60'	4,017 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
915.60	1,133	0.0	0	0
916.60	1,133	35.0	397	397
918.60	1,133	25.0	567	963
920.50	2,082	100.0	3,054	4,017

Device	Routing	Invert	Outlet Devices
#1	Primary	915.85'	**6.0" Round Culvert** L= 53.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 915.85' / 915.75' S= 0.0019 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf
#2	Device 1	915.85'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	919.50'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.63 cfs @ 12.49 hrs HW=918.25' (Free Discharge)
└**1=Culvert** (Passes 0.63 cfs of 1.12 cfs potential flow)
  └**2=Orifice/Grate** (Orifice Controls 0.63 cfs @ 7.19 fps)
  └**3=Orifice/Grate** (Controls 0.00 cfs)

Pond 6P: BIO 5


Hydrograph
1.10 cfs
0.63 cfs
Inflow Area=0.622 ac
Peak Elev=918.26'
Storage=866 cf
Inflow
Primary
Flow (cfs)
Time (hours)
0
1
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Summary for Pond 8P: BIO 2

[88] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 0.564 ac, 54.07% Impervious, Inflow Depth > 1.19" for 1-Year event
Inflow = 1.25 cfs @ 12.14 hrs, Volume= 0.056 af
Outflow = 1.25 cfs @ 12.14 hrs, Volume= 0.053 af, Atten= 0%, Lag= 0.2 min
Primary = 1.21 cfs @ 12.14 hrs, Volume= 0.053 af
Secondary = 0.04 cfs @ 12.15 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 915.22' @ 12.14 hrs Surf.Area= 180 sf Storage= 138 cf

Plug-Flow detention time= 23.4 min calculated for 0.053 af (95% of inflow)
Center-of-Mass det. time= 5.8 min (790.8 - 785.0)

Volume	Invert	Avail.Storage	Storage Description
#1	911.95'	234 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

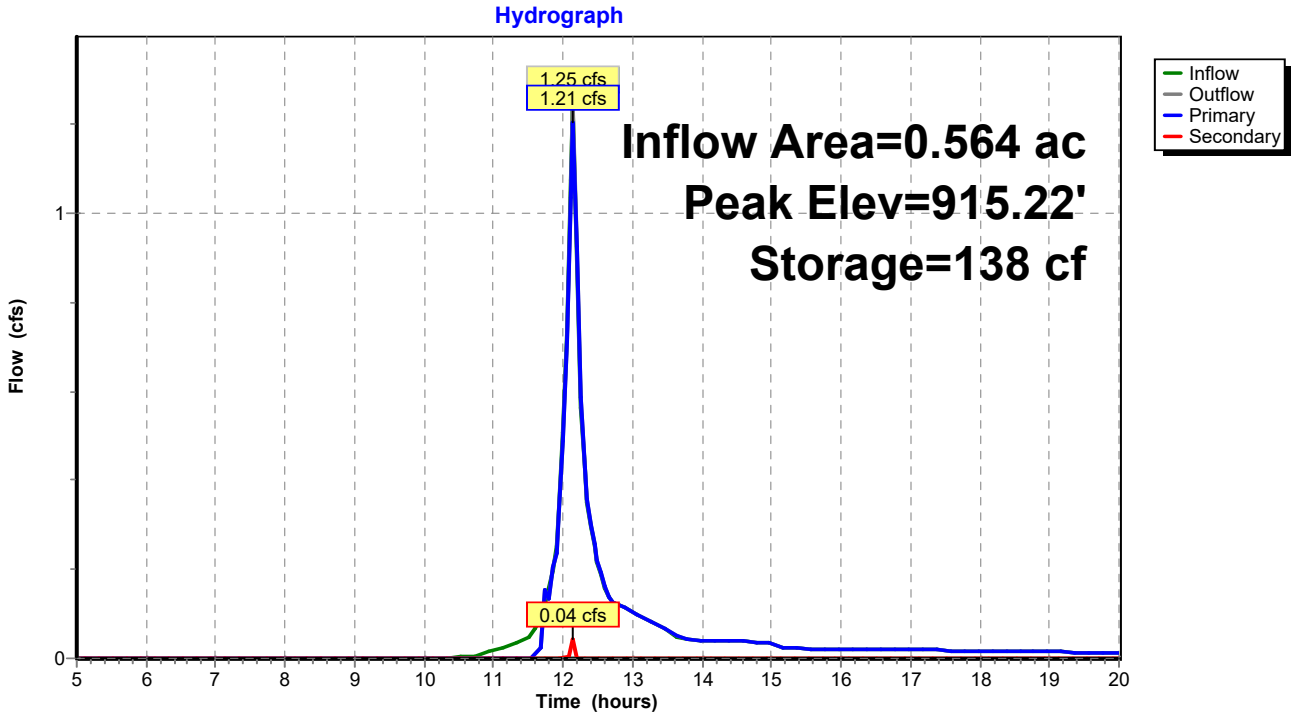
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
911.95	116	0.0	0	0
912.95	116	35.0	41	41
914.95	116	25.0	58	99
915.63	281	100.0	135	234

Device	Routing	Invert	Outlet Devices
#1	Primary	912.20'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	915.20'	**7.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#3	Device 1	915.10'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.18 cfs @ 12.14 hrs HW=915.21' (Free Discharge)
└**1=Orifice/Grate** (Passes 1.18 cfs of 1.57 cfs potential flow)
└**3=Orifice/Grate** (Weir Controls 1.18 cfs @ 1.10 fps)

Secondary OutFlow Max=0.03 cfs @ 12.15 hrs HW=915.21' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 0.03 cfs @ 0.30 fps)

Pond 8P: BIO 2


Hydrograph
1.25 cfs
1.21 cfs
Inflow Area=0.564 ac
Peak Elev=915.22'
Storage=138 cf
0.04 cfs
Inflow
Outflow
Primary
Secondary
Flow (cfs)
Time (hours)
0
1
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Summary for Pond 9P: BIO 3

Inflow Area = 0.322 ac, 35.22% Impervious, Inflow Depth > 0.90" for 1-Year event
Inflow = 0.58 cfs @ 12.14 hrs, Volume= 0.024 af
Outflow = 0.54 cfs @ 12.16 hrs, Volume= 0.024 af, Atten= 8%, Lag= 1.1 min
Primary = 0.54 cfs @ 12.16 hrs, Volume= 0.024 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 910.59' @ 12.16 hrs Surf.Area= 237 sf Storage= 68 cf

Plug-Flow detention time= 13.0 min calculated for 0.024 af (98% of inflow)
Center-of-Mass det. time= 4.2 min (798.7 - 794.4)

Volume	Invert	Avail.Storage	Storage Description
#1	909.77'	432 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

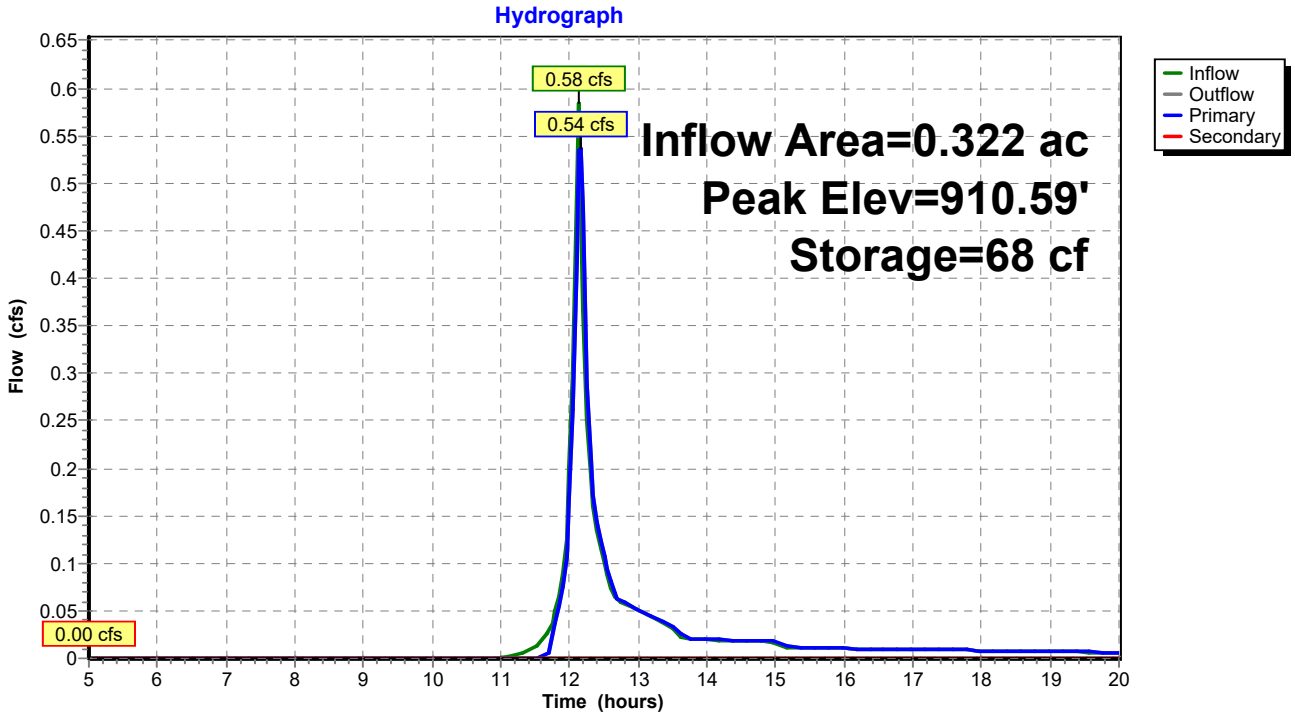
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
909.77	237	0.0	0	0
910.77	237	35.0	83	83
912.77	237	25.0	119	201
913.50	395	100.0	231	432

Device	Routing	Invert	Outlet Devices
#1	Primary	910.02'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	913.00'	**7.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=0.53 cfs @ 12.16 hrs HW=910.58' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 0.53 cfs @ 2.68 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=909.77' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 9P: BIO 3


Hydrograph
0.58 cfs
0.54 cfs
0.00 cfs
Inflow Area=0.322 ac
Peak Elev=910.59'
Storage=68 cf
Inflow
Outflow
Primary
Secondary
Flow (cfs)
Time (hours)
0.65
0.6
0.55
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
5
6
7
8
9
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Summary for Pond 10P: BIO 4

[79] Warning: Submerged Pond 9P Primary device # 1 by 0.38'

Inflow Area = 0.570 ac, 43.53% Impervious, Inflow Depth > 1.02" for 1-Year event
Inflow = 1.08 cfs @ 12.14 hrs, Volume= 0.048 af
Outflow = 1.01 cfs @ 12.17 hrs, Volume= 0.048 af, Atten= 6%, Lag= 1.4 min
Primary = 1.01 cfs @ 12.17 hrs, Volume= 0.048 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 910.44' @ 12.17 hrs Surf.Area= 191 sf Storage= 97 cf

Plug-Flow detention time= 6.4 min calculated for 0.048 af (99% of inflow)
Center-of-Mass det. time= 2.6 min (793.8 - 791.2)

Volume	Invert	Avail.Storage	Storage Description
#1	908.80'	614 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

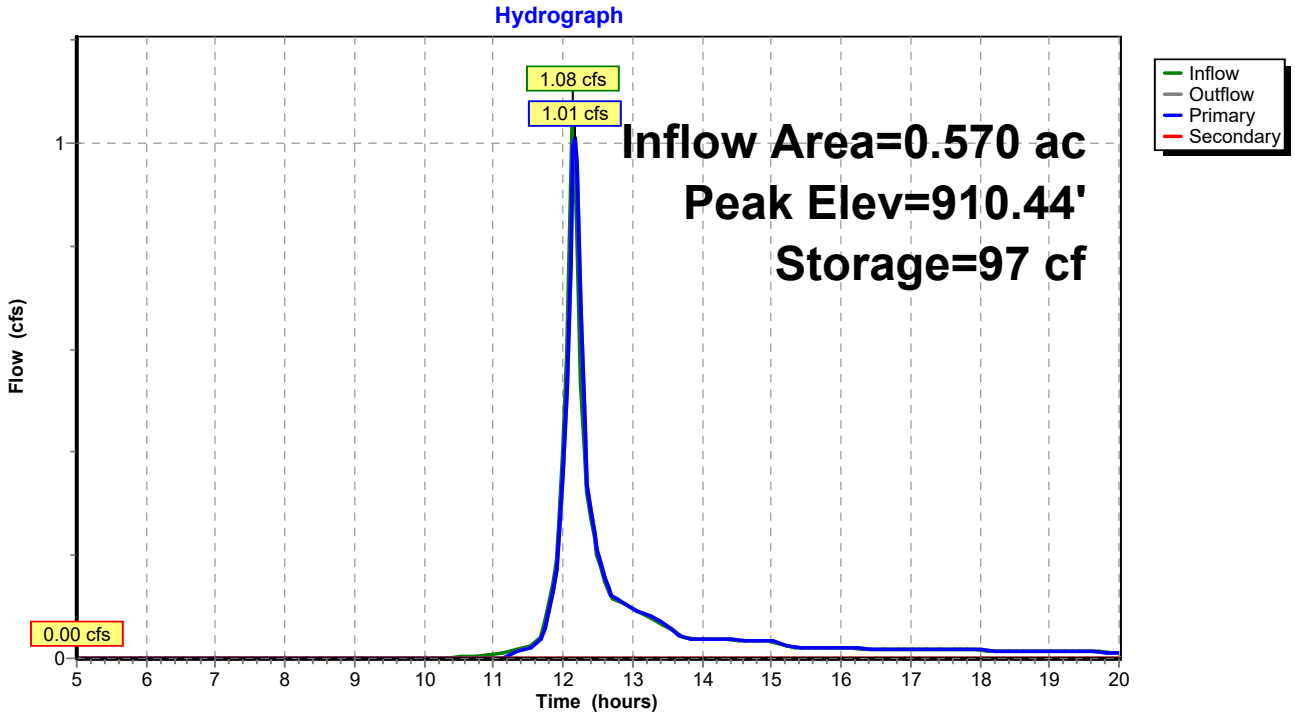
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
908.80	191	0.0	0	0
909.80	191	35.0	67	67
911.80	191	25.0	96	162
912.66	600	100.0	340	502
912.80	1,000	100.0	112	614

Device	Routing	Invert	Outlet Devices
#1	Primary	909.00'	**12.0" Round Culvert** L= 51.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 909.00' / 908.90' S= 0.0020 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Device 1	909.05'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	912.40'	**36.0" Horiz. Orifice/Grate** C= 0.600
#4	Secondary	912.65'	**24.0" x 36.0" Horiz. Orifice/Grate** X 2 rows C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.98 cfs @ 12.17 hrs HW=910.37' (Free Discharge)
└**1=Culvert** (Passes 0.98 cfs of 2.67 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.98 cfs @ 4.99 fps)
  └**3=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=908.80' (Free Discharge)
└**4=Orifice/Grate** (Controls 0.00 cfs)

Pond 10P: BIO 4

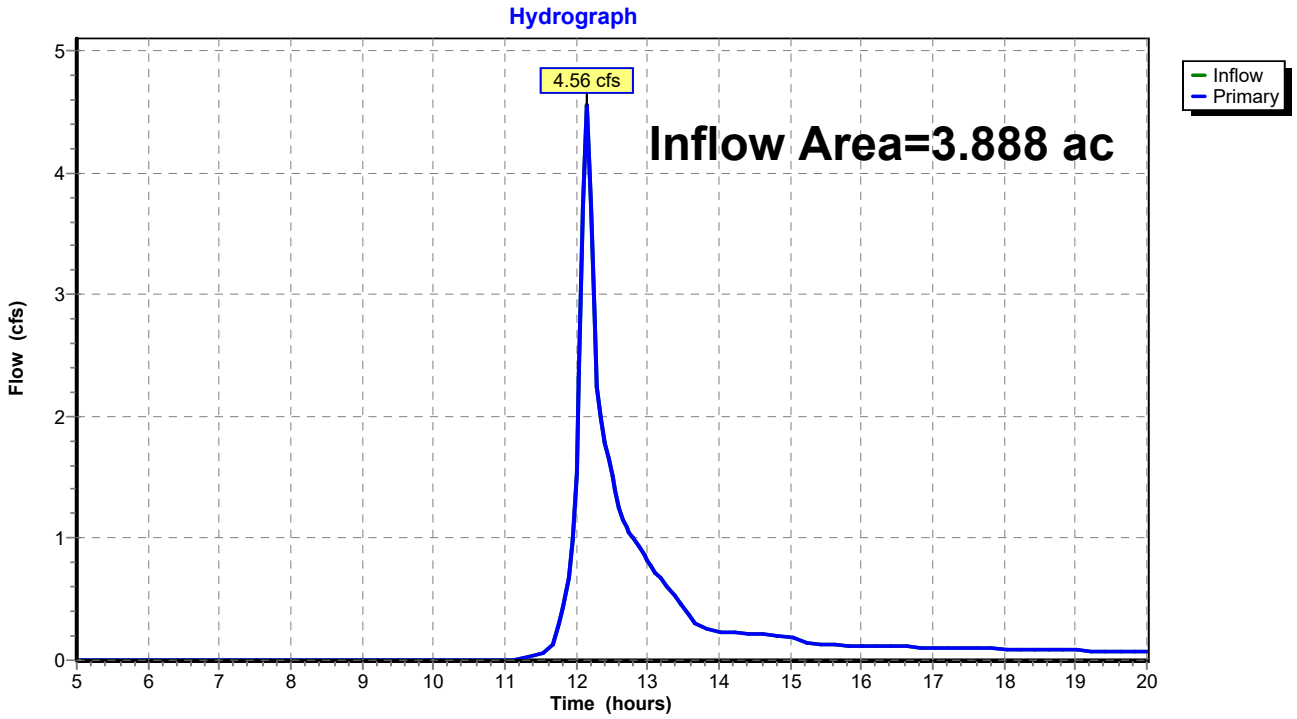


Summary for Link 7L: PROPOSED

Inflow Area = 3.888 ac, 25.91% Impervious, Inflow Depth > 0.83" for 1-Year event
Inflow = 4.56 cfs @ 12.15 hrs, Volume= 0.269 af
Primary = 4.56 cfs @ 12.15 hrs, Volume= 0.269 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 7L: PROPOSED



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: 1 Runoff Area=8,335 sf 7.05% Impervious Runoff Depth>0.79"
Tc=6.0 min CN=76 Runoff=0.28 cfs 0.013 af

Subcatchment2S: 2 Runoff Area=84,555 sf 0.00% Impervious Runoff Depth>0.69"
Tc=6.0 min CN=74 Runoff=2.47 cfs 0.112 af

Subcatchment3S: 3 Runoff Area=14,755 sf 54.09% Impervious Runoff Depth>1.44"
Tc=6.0 min CN=87 Runoff=0.90 cfs 0.041 af

Subcatchment4S: 4 Runoff Area=9,802 sf 54.05% Impervious Runoff Depth>1.44"
Tc=6.0 min CN=87 Runoff=0.60 cfs 0.027 af

Subcatchment5S: 5 Runoff Area=14,045 sf 35.22% Impervious Runoff Depth>1.11"
Tc=6.0 min CN=82 Runoff=0.67 cfs 0.030 af

Subcatchment6S: 6 Runoff Area=10,785 sf 54.35% Impervious Runoff Depth>1.44"
Tc=6.0 min CN=87 Runoff=0.66 cfs 0.030 af

Subcatchment7S: 7 Runoff Area=27,088 sf 70.91% Impervious Runoff Depth>1.74"
Flow Length=300' Slope=0.0450 '/' Tc=18.5 min CN=91 Runoff=1.30 cfs 0.090 af

Pond 5P: BIO 1 Peak Elev=916.89' Storage=42 cf Inflow=0.90 cfs 0.041 af
Primary=0.89 cfs 0.040 af Secondary=0.00 cfs 0.000 af Outflow=0.89 cfs 0.040 af

Pond 6P: BIO 5 Peak Elev=918.67' Storage=1,042 cf Inflow=1.30 cfs 0.090 af
Outflow=0.68 cfs 0.087 af

Pond 8P: BIO 2 Peak Elev=915.23' Storage=140 cf Inflow=1.49 cfs 0.067 af
Primary=1.39 cfs 0.064 af Secondary=0.09 cfs 0.001 af Outflow=1.49 cfs 0.064 af

Pond 9P: BIO 3 Peak Elev=910.80' Storage=85 cf Inflow=0.77 cfs 0.030 af
Primary=0.69 cfs 0.030 af Secondary=0.00 cfs 0.000 af Outflow=0.69 cfs 0.030 af

Pond 10P: BIO 4 Peak Elev=910.97' Storage=123 cf Inflow=1.33 cfs 0.059 af
Primary=1.23 cfs 0.059 af Secondary=0.00 cfs 0.000 af Outflow=1.23 cfs 0.059 af

Link 7L: PROPOSED Inflow=5.69 cfs 0.334 af
Primary=5.69 cfs 0.334 af

Total Runoff Area = 3.888 ac Runoff Volume = 0.341 af Average Runoff Depth = 1.05"
74.09% Pervious = 2.881 ac 25.91% Impervious = 1.007 ac

Summary for Subcatchment 1S: 1

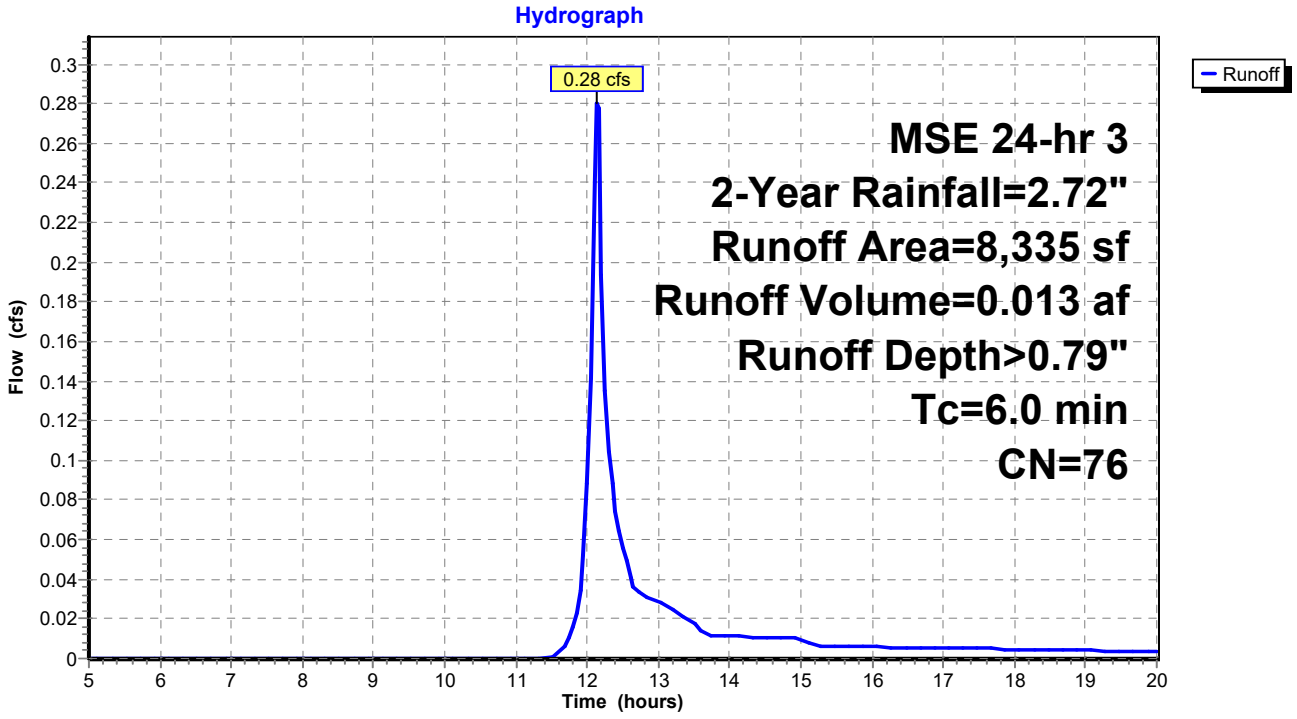
Runoff = 0.28 cfs @ 12.14 hrs, Volume= 0.013 af, Depth> 0.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-Year Rainfall=2.72"

Area (sf)	CN	Description
588	98	Paved parking, HSG C
7,747	74	>75% Grass cover, Good, HSG C
8,335	76	Weighted Average
7,747		92.95% Pervious Area
588		7.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, PER TR-55**

Subcatchment 1S: 1



Summary for Subcatchment 2S: 2

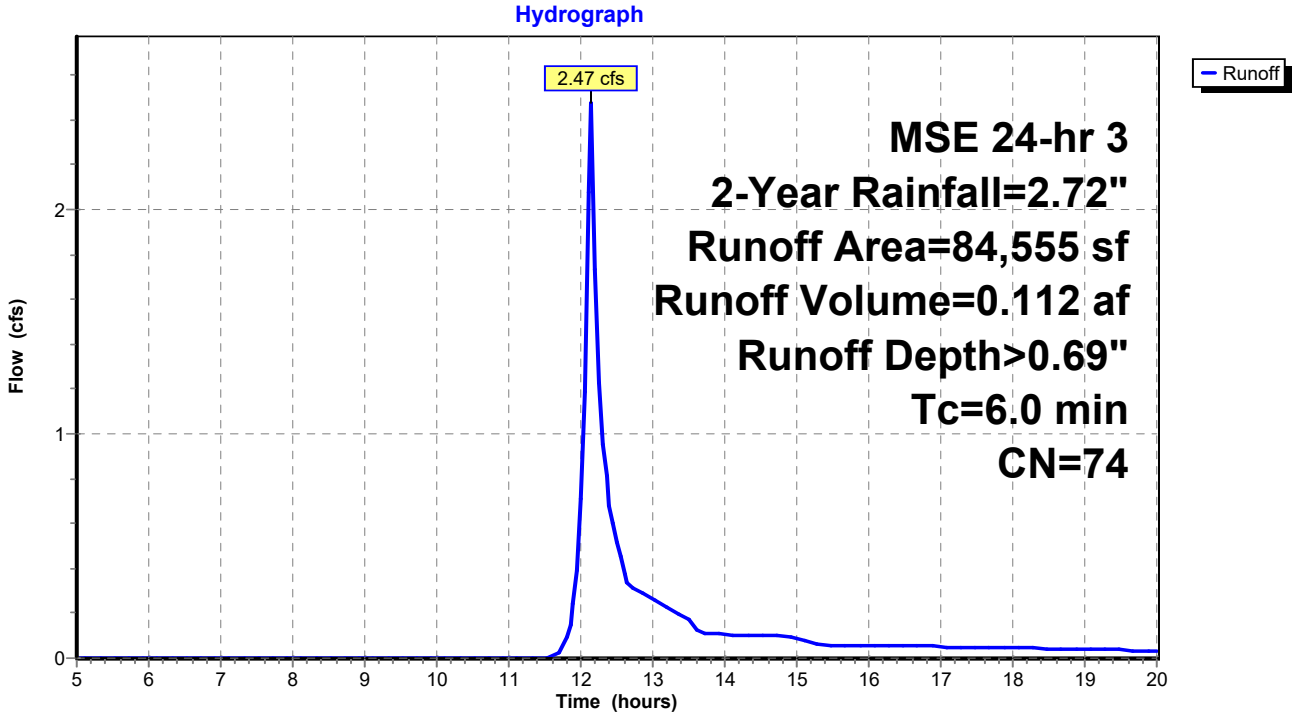
Runoff = 2.47 cfs @ 12.14 hrs, Volume= 0.112 af, Depth> 0.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-Year Rainfall=2.72"

Area (sf)	CN	Description
2,713	89	Gravel roads, HSG C
81,842	74	>75% Grass cover, Good, HSG C
84,555	74	Weighted Average
84,555		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, PER TR-55**

Subcatchment 2S: 2



Summary for Subcatchment 3S: 3

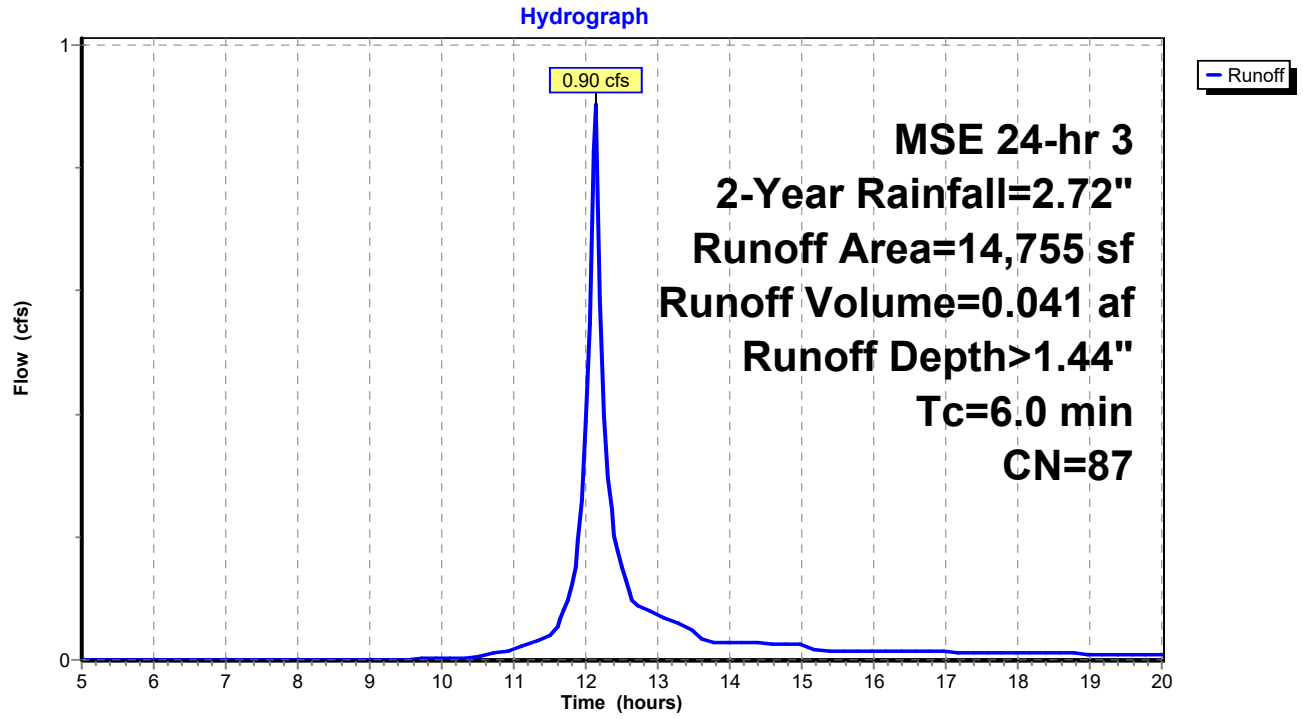
Runoff = 0.90 cfs @ 12.13 hrs, Volume= 0.041 af, Depth> 1.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-Year Rainfall=2.72"

Area (sf)	CN	Description
3,456	98	Paved parking, HSG C
2,817	98	Paved parking, HSG C
1,482	98	Paved parking, HSG C
226	98	Paved parking, HSG C
6,774	74	>75% Grass cover, Good, HSG C
14,755	87	Weighted Average
6,774		45.91% Pervious Area
7,981		54.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, PER TR-55**

Subcatchment 3S: 3



Summary for Subcatchment 4S: 4

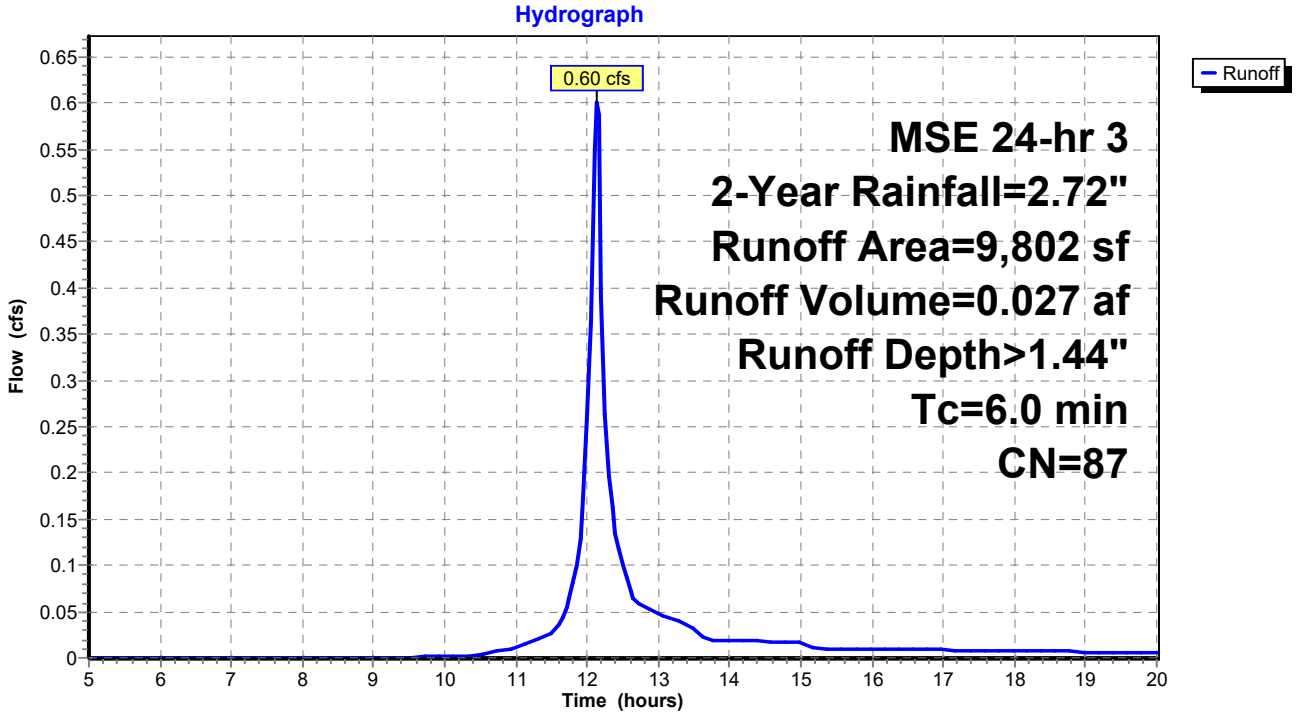
Runoff = 0.60 cfs @ 12.13 hrs, Volume= 0.027 af, Depth> 1.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-Year Rainfall=2.72"

Area (sf)	CN	Description
1,867	98	Paved parking, HSG C
1,687	98	Paved parking, HSG C
602	98	Paved parking, HSG C
1,142	98	Paved parking, HSG C
4,504	74	>75% Grass cover, Good, HSG C
9,802	87	Weighted Average
4,504		45.95% Pervious Area
5,298		54.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, PER TR-55**

Subcatchment 4S: 4



Summary for Subcatchment 5S: 5

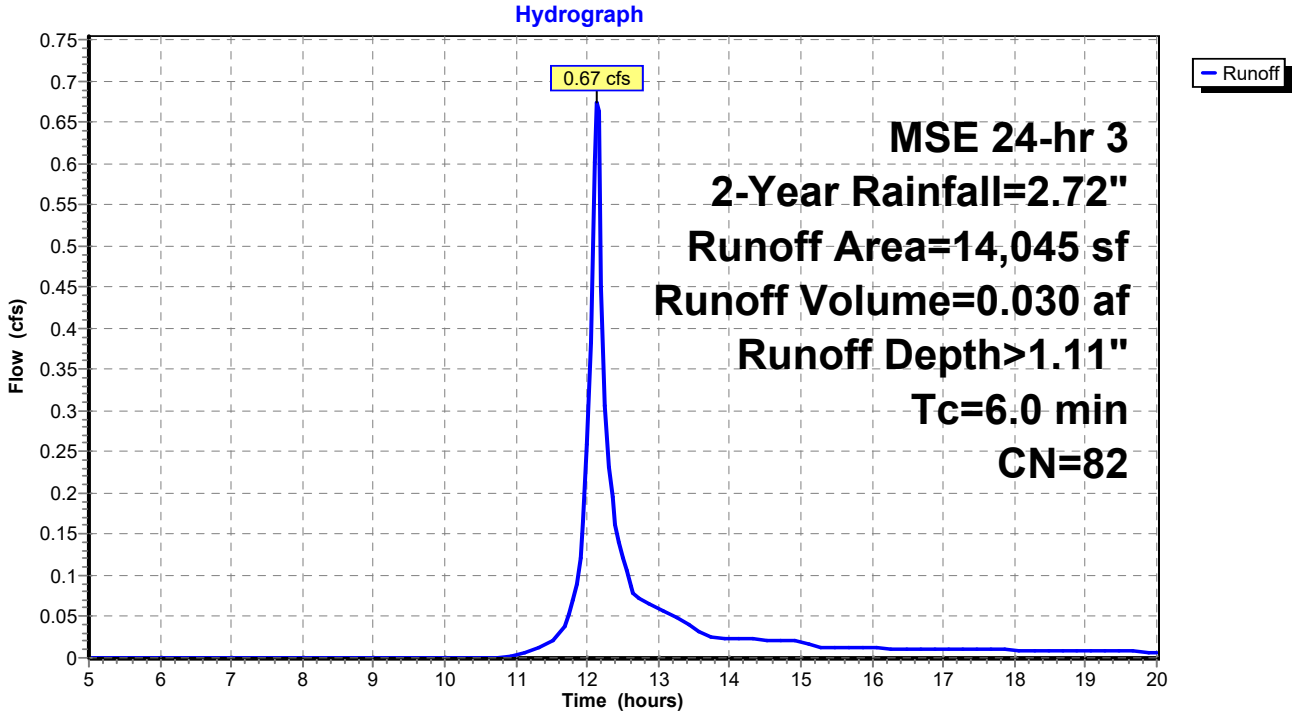
Runoff = 0.67 cfs @ 12.14 hrs, Volume= 0.030 af, Depth> 1.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-Year Rainfall=2.72"

Area (sf)	CN	Description
1,609	98	Paved parking, HSG C
2,002	98	Paved parking, HSG C
487	98	Paved parking, HSG C
849	98	Paved parking, HSG C
9,098	74	>75% Grass cover, Good, HSG C
14,045	82	Weighted Average
9,098		64.78% Pervious Area
4,947		35.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, PER TR-55**

Subcatchment 5S: 5



Summary for Subcatchment 6S: 6

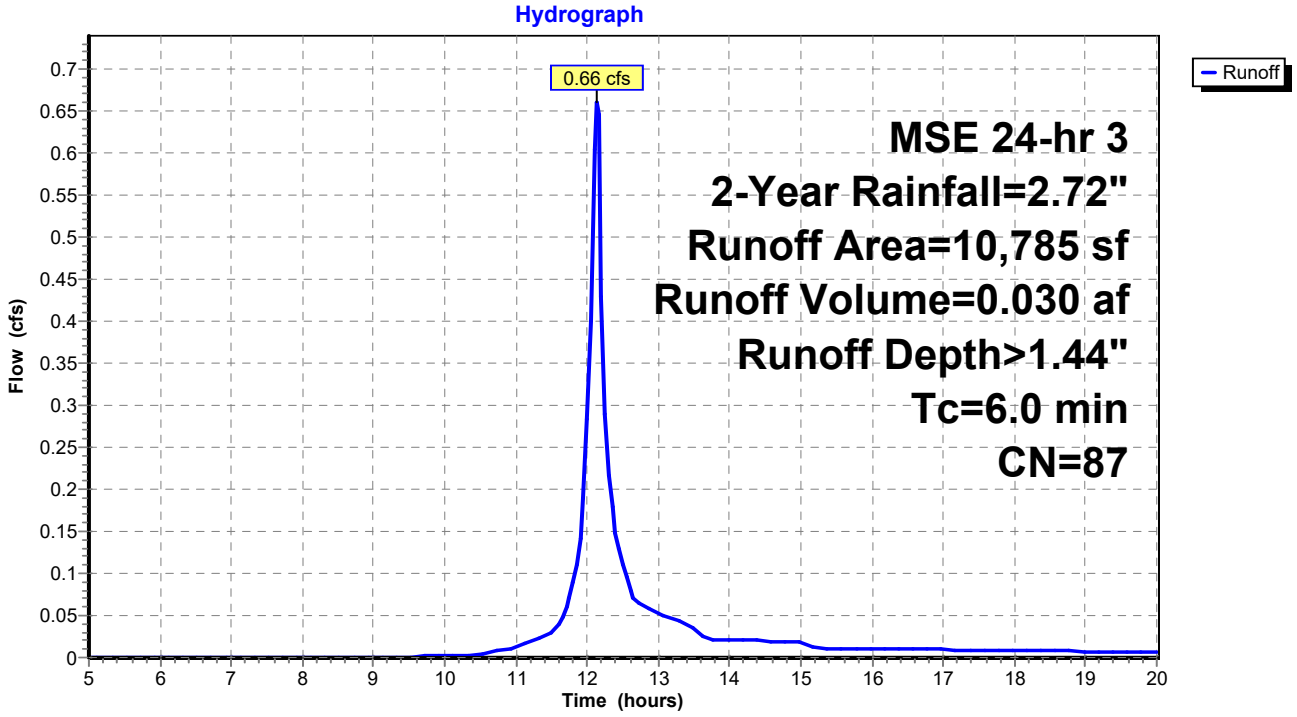
Runoff = 0.66 cfs @ 12.13 hrs, Volume= 0.030 af, Depth> 1.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-Year Rainfall=2.72"

Area (sf)	CN	Description
1,507	98	Paved parking, HSG C
2,759	98	Paved parking, HSG C
494	98	Paved parking, HSG C
1,102	98	Paved parking, HSG C
323	89	Gravel roads, HSG C
4,600	74	>75% Grass cover, Good, HSG C
10,785	87	Weighted Average
4,923		45.65% Pervious Area
5,862		54.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, PER TR-55**

Subcatchment 6S: 6



Summary for Subcatchment 7S: 7

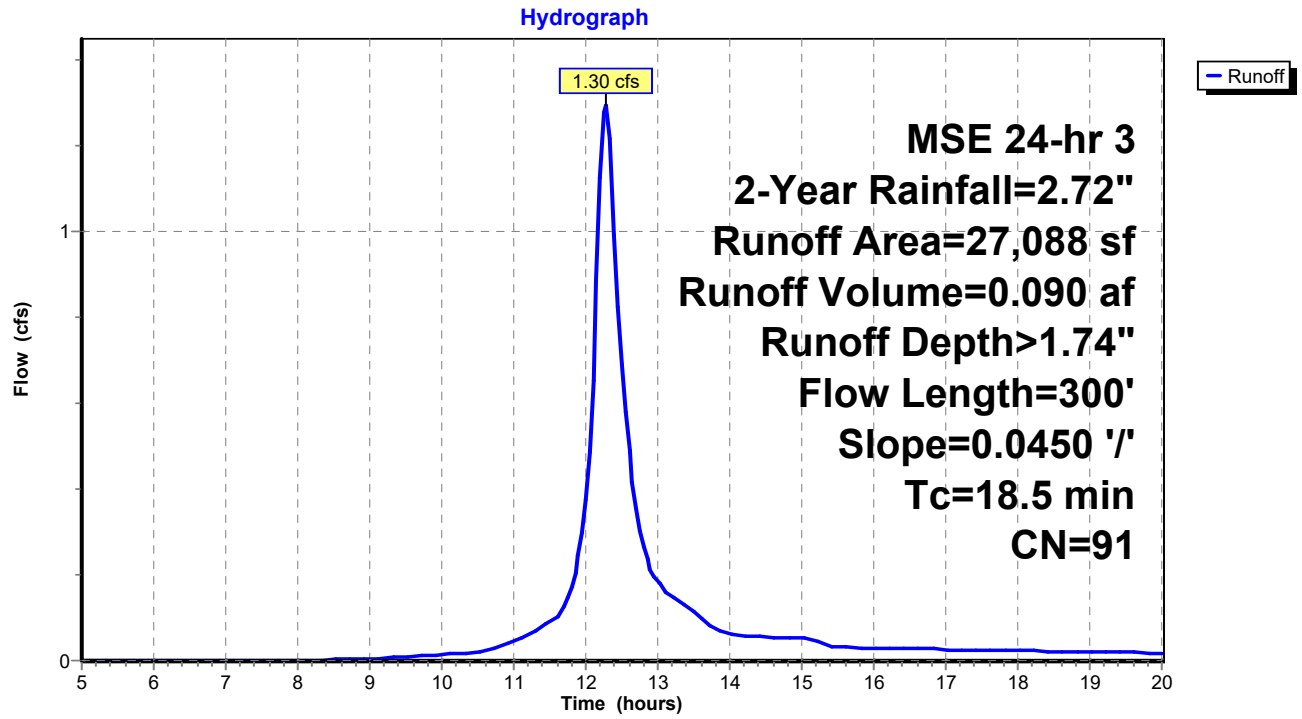
Runoff = 1.30 cfs @ 12.27 hrs, Volume= 0.090 af, Depth> 1.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-Year Rainfall=2.72"

Area (sf)	CN	Description
19,123	98	Paved parking, HSG C
85	98	Paved parking, HSG C
7,880	74	>75% Grass cover, Good, HSG C
27,088	91	Weighted Average
7,880		29.09% Pervious Area
19,208		70.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.5	300	0.0450	0.27		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.72"

Subcatchment 7S: 7



Summary for Pond 5P: BIO 1

Inflow Area = 0.339 ac, 54.09% Impervious, Inflow Depth > 1.44" for 2-Year event
Inflow = 0.90 cfs @ 12.13 hrs, Volume= 0.041 af
Outflow = 0.89 cfs @ 12.14 hrs, Volume= 0.040 af, Atten= 1%, Lag= 0.7 min
Primary = 0.89 cfs @ 12.14 hrs, Volume= 0.040 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 916.89' @ 12.15 hrs Surf.Area= 94 sf Storage= 42 cf

Plug-Flow detention time= 3.8 min calculated for 0.040 af (99% of inflow)
Center-of-Mass det. time= 1.6 min (782.6 - 780.9)

Volume	Invert	Avail.Storage	Storage Description
#1	915.50'	115 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

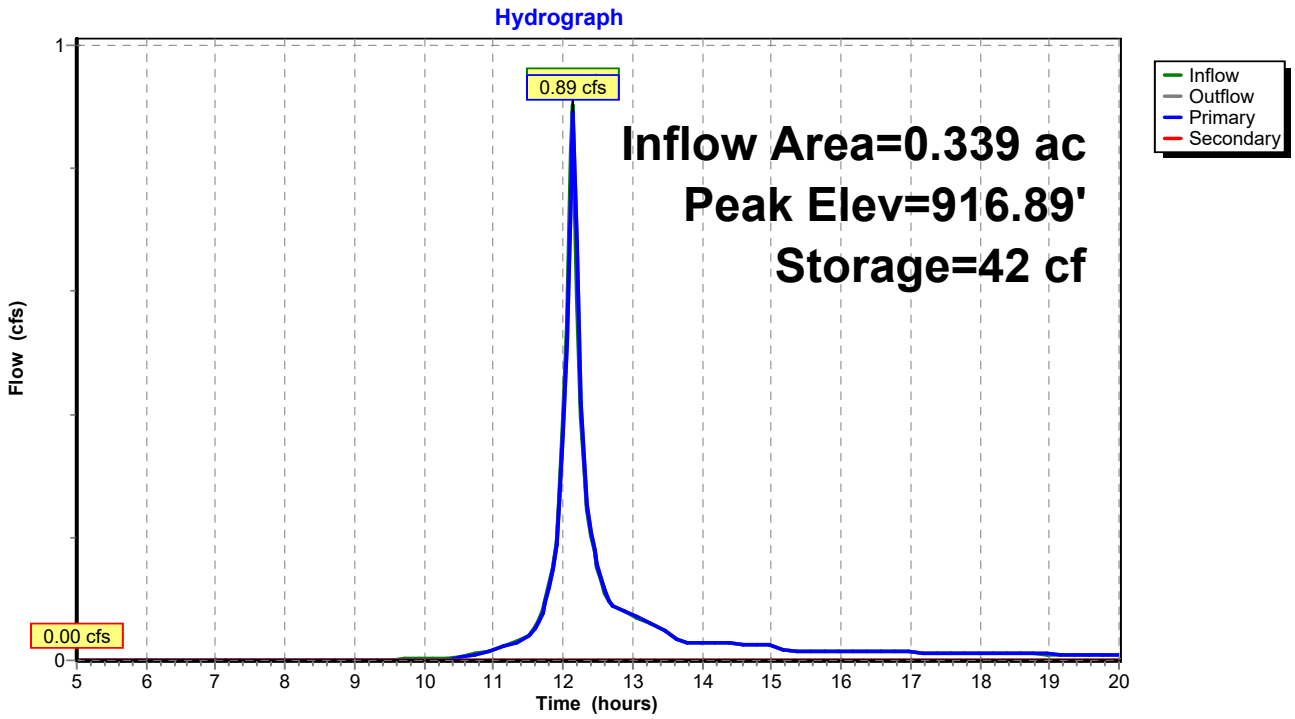
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
915.50	94	0.0	0	0
916.50	94	35.0	33	33
918.50	94	25.0	47	80
918.70	254	100.0	35	115

Device	Routing	Invert	Outlet Devices
#1	Primary	915.75'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	918.60'	**7.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=0.88 cfs @ 12.14 hrs HW=916.86' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 0.88 cfs @ 4.48 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=915.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 5P: BIO 1


Hydrograph
Inflow Area=0.339 ac
Peak Elev=916.89'
Storage=42 cf
0.89 cfs
0.00 cfs
Inflow
Outflow
Primary
Secondary
Flow (cfs)
Time (hours)
0
1
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Summary for Pond 6P: BIO 5

Inflow Area = 0.622 ac, 70.91% Impervious, Inflow Depth > 1.74" for 2-Year event
Inflow = 1.30 cfs @ 12.27 hrs, Volume= 0.090 af
Outflow = 0.68 cfs @ 12.51 hrs, Volume= 0.087 af, Atten= 47%, Lag= 13.8 min
Primary = 0.68 cfs @ 12.51 hrs, Volume= 0.087 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 918.67' @ 12.51 hrs Surf.Area= 1,167 sf Storage= 1,042 cf

Plug-Flow detention time= 33.3 min calculated for 0.087 af (96% of inflow)
Center-of-Mass det. time= 20.5 min (801.6 - 781.1)

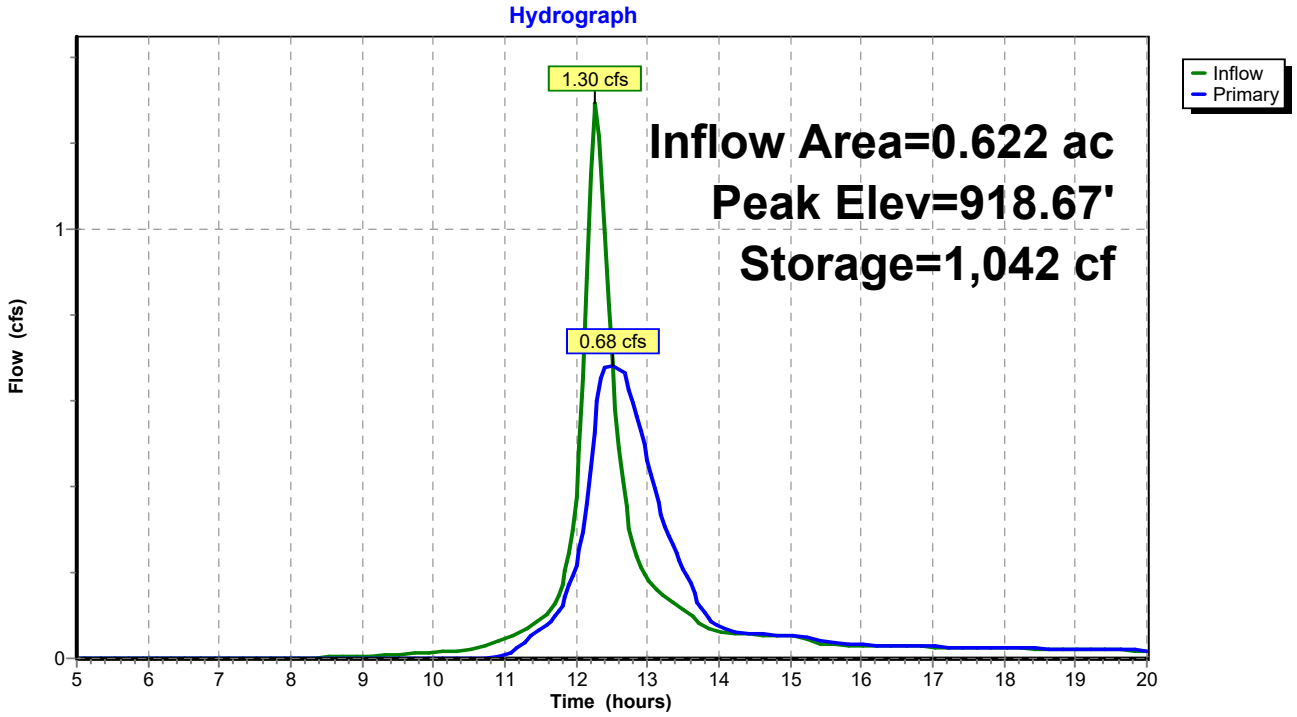
Volume	Invert	Avail.Storage	Storage Description
#1	915.60'	4,017 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
915.60	1,133	0.0	0	0
916.60	1,133	35.0	397	397
918.60	1,133	25.0	567	963
920.50	2,082	100.0	3,054	4,017

Device	Routing	Invert	Outlet Devices
#1	Primary	915.85'	**6.0" Round Culvert** L= 53.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 915.85' / 915.75' S= 0.0019 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf
#2	Device 1	915.85'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	919.50'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.68 cfs @ 12.51 hrs HW=918.67' (Free Discharge)
└**1=Culvert** (Passes 0.68 cfs of 1.23 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.68 cfs @ 7.84 fps)
  └**3=Orifice/Grate** (Controls 0.00 cfs)

Pond 6P: BIO 5


Hydrograph
1.30 cfs
0.68 cfs
Inflow Area=0.622 ac
Peak Elev=918.67'
Storage=1,042 cf
Inflow
Primary
Flow (cfs)
Time (hours)
0
1
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Summary for Pond 8P: BIO 2

Inflow Area = 0.564 ac, 54.07% Impervious, Inflow Depth > 1.43" for 2-Year event
Inflow = 1.49 cfs @ 12.14 hrs, Volume= 0.067 af
Outflow = 1.49 cfs @ 12.14 hrs, Volume= 0.064 af, Atten= 0%, Lag= 0.2 min
Primary = 1.39 cfs @ 12.14 hrs, Volume= 0.064 af
Secondary = 0.09 cfs @ 12.14 hrs, Volume= 0.001 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 915.23' @ 12.14 hrs Surf.Area= 184 sf Storage= 140 cf

Plug-Flow detention time= 20.3 min calculated for 0.064 af (96% of inflow)
Center-of-Mass det. time= 5.3 min (787.2 - 781.9)

Volume	Invert	Avail.Storage	Storage Description
#1	911.95'	234 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

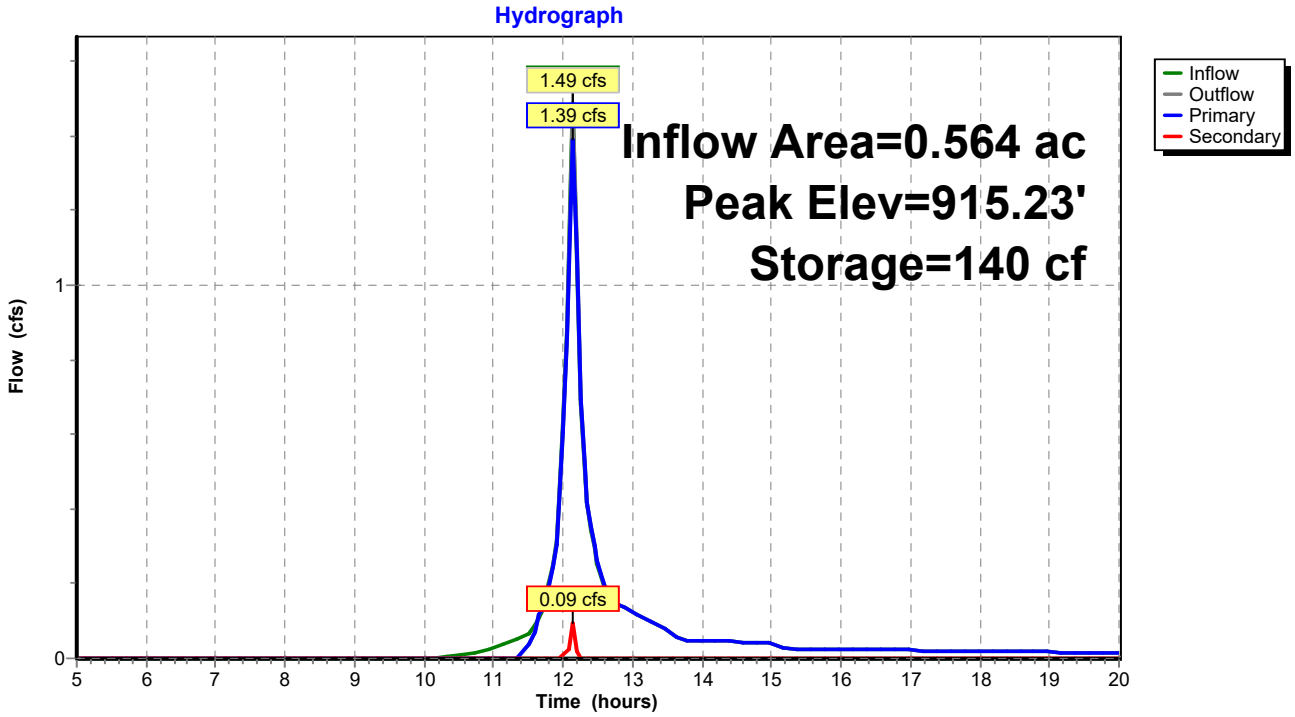
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
911.95	116	0.0	0	0
912.95	116	35.0	41	41
914.95	116	25.0	58	99
915.63	281	100.0	135	234

Device	Routing	Invert	Outlet Devices
#1	Primary	912.20'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	915.20'	**7.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#3	Device 1	915.10'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.40 cfs @ 12.14 hrs HW=915.23' (Free Discharge)
↑—**1=Orifice/Grate** (Passes 1.40 cfs of 1.58 cfs potential flow)
↑—**3=Orifice/Grate** (Weir Controls 1.40 cfs @ 1.17 fps)

Secondary OutFlow Max=0.08 cfs @ 12.14 hrs HW=915.23' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 0.08 cfs @ 0.42 fps)

Pond 8P: BIO 2


Hydrograph
1.49 cfs
1.39 cfs
0.09 cfs
Inflow Area=0.564 ac
Peak Elev=915.23'
Storage=140 cf
Inflow
Outflow
Primary
Secondary
Flow (cfs)
Time (hours)
0
1
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Summary for Pond 9P: BIO 3

Inflow Area = 0.322 ac, 35.22% Impervious, Inflow Depth > 1.13" for 2-Year event
Inflow = 0.77 cfs @ 12.14 hrs, Volume= 0.030 af
Outflow = 0.69 cfs @ 12.16 hrs, Volume= 0.030 af, Atten= 10%, Lag= 1.3 min
Primary = 0.69 cfs @ 12.16 hrs, Volume= 0.030 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 910.80' @ 12.16 hrs Surf.Area= 237 sf Storage= 85 cf

Plug-Flow detention time= 10.8 min calculated for 0.030 af (98% of inflow)
Center-of-Mass det. time= 3.8 min (793.9 - 790.1)

Volume	Invert	Avail.Storage	Storage Description
#1	909.77'	432 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

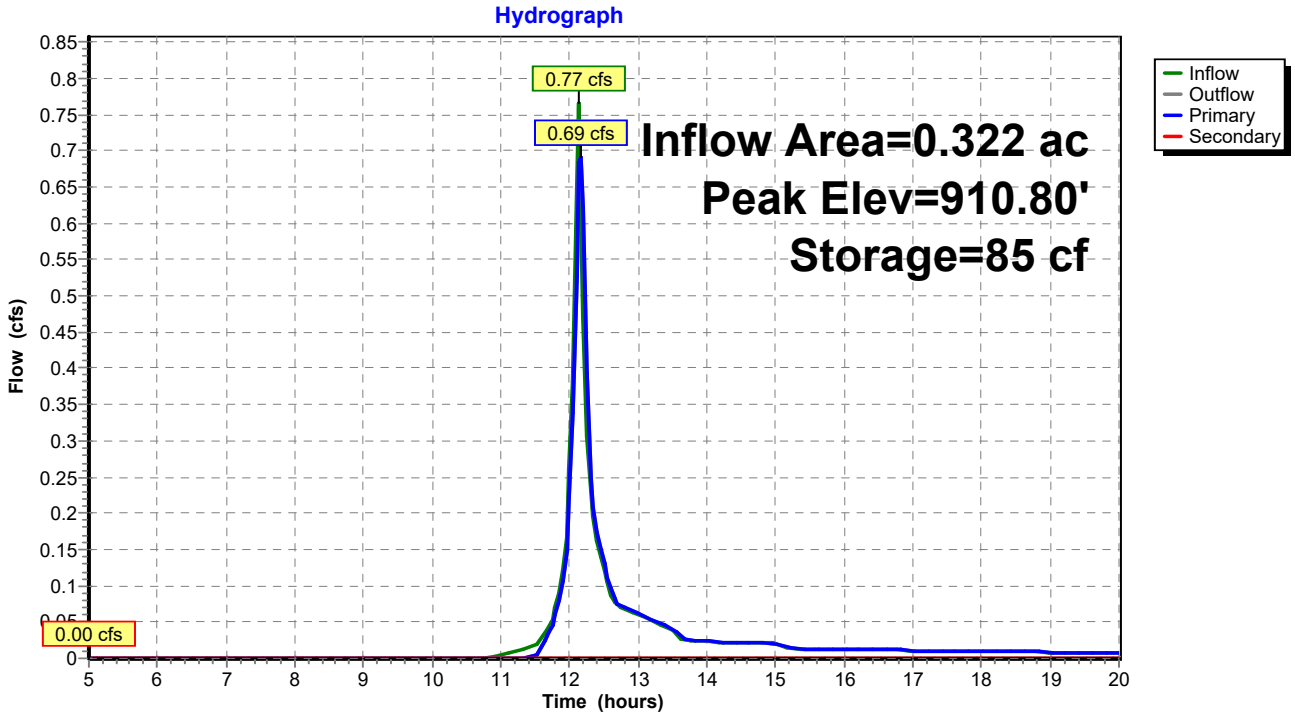
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
909.77	237	0.0	0	0
910.77	237	35.0	83	83
912.77	237	25.0	119	201
913.50	395	100.0	231	432

Device	Routing	Invert	Outlet Devices
#1	Primary	910.02'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	913.00'	**7.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=0.67 cfs @ 12.16 hrs HW=910.78' (Free Discharge)
1=Orifice/Grate (Orifice Controls 0.67 cfs @ 3.42 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=909.77' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 9P: BIO 3


Hydrograph
Inflow Area=0.322 ac
Peak Elev=910.80'
Storage=85 cf
0.77 cfs
0.69 cfs
0.00 cfs
Inflow
Outflow
Primary
Secondary
Flow (cfs)
Time (hours)
0.85
0.8
0.75
0.7
0.65
0.6
0.55
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Summary for Pond 10P: BIO 4

[81] Warning: Exceeded Pond 9P by 0.19' @ 12.20 hrs

Inflow Area = 0.570 ac, 43.53% Impervious, Inflow Depth > 1.25" for 2-Year event
Inflow = 1.33 cfs @ 12.15 hrs, Volume= 0.059 af
Outflow = 1.23 cfs @ 12.17 hrs, Volume= 0.059 af, Atten= 8%, Lag= 1.7 min
Primary = 1.23 cfs @ 12.17 hrs, Volume= 0.059 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 910.97' @ 12.17 hrs Surf.Area= 191 sf Storage= 123 cf

Plug-Flow detention time= 5.6 min calculated for 0.059 af (99% of inflow)
Center-of-Mass det. time= 2.4 min (789.9 - 787.4)

Volume	Invert	Avail.Storage	Storage Description
#1	908.80'	614 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

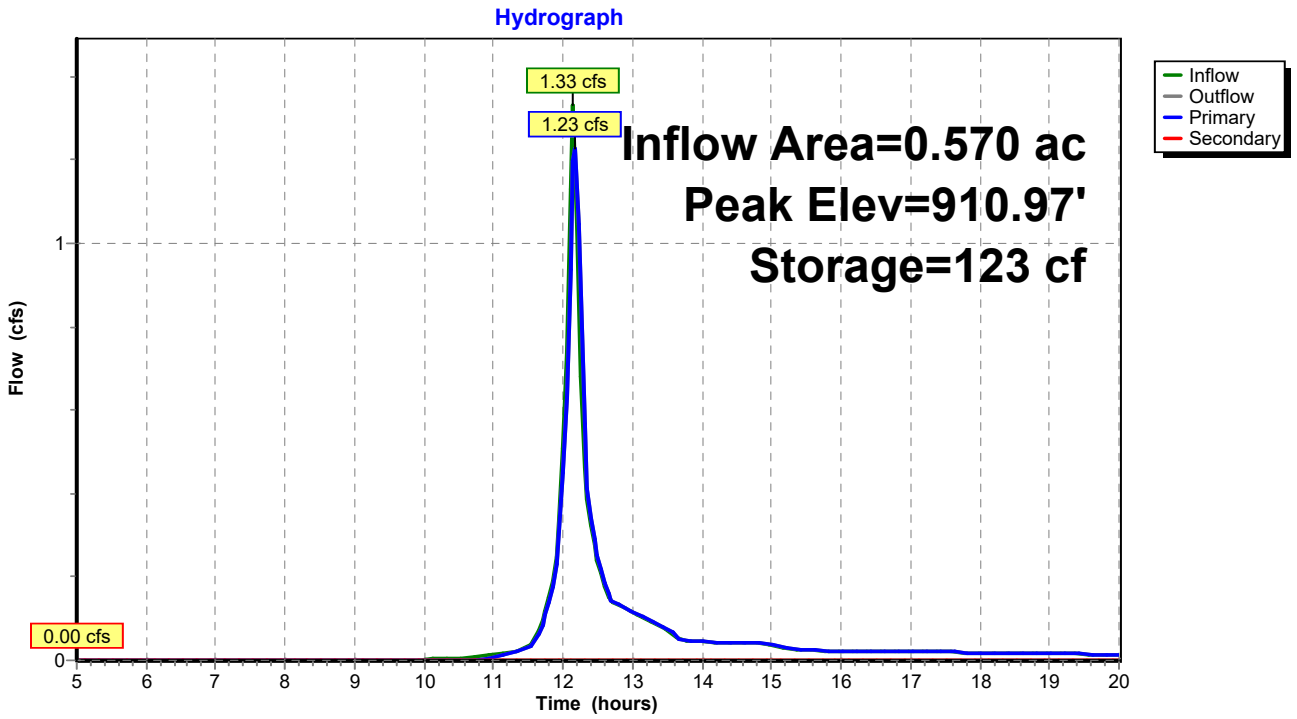
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
908.80	191	0.0	0	0
909.80	191	35.0	67	67
911.80	191	25.0	96	162
912.66	600	100.0	340	502
912.80	1,000	100.0	112	614

Device	Routing	Invert	Outlet Devices
#1	Primary	909.00'	**12.0" Round Culvert** L= 51.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 909.00' / 908.90' S= 0.0020 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Device 1	909.05'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	912.40'	**36.0" Horiz. Orifice/Grate** C= 0.600
#4	Secondary	912.65'	**24.0" x 36.0" Horiz. Orifice/Grate** X 2 rows C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.19 cfs @ 12.17 hrs HW=910.90' (Free Discharge)
└**1=Culvert** (Passes 1.19 cfs of 3.87 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 1.19 cfs @ 6.08 fps)
  └**3=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=908.80' (Free Discharge)
└**4=Orifice/Grate** (Controls 0.00 cfs)

Pond 10P: BIO 4

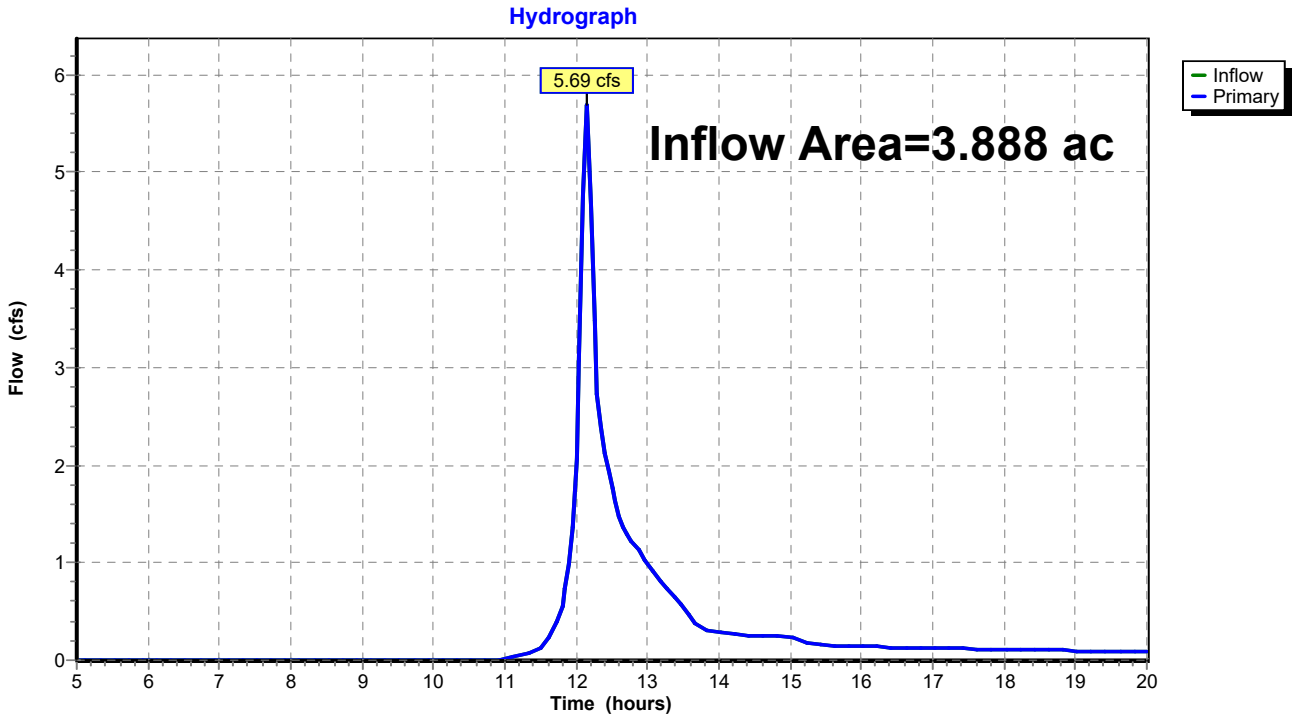


Summary for Link 7L: PROPOSED

Inflow Area = 3.888 ac, 25.91% Impervious, Inflow Depth > 1.03" for 2-Year event
Inflow = 5.69 cfs @ 12.15 hrs, Volume= 0.334 af
Primary = 5.69 cfs @ 12.15 hrs, Volume= 0.334 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 7L: PROPOSED



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: 1 Runoff Area=8,335 sf 7.05% Impervious Runoff Depth>1.53"
Tc=6.0 min CN=76 Runoff=0.55 cfs 0.024 af

Subcatchment2S: 2 Runoff Area=84,555 sf 0.00% Impervious Runoff Depth>1.40"
Tc=6.0 min CN=74 Runoff=5.12 cfs 0.226 af

Subcatchment3S: 3 Runoff Area=14,755 sf 54.09% Impervious Runoff Depth>2.39"
Tc=6.0 min CN=87 Runoff=1.47 cfs 0.067 af

Subcatchment4S: 4 Runoff Area=9,802 sf 54.05% Impervious Runoff Depth>2.39"
Tc=6.0 min CN=87 Runoff=0.98 cfs 0.045 af

Subcatchment5S: 5 Runoff Area=14,045 sf 35.22% Impervious Runoff Depth>1.97"
Tc=6.0 min CN=82 Runoff=1.19 cfs 0.053 af

Subcatchment6S: 6 Runoff Area=10,785 sf 54.35% Impervious Runoff Depth>2.39"
Tc=6.0 min CN=87 Runoff=1.07 cfs 0.049 af

Subcatchment7S: 7 Runoff Area=27,088 sf 70.91% Impervious Runoff Depth>2.75"
Flow Length=300' Slope=0.0450 '/' Tc=18.5 min CN=91 Runoff=2.01 cfs 0.142 af

Pond 5P: BIO 1 Peak Elev=918.26' Storage=74 cf Inflow=1.47 cfs 0.067 af
Primary=1.42 cfs 0.067 af Secondary=0.00 cfs 0.000 af Outflow=1.42 cfs 0.067 af

Pond 6P: BIO 5 Peak Elev=919.32' Storage=1,915 cf Inflow=2.01 cfs 0.142 af
Outflow=0.76 cfs 0.139 af

Pond 8P: BIO 2 Peak Elev=915.32' Storage=159 cf Inflow=2.39 cfs 0.112 af
Primary=1.60 cfs 0.102 af Secondary=0.78 cfs 0.007 af Outflow=2.38 cfs 0.109 af

Pond 9P: BIO 3 Peak Elev=912.97' Storage=252 cf Inflow=1.95 cfs 0.060 af
Primary=1.56 cfs 0.059 af Secondary=0.00 cfs 0.000 af Outflow=1.56 cfs 0.059 af

Pond 10P: BIO 4 Peak Elev=912.41' Storage=366 cf Inflow=2.55 cfs 0.108 af
Primary=2.51 cfs 0.108 af Secondary=0.00 cfs 0.000 af Outflow=2.51 cfs 0.108 af

Link 7L: PROPOSED Inflow=9.37 cfs 0.600 af
Primary=9.37 cfs 0.600 af

Total Runoff Area = 3.888 ac Runoff Volume = 0.608 af Average Runoff Depth = 1.88"
74.09% Pervious = 2.881 ac 25.91% Impervious = 1.007 ac

Summary for Subcatchment 1S: 1

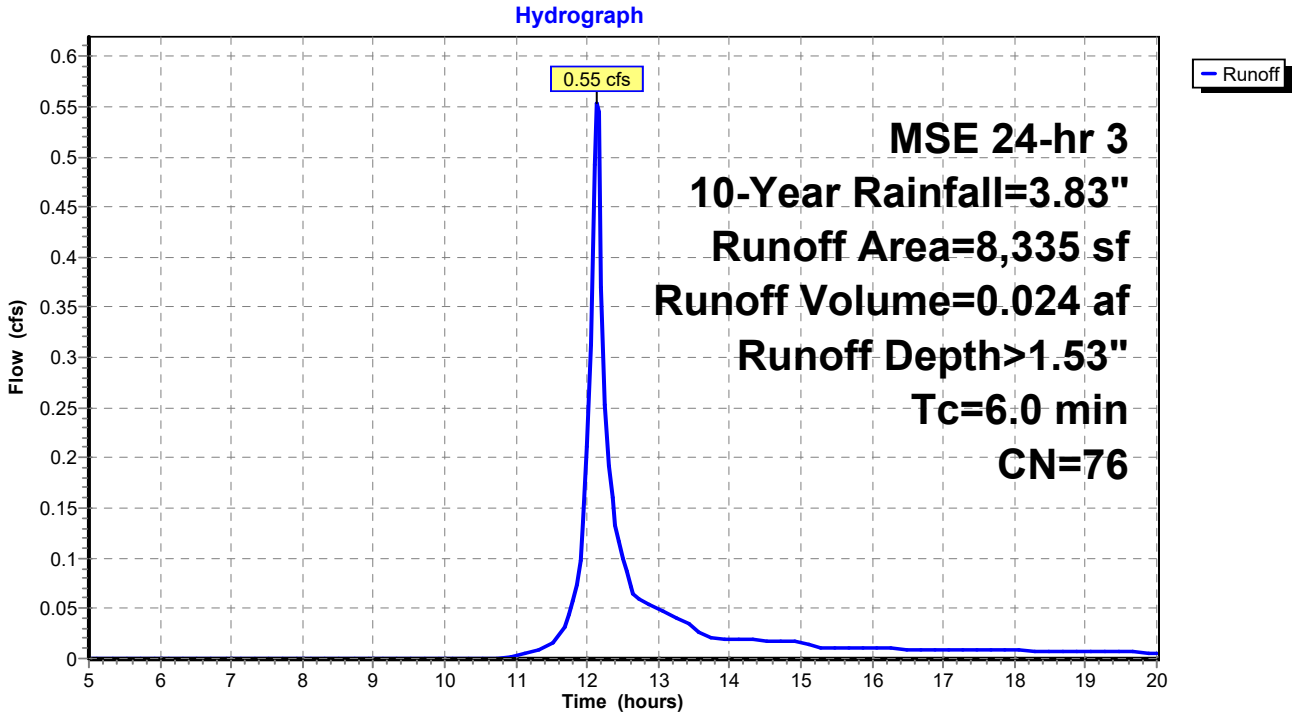
Runoff = 0.55 cfs @ 12.14 hrs, Volume= 0.024 af, Depth> 1.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-Year Rainfall=3.83"

Area (sf)	CN	Description
588	98	Paved parking, HSG C
7,747	74	>75% Grass cover, Good, HSG C
8,335	76	Weighted Average
7,747		92.95% Pervious Area
588		7.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, PER TR-55**

Subcatchment 1S: 1



Summary for Subcatchment 2S: 2

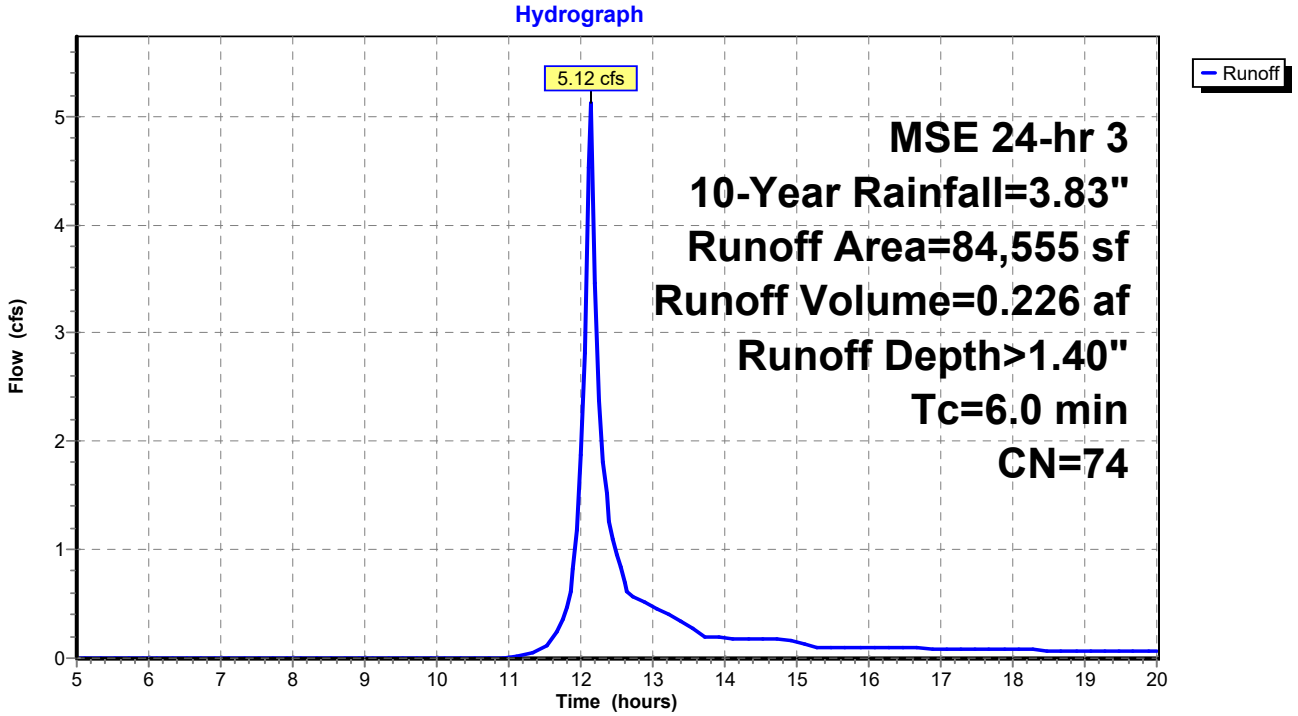
Runoff = 5.12 cfs @ 12.14 hrs, Volume= 0.226 af, Depth> 1.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-Year Rainfall=3.83"

Area (sf)	CN	Description
2,713	89	Gravel roads, HSG C
81,842	74	>75% Grass cover, Good, HSG C
84,555	74	Weighted Average
84,555		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, PER TR-55**

Subcatchment 2S: 2



Summary for Subcatchment 3S: 3

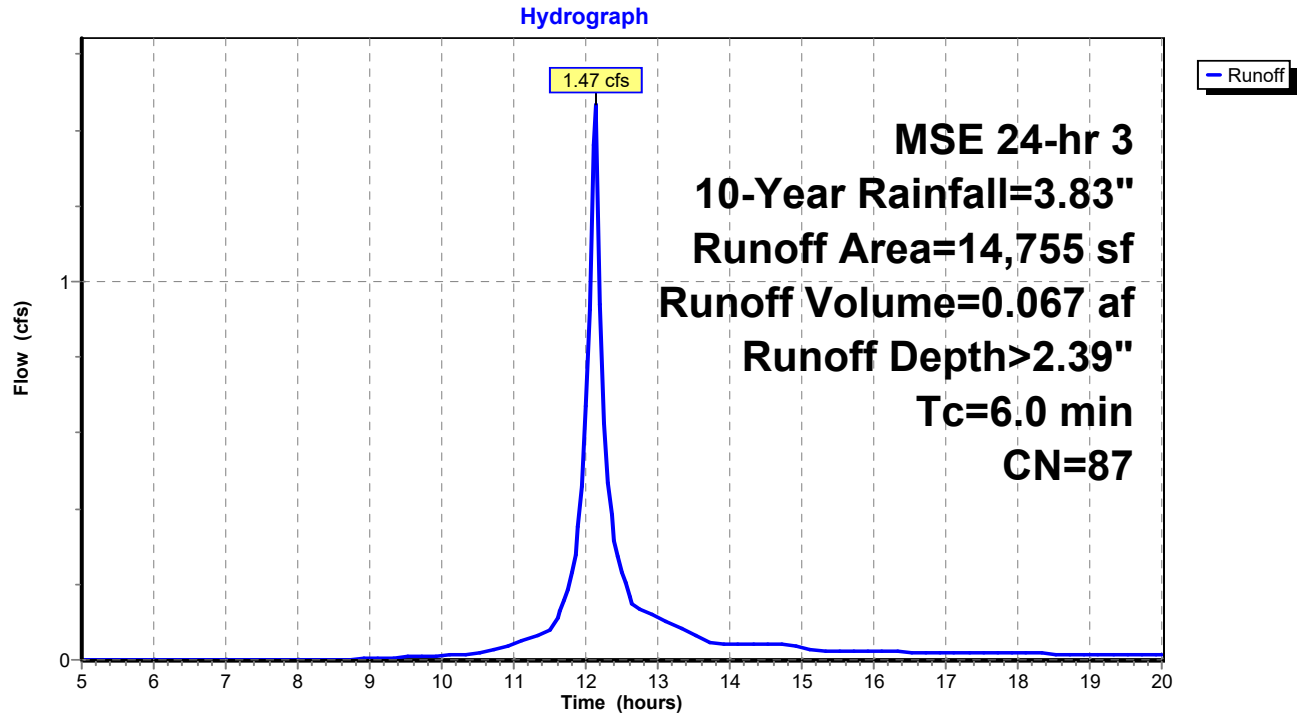
Runoff = 1.47 cfs @ 12.13 hrs, Volume= 0.067 af, Depth> 2.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-Year Rainfall=3.83"

Area (sf)	CN	Description
3,456	98	Paved parking, HSG C
2,817	98	Paved parking, HSG C
1,482	98	Paved parking, HSG C
226	98	Paved parking, HSG C
6,774	74	>75% Grass cover, Good, HSG C
14,755	87	Weighted Average
6,774		45.91% Pervious Area
7,981		54.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, PER TR-55**

Subcatchment 3S: 3



Summary for Subcatchment 4S: 4

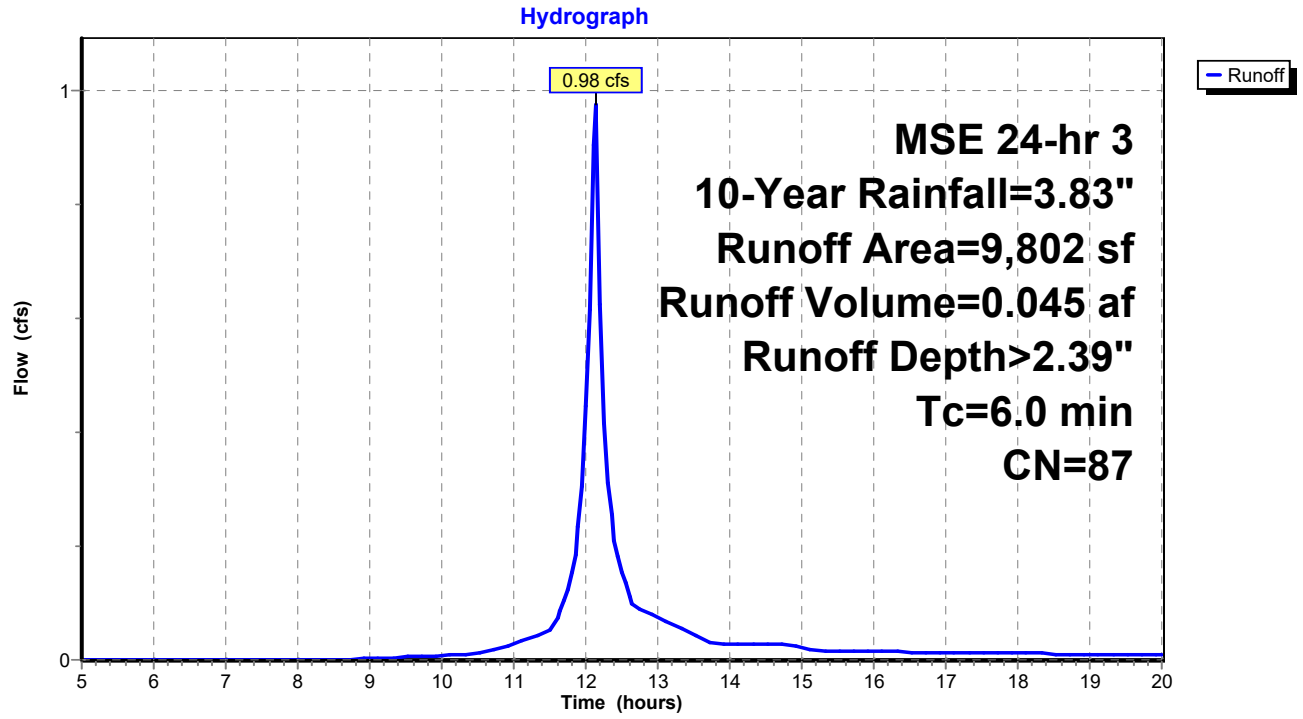
Runoff = 0.98 cfs @ 12.13 hrs, Volume= 0.045 af, Depth> 2.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-Year Rainfall=3.83"

Area (sf)	CN	Description
1,867	98	Paved parking, HSG C
1,687	98	Paved parking, HSG C
602	98	Paved parking, HSG C
1,142	98	Paved parking, HSG C
4,504	74	>75% Grass cover, Good, HSG C
9,802	87	Weighted Average
4,504		45.95% Pervious Area
5,298		54.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, PER TR-55**

Subcatchment 4S: 4



Summary for Subcatchment 5S: 5

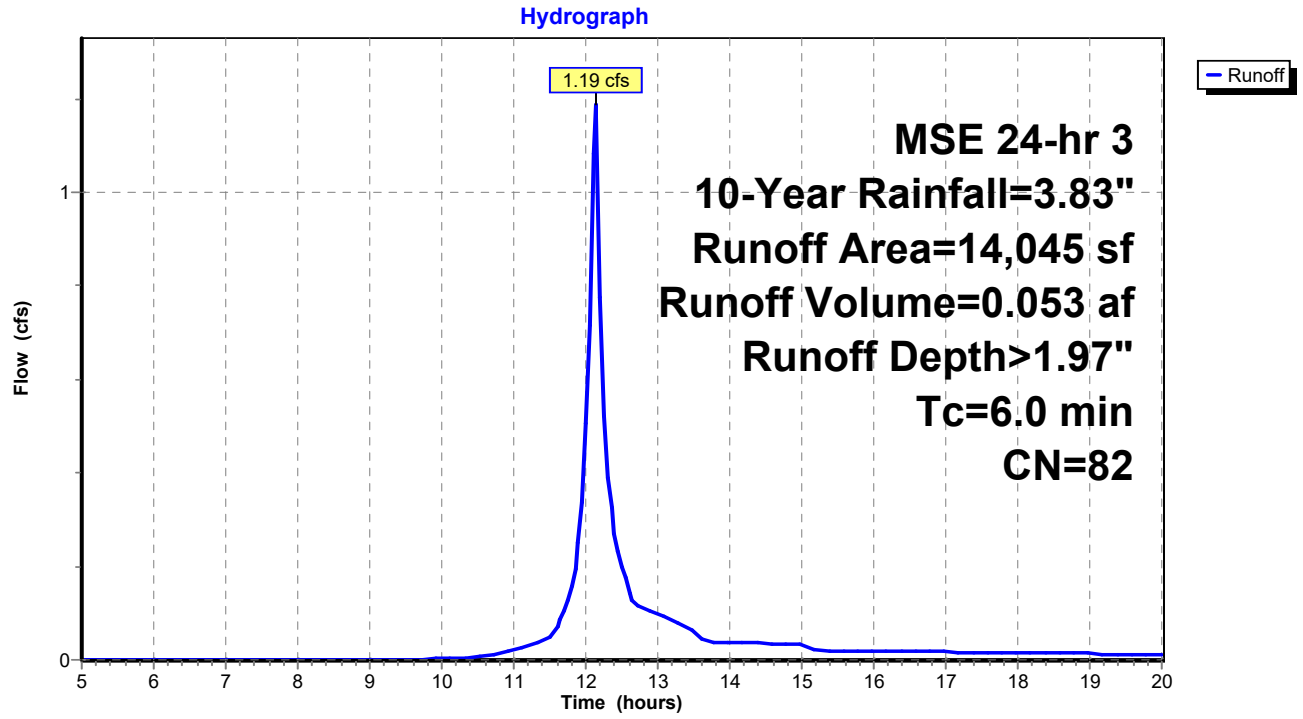
Runoff = 1.19 cfs @ 12.13 hrs, Volume= 0.053 af, Depth> 1.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-Year Rainfall=3.83"

Area (sf)	CN	Description
1,609	98	Paved parking, HSG C
2,002	98	Paved parking, HSG C
487	98	Paved parking, HSG C
849	98	Paved parking, HSG C
9,098	74	>75% Grass cover, Good, HSG C
14,045	82	Weighted Average
9,098		64.78% Pervious Area
4,947		35.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, PER TR-55**

Subcatchment 5S: 5



Summary for Subcatchment 6S: 6

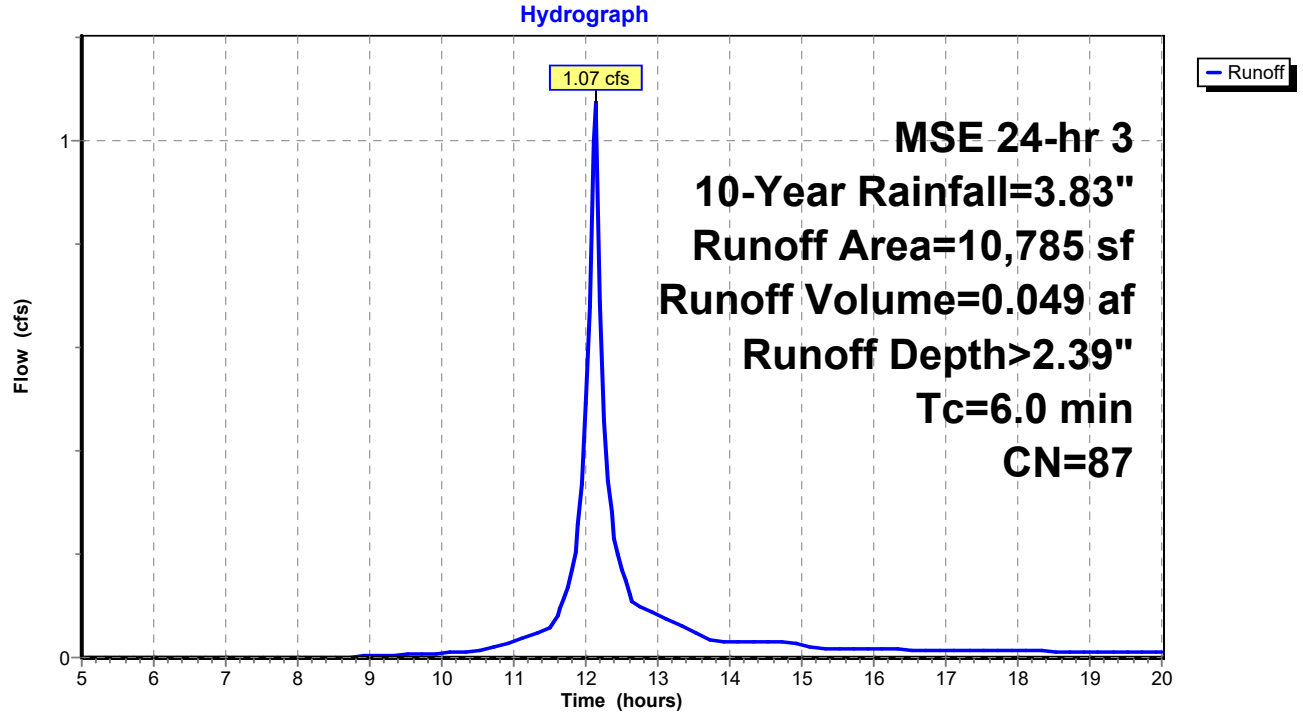
Runoff = 1.07 cfs @ 12.13 hrs, Volume= 0.049 af, Depth> 2.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-Year Rainfall=3.83"

Area (sf)	CN	Description
1,507	98	Paved parking, HSG C
2,759	98	Paved parking, HSG C
494	98	Paved parking, HSG C
1,102	98	Paved parking, HSG C
323	89	Gravel roads, HSG C
4,600	74	>75% Grass cover, Good, HSG C
10,785	87	Weighted Average
4,923		45.65% Pervious Area
5,862		54.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, PER TR-55**

Subcatchment 6S: 6



Summary for Subcatchment 7S: 7

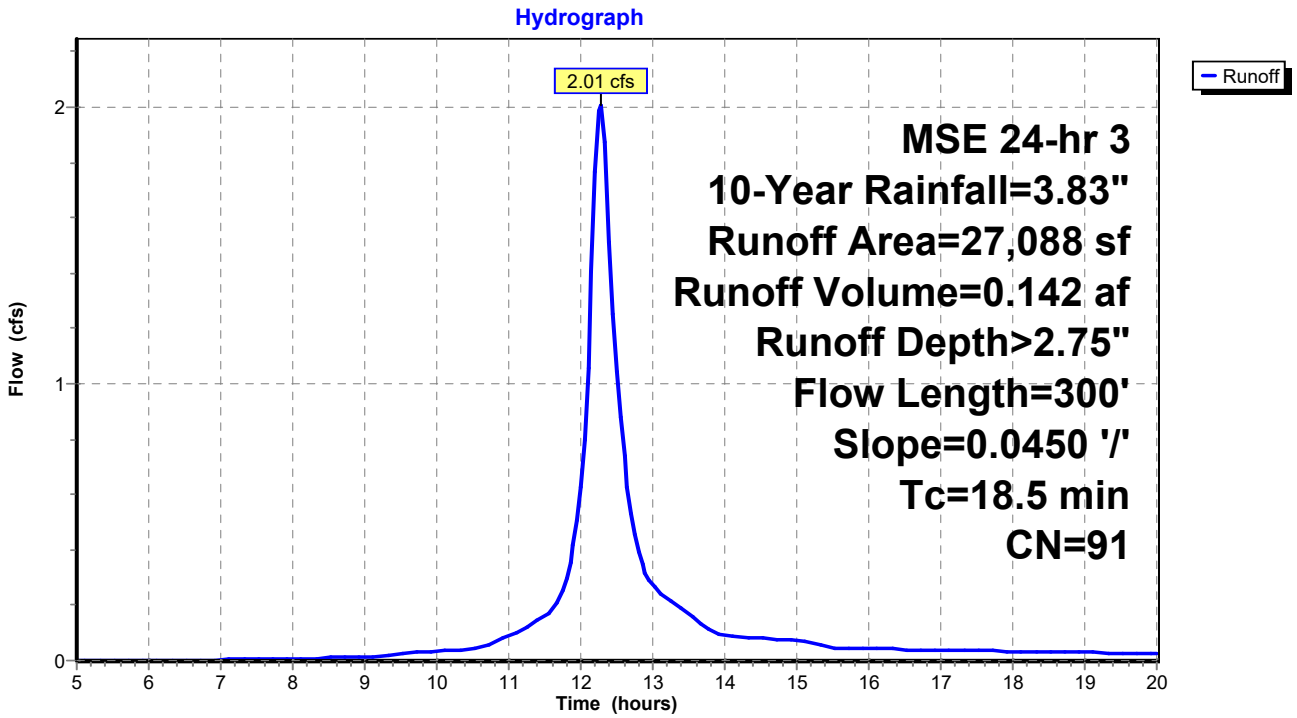
Runoff = 2.01 cfs @ 12.27 hrs, Volume= 0.142 af, Depth> 2.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-Year Rainfall=3.83"

Area (sf)	CN	Description
19,123	98	Paved parking, HSG C
85	98	Paved parking, HSG C
7,880	74	>75% Grass cover, Good, HSG C
27,088	91	Weighted Average
7,880		29.09% Pervious Area
19,208		70.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.5	300	0.0450	0.27		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.72"

Subcatchment 7S: 7



Summary for Pond 5P: BIO 1

Inflow Area = 0.339 ac, 54.09% Impervious, Inflow Depth > 2.39" for 10-Year event
Inflow = 1.47 cfs @ 12.13 hrs, Volume= 0.067 af
Outflow = 1.42 cfs @ 12.15 hrs, Volume= 0.067 af, Atten= 3%, Lag= 0.9 min
Primary = 1.42 cfs @ 12.15 hrs, Volume= 0.067 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 918.26' @ 12.15 hrs Surf.Area= 94 sf Storage= 74 cf

Plug-Flow detention time= 2.8 min calculated for 0.067 af (100% of inflow)
Center-of-Mass det. time= 1.4 min (773.9 - 772.5)

Volume	Invert	Avail.Storage	Storage Description
#1	915.50'	115 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

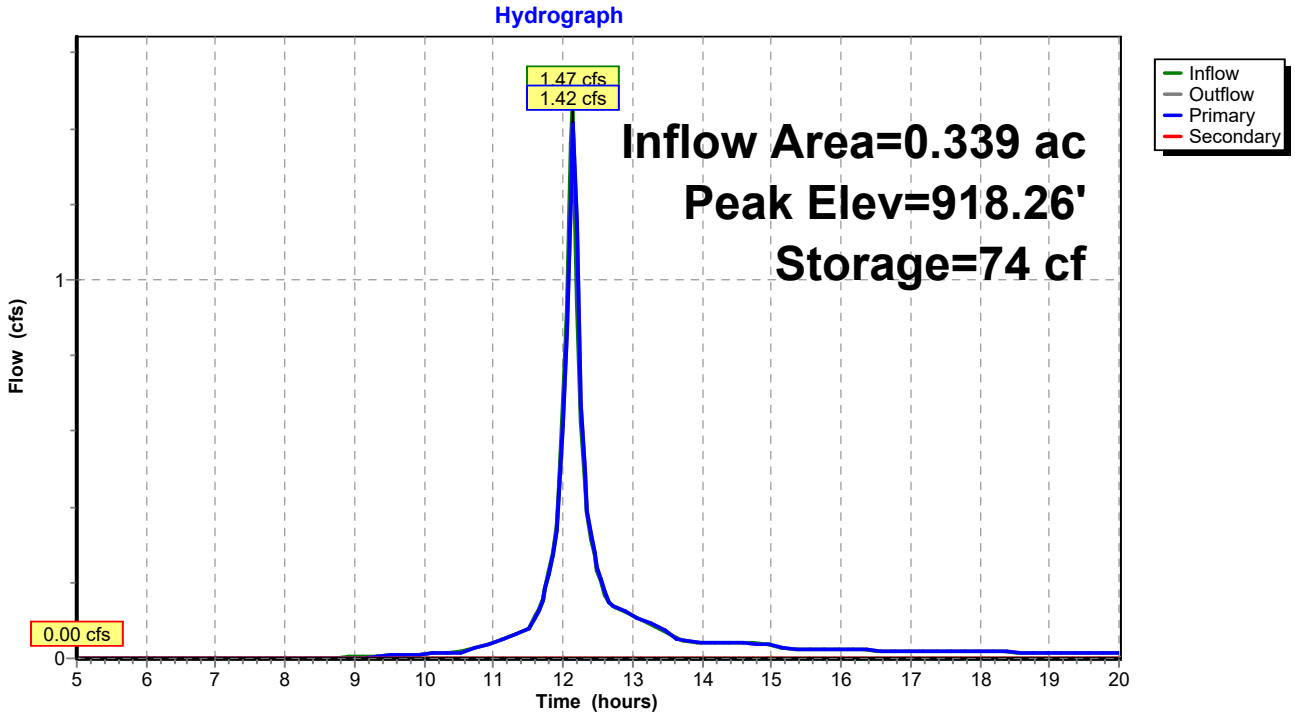
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
915.50	94	0.0	0	0
916.50	94	35.0	33	33
918.50	94	25.0	47	80
918.70	254	100.0	35	115

Device	Routing	Invert	Outlet Devices
#1	Primary	915.75'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	918.60'	**7.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=1.41 cfs @ 12.15 hrs HW=918.22' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 1.41 cfs @ 7.17 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=915.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 5P: BIO 1


Hydrograph
1.47 cfs
1.42 cfs
Inflow Area=0.339 ac
Peak Elev=918.26'
Storage=74 cf
Inflow
Outflow
Primary
Secondary
0.00 cfs
Flow (cfs)
Time (hours)
0
1
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Summary for Pond 6P: BIO 5

Inflow Area = 0.622 ac, 70.91% Impervious, Inflow Depth > 2.75" for 10-Year event
Inflow = 2.01 cfs @ 12.27 hrs, Volume= 0.142 af
Outflow = 0.76 cfs @ 12.59 hrs, Volume= 0.139 af, Atten= 62%, Lag= 19.3 min
Primary = 0.76 cfs @ 12.59 hrs, Volume= 0.139 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 919.32' @ 12.59 hrs Surf.Area= 1,495 sf Storage= 1,915 cf

Plug-Flow detention time= 35.4 min calculated for 0.139 af (98% of inflow)
Center-of-Mass det. time= 26.3 min (799.6 - 773.3)

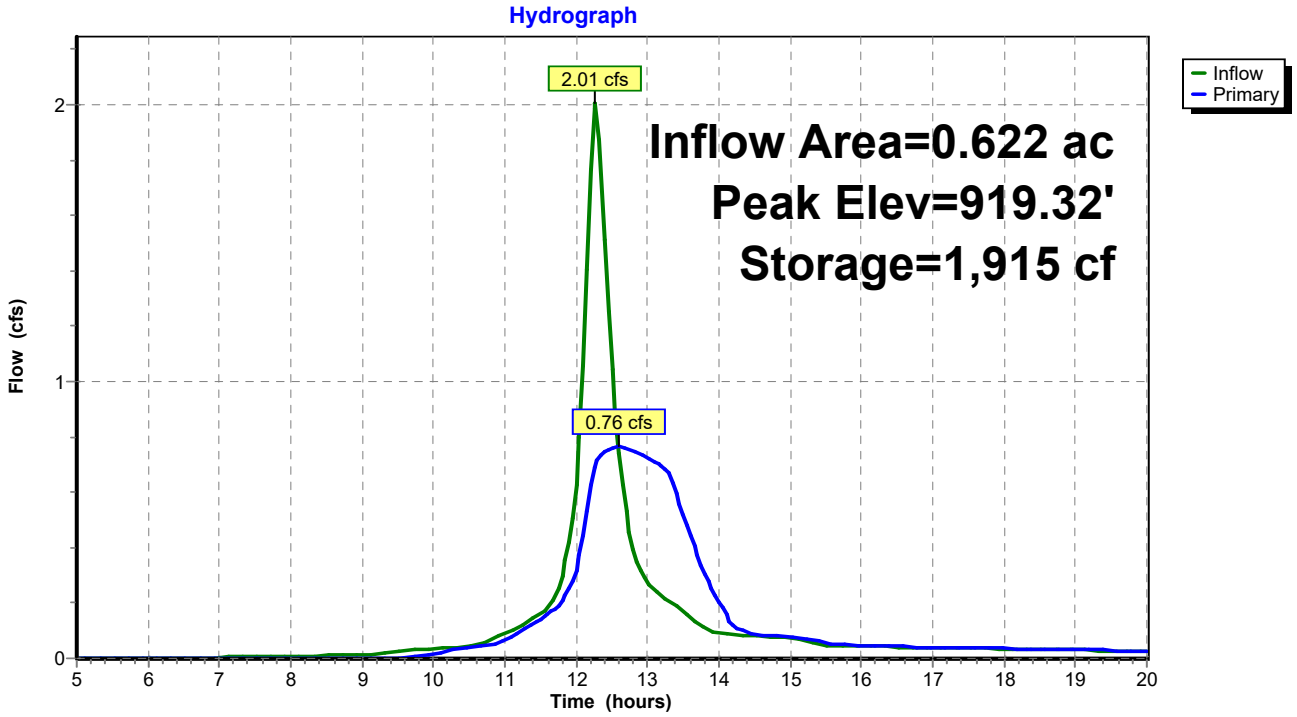
Volume	Invert	Avail.Storage	Storage Description
#1	915.60'	4,017 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
915.60	1,133	0.0	0	0
916.60	1,133	35.0	397	397
918.60	1,133	25.0	567	963
920.50	2,082	100.0	3,054	4,017

Device	Routing	Invert	Outlet Devices
#1	Primary	915.85'	**6.0" Round Culvert** L= 53.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 915.85' / 915.75' S= 0.0019 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf
#2	Device 1	915.85'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	919.50'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.76 cfs @ 12.59 hrs HW=919.32' (Free Discharge)
└**1=Culvert** (Passes 0.76 cfs of 1.38 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.76 cfs @ 8.76 fps)
  └**3=Orifice/Grate** (Controls 0.00 cfs)

Pond 6P: BIO 5


Hydrograph
2.01 cfs
0.76 cfs
Inflow Area=0.622 ac
Peak Elev=919.32'
Storage=1,915 cf
Inflow
Primary
Flow (cfs)
Time (hours)
0
1
2
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Summary for Pond 8P: BIO 2

Inflow Area = 0.564 ac, 54.07% Impervious, Inflow Depth > 2.38" for 10-Year event
Inflow = 2.39 cfs @ 12.14 hrs, Volume= 0.112 af
Outflow = 2.38 cfs @ 12.15 hrs, Volume= 0.109 af, Atten= 0%, Lag= 0.4 min
Primary = 1.60 cfs @ 12.15 hrs, Volume= 0.102 af
Secondary = 0.78 cfs @ 12.15 hrs, Volume= 0.007 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 915.32' @ 12.15 hrs Surf.Area= 207 sf Storage= 159 cf

Plug-Flow detention time= 14.0 min calculated for 0.109 af (98% of inflow)
Center-of-Mass det. time= 4.5 min (777.8 - 773.3)

Volume	Invert	Avail.Storage	Storage Description
#1	911.95'	234 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

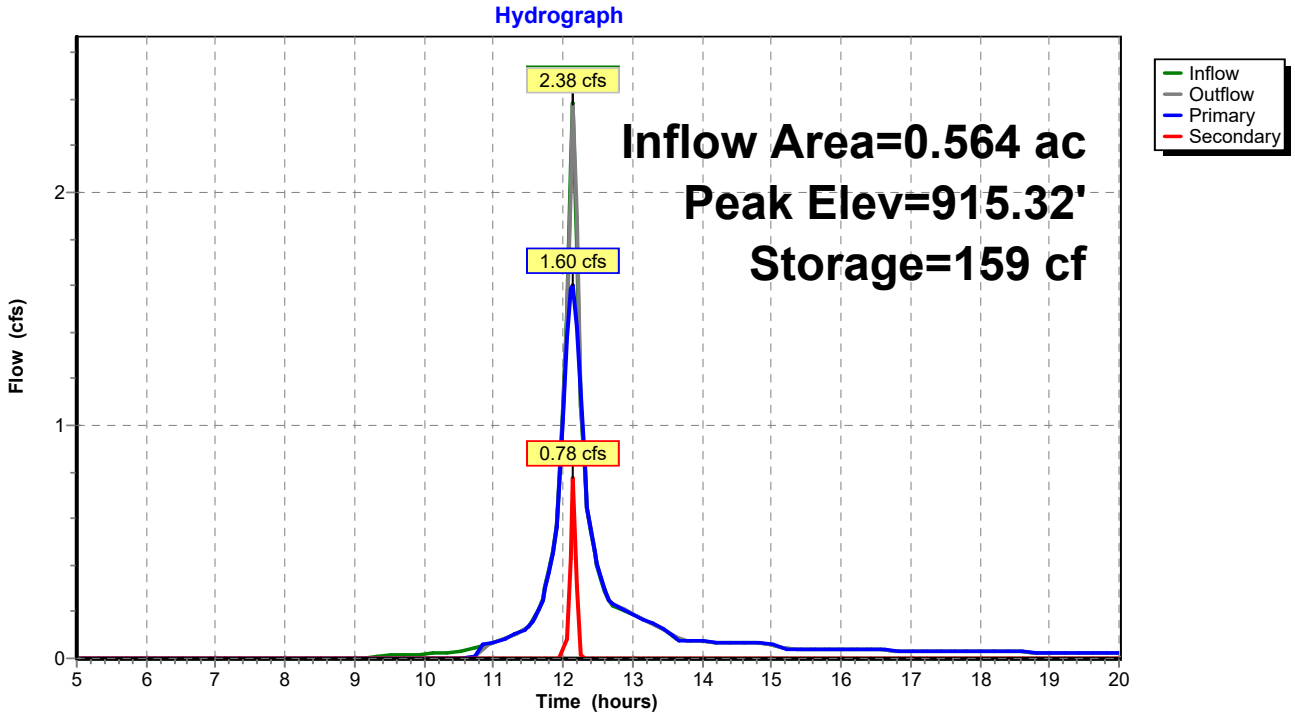
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
911.95	116	0.0	0	0
912.95	116	35.0	41	41
914.95	116	25.0	58	99
915.63	281	100.0	135	234

Device	Routing	Invert	Outlet Devices
#1	Primary	912.20'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	915.20'	**7.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#3	Device 1	915.10'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.60 cfs @ 12.15 hrs HW=915.32' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 1.60 cfs @ 8.16 fps)
↑—**3=Orifice/Grate** (Passes 1.60 cfs of 3.17 cfs potential flow)

Secondary OutFlow Max=0.74 cfs @ 12.15 hrs HW=915.32' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 0.74 cfs @ 0.88 fps)

Pond 8P: BIO 2


Hydrograph
2.38 cfs
1.60 cfs
0.78 cfs
Inflow Area=0.564 ac
Peak Elev=915.32'
Storage=159 cf
Inflow
Outflow
Primary
Secondary
Flow (cfs)
Time (hours)
0
1
2
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Summary for Pond 9P: BIO 3

Inflow Area = 0.322 ac, 35.22% Impervious, Inflow Depth > 2.22" for 10-Year event
Inflow = 1.95 cfs @ 12.14 hrs, Volume= 0.060 af
Outflow = 1.56 cfs @ 12.18 hrs, Volume= 0.059 af, Atten= 20%, Lag= 2.0 min
Primary = 1.56 cfs @ 12.18 hrs, Volume= 0.059 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 912.97' @ 12.18 hrs Surf.Area= 279 sf Storage= 252 cf

Plug-Flow detention time= 7.0 min calculated for 0.059 af (99% of inflow)
Center-of-Mass det. time= 3.1 min (779.1 - 776.0)

Volume	Invert	Avail.Storage	Storage Description
#1	909.77'	432 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

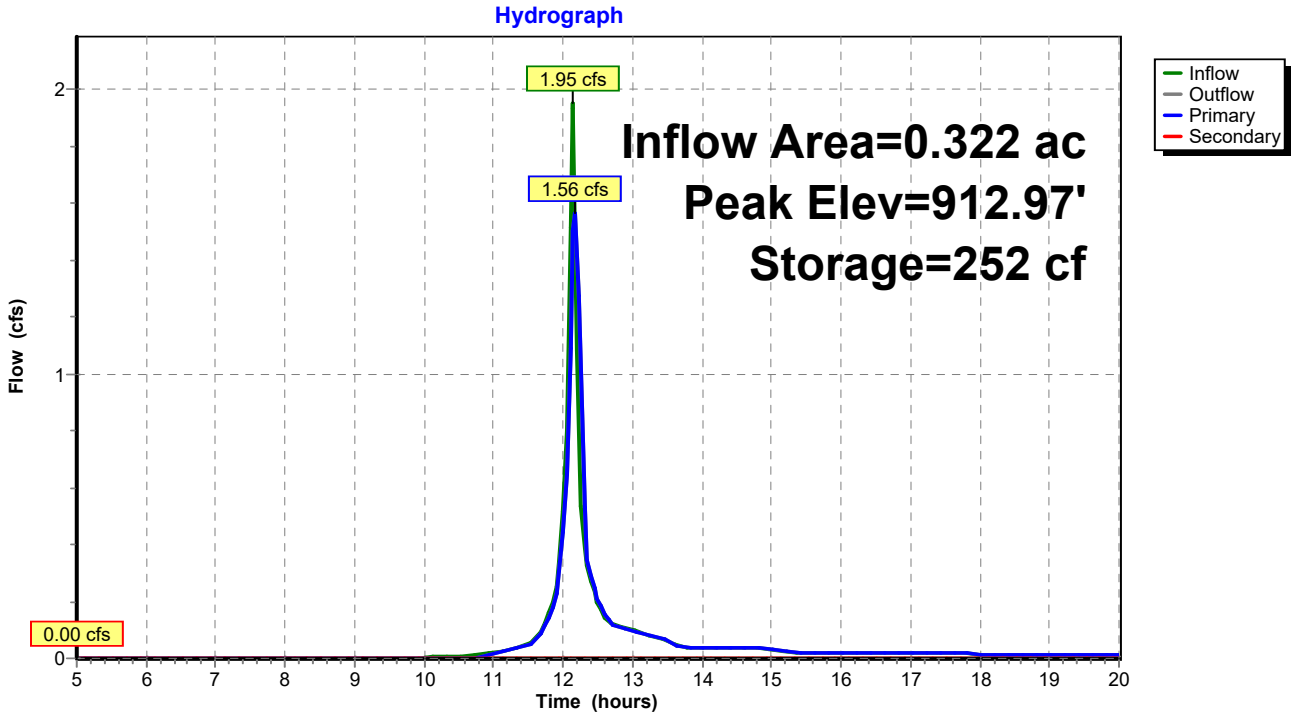
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
909.77	237	0.0	0	0
910.77	237	35.0	83	83
912.77	237	25.0	119	201
913.50	395	100.0	231	432

Device	Routing	Invert	Outlet Devices
#1	Primary	910.02'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	913.00'	**7.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=1.50 cfs @ 12.18 hrs HW=912.80' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 1.50 cfs @ 7.66 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=909.77' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 9P: BIO 3


Hydrograph
1.95 cfs
1.56 cfs
0.00 cfs
Inflow Area=0.322 ac
Peak Elev=912.97'
Storage=252 cf
Inflow
Outflow
Primary
Secondary
Flow (cfs)
Time (hours)
0
1
2
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Summary for Pond 10P: BIO 4

[81] Warning: Exceeded Pond 9P by 1.54' @ 12.30 hrs

Inflow Area = 0.570 ac, 43.53% Impervious, Inflow Depth > 2.28" for 10-Year event
Inflow = 2.55 cfs @ 12.15 hrs, Volume= 0.108 af
Outflow = 2.51 cfs @ 12.20 hrs, Volume= 0.108 af, Atten= 2%, Lag= 2.8 min
Primary = 2.51 cfs @ 12.20 hrs, Volume= 0.108 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 912.41' @ 12.20 hrs Surf.Area= 480 sf Storage= 366 cf

Plug-Flow detention time= 4.4 min calculated for 0.108 af (100% of inflow)
Center-of-Mass det. time= 2.5 min (778.6 - 776.1)

Volume	Invert	Avail.Storage	Storage Description
#1	908.80'	614 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

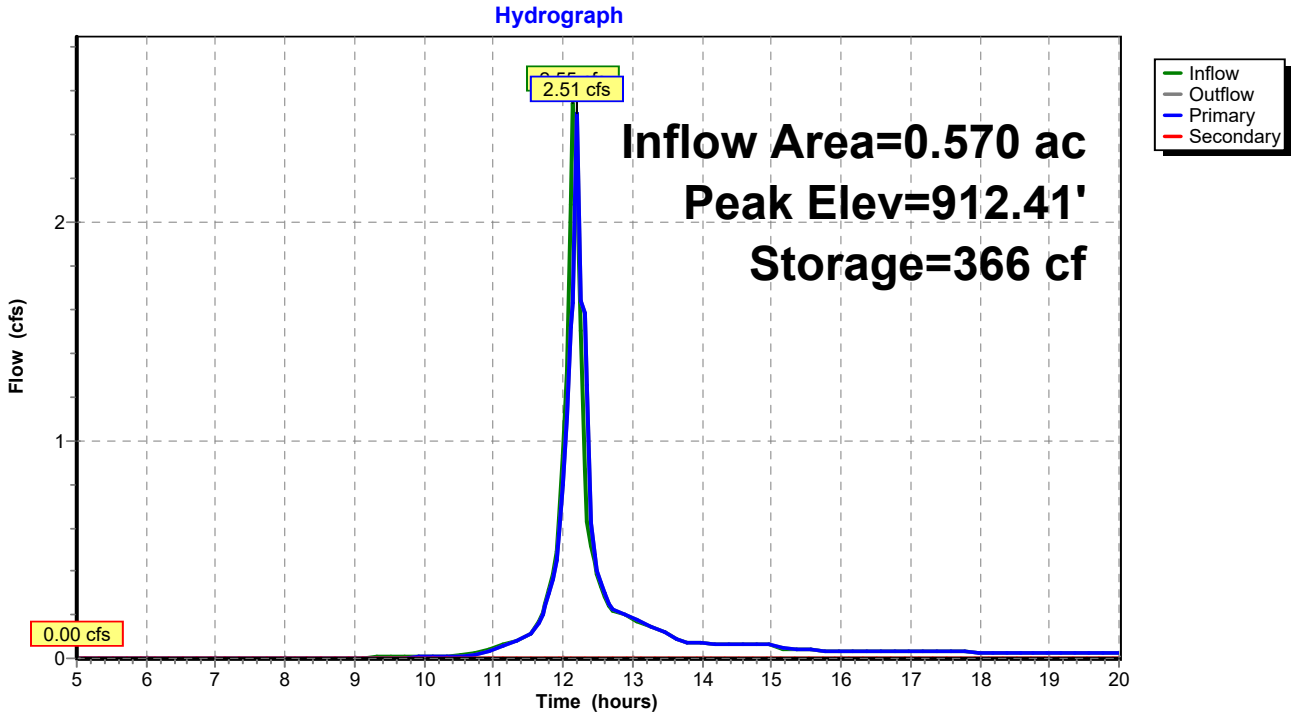
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
908.80	191	0.0	0	0
909.80	191	35.0	67	67
911.80	191	25.0	96	162
912.66	600	100.0	340	502
912.80	1,000	100.0	112	614

Device	Routing	Invert	Outlet Devices
#1	Primary	909.00'	**12.0" Round Culvert** L= 51.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 909.00' / 908.90' S= 0.0020 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Device 1	909.05'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	912.40'	**36.0" Horiz. Orifice/Grate** C= 0.600
#4	Secondary	912.65'	**24.0" x 36.0" Horiz. Orifice/Grate** X 2 rows C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=4.56 cfs @ 12.20 hrs HW=912.41' (Free Discharge)
└**1=Culvert** (Passes 4.56 cfs of 6.13 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 1.67 cfs @ 8.49 fps)
  └**3=Orifice/Grate** (Orifice Controls 2.90 cfs @ 0.41 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=908.80' (Free Discharge)
└**4=Orifice/Grate** (Controls 0.00 cfs)

Pond 10P: BIO 4

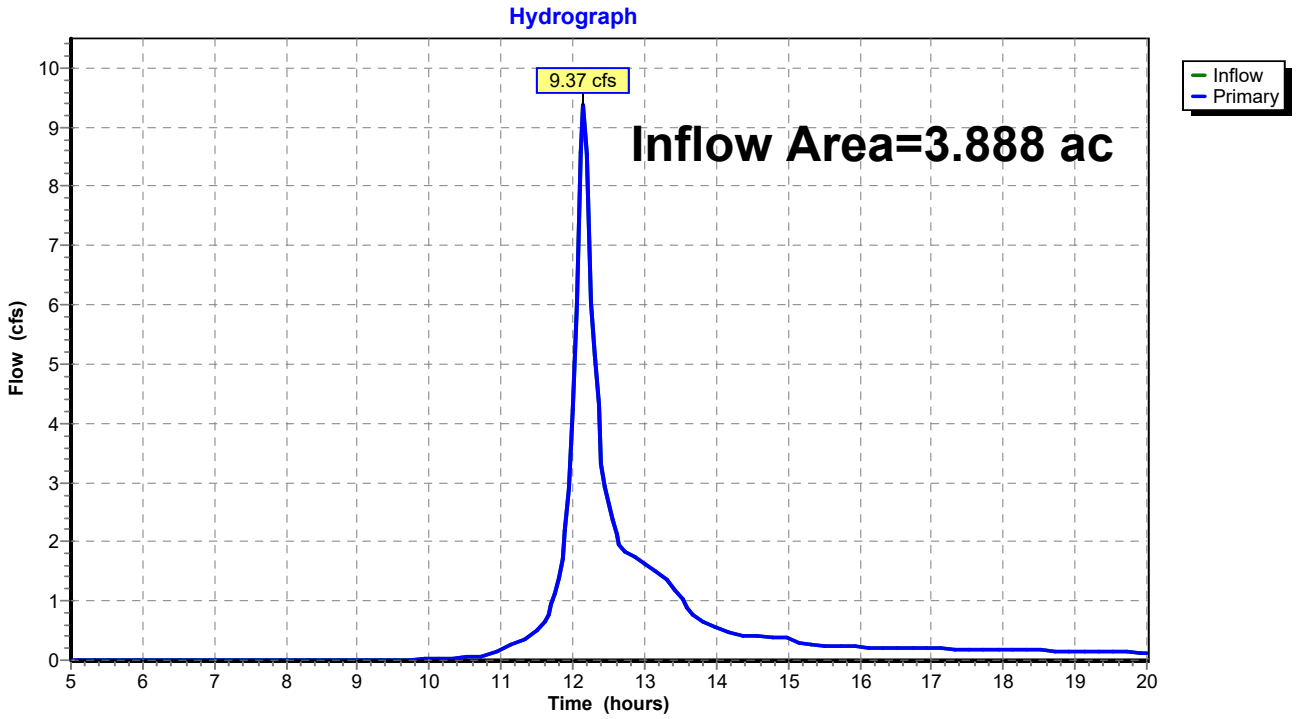


Summary for Link 7L: PROPOSED

Inflow Area = 3.888 ac, 25.91% Impervious, Inflow Depth > 1.85" for 10-Year event
Inflow = 9.37 cfs @ 12.15 hrs, Volume= 0.600 af
Primary = 9.37 cfs @ 12.15 hrs, Volume= 0.600 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 7L: PROPOSED



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: 1 Runoff Area=8,335 sf 7.05% Impervious Runoff Depth>3.39"
Tc=6.0 min CN=76 Runoff=1.20 cfs 0.054 af

Subcatchment2S: 2 Runoff Area=84,555 sf 0.00% Impervious Runoff Depth>3.20"
Tc=6.0 min CN=74 Runoff=11.56 cfs 0.517 af

Subcatchment3S: 3 Runoff Area=14,755 sf 54.09% Impervious Runoff Depth>4.53"
Tc=6.0 min CN=87 Runoff=2.68 cfs 0.128 af

Subcatchment4S: 4 Runoff Area=9,802 sf 54.05% Impervious Runoff Depth>4.53"
Tc=6.0 min CN=87 Runoff=1.78 cfs 0.085 af

Subcatchment5S: 5 Runoff Area=14,045 sf 35.22% Impervious Runoff Depth>4.00"
Tc=6.0 min CN=82 Runoff=2.33 cfs 0.107 af

Subcatchment6S: 6 Runoff Area=10,785 sf 54.35% Impervious Runoff Depth>4.53"
Tc=6.0 min CN=87 Runoff=1.96 cfs 0.093 af

Subcatchment7S: 7 Runoff Area=27,088 sf 70.91% Impervious Runoff Depth>4.96"
Flow Length=300' Slope=0.0450 '/' Tc=18.5 min CN=91 Runoff=3.50 cfs 0.257 af

Pond 5P: BIO 1 Peak Elev=918.76' Storage=115 cf Inflow=2.68 cfs 0.128 af
Primary=1.57 cfs 0.119 af Secondary=1.13 cfs 0.009 af Outflow=2.70 cfs 0.128 af

Pond 6P: BIO 5 Peak Elev=920.17' Storage=3,349 cf Inflow=3.50 cfs 0.257 af
Outflow=1.56 cfs 0.253 af

Pond 8P: BIO 2 Peak Elev=915.49' Storage=198 cf Inflow=4.48 cfs 0.213 af
Primary=1.65 cfs 0.174 af Secondary=2.86 cfs 0.036 af Outflow=4.51 cfs 0.210 af

Pond 9P: BIO 3 Peak Elev=913.33' Storage=369 cf Inflow=5.18 cfs 0.144 af
Primary=1.65 cfs 0.110 af Secondary=3.47 cfs 0.033 af Outflow=5.12 cfs 0.143 af

Pond 10P: BIO 4 Peak Elev=912.59' Storage=463 cf Inflow=7.07 cfs 0.236 af
Primary=6.36 cfs 0.236 af Secondary=0.00 cfs 0.000 af Outflow=6.36 cfs 0.236 af

Link 7L: PROPOSED Inflow=21.48 cfs 1.234 af
Primary=21.48 cfs 1.234 af

Total Runoff Area = 3.888 ac Runoff Volume = 1.242 af Average Runoff Depth = 3.83"
74.09% Pervious = 2.881 ac 25.91% Impervious = 1.007 ac

Summary for Subcatchment 1S: 1

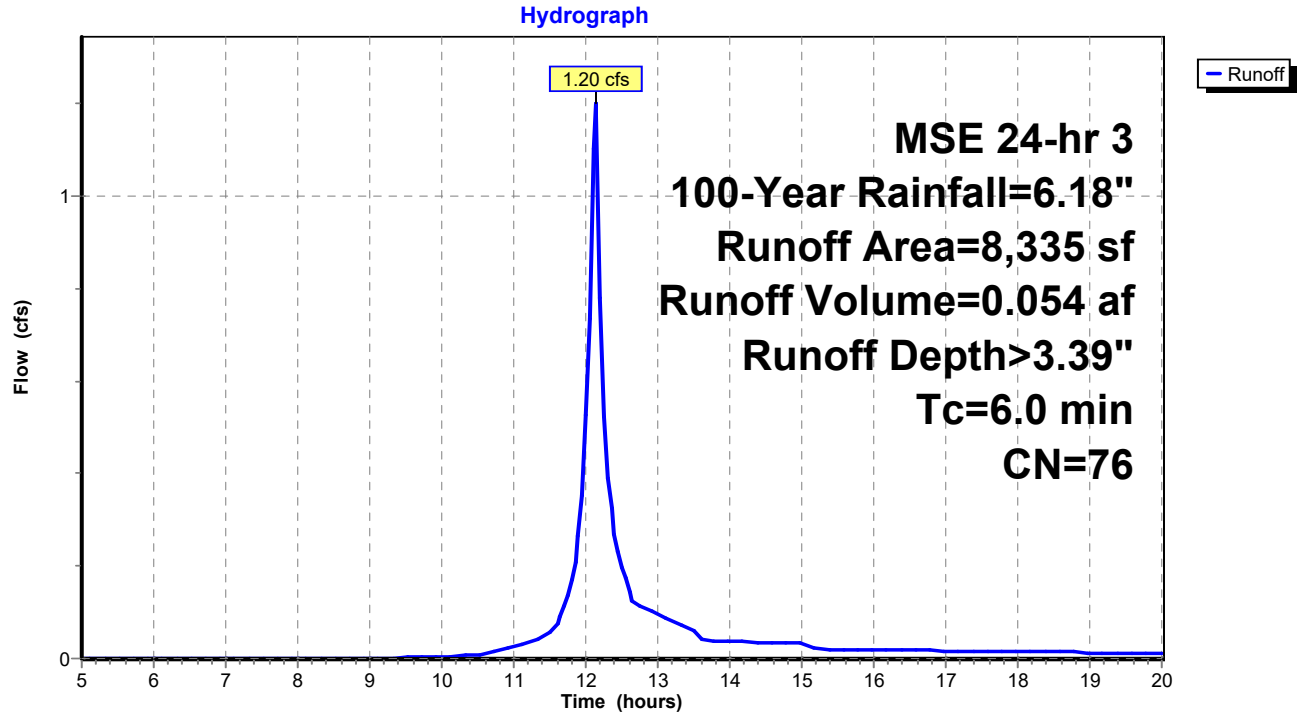
Runoff = 1.20 cfs @ 12.13 hrs, Volume= 0.054 af, Depth> 3.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-Year Rainfall=6.18"

Area (sf)	CN	Description
588	98	Paved parking, HSG C
7,747	74	>75% Grass cover, Good, HSG C
8,335	76	Weighted Average
7,747		92.95% Pervious Area
588		7.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, PER TR-55**

Subcatchment 1S: 1



Summary for Subcatchment 2S: 2

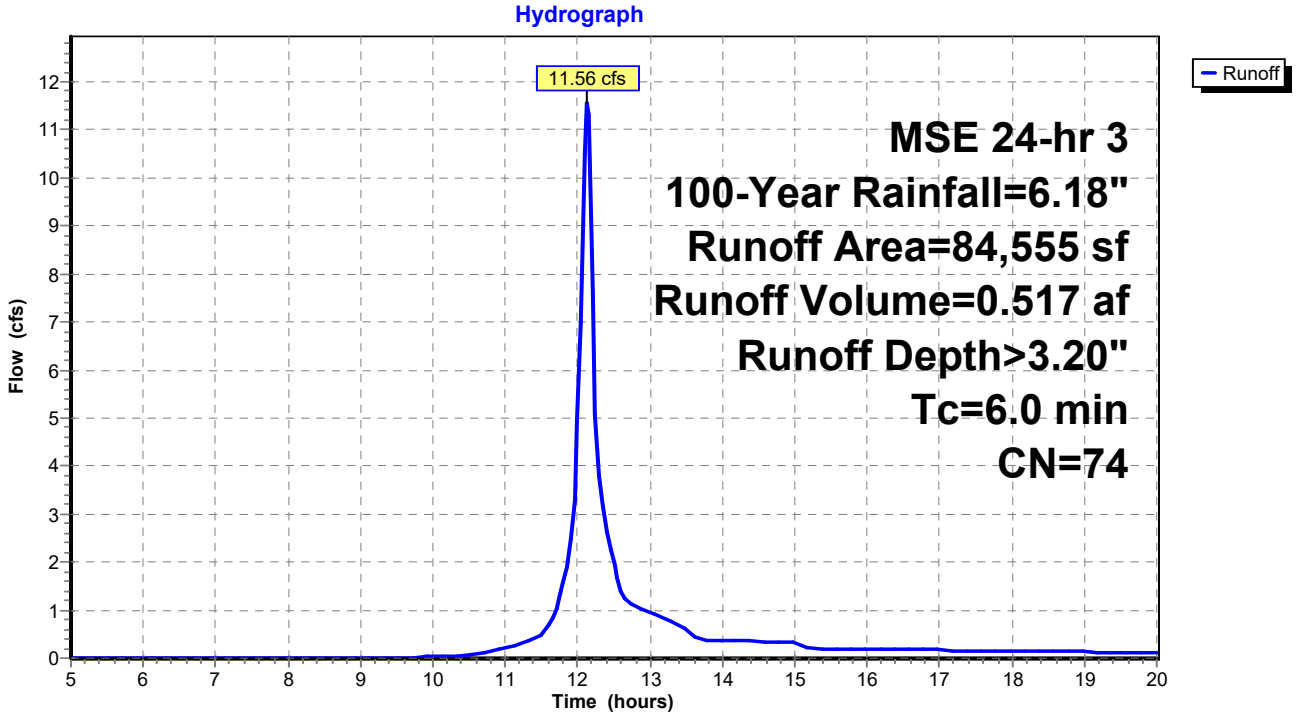
Runoff = 11.56 cfs @ 12.13 hrs, Volume= 0.517 af, Depth> 3.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-Year Rainfall=6.18"

Area (sf)	CN	Description
2,713	89	Gravel roads, HSG C
81,842	74	>75% Grass cover, Good, HSG C
84,555	74	Weighted Average
84,555		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, PER TR-55**

Subcatchment 2S: 2



Summary for Subcatchment 3S: 3

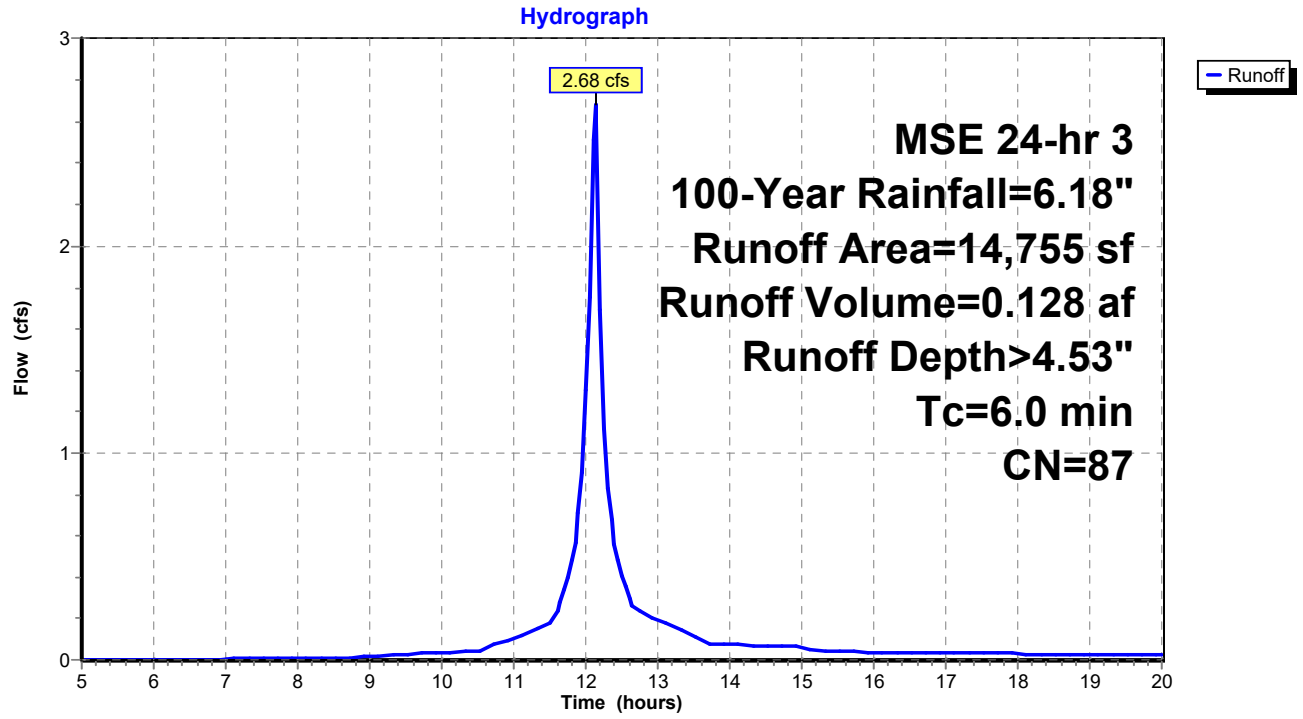
Runoff = 2.68 cfs @ 12.13 hrs, Volume= 0.128 af, Depth> 4.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-Year Rainfall=6.18"

Area (sf)	CN	Description
3,456	98	Paved parking, HSG C
2,817	98	Paved parking, HSG C
1,482	98	Paved parking, HSG C
226	98	Paved parking, HSG C
6,774	74	>75% Grass cover, Good, HSG C
14,755	87	Weighted Average
6,774		45.91% Pervious Area
7,981		54.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, PER TR-55**

Subcatchment 3S: 3



Summary for Subcatchment 4S: 4

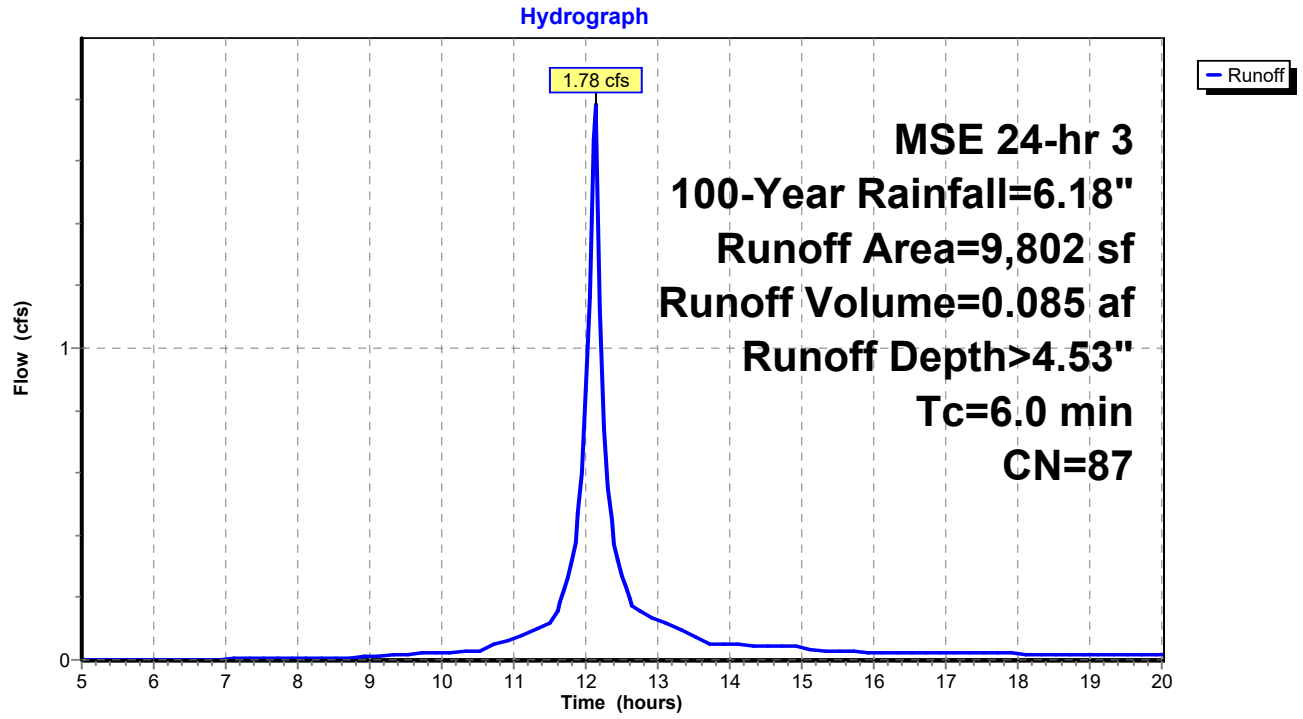
Runoff = 1.78 cfs @ 12.13 hrs, Volume= 0.085 af, Depth> 4.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-Year Rainfall=6.18"

Area (sf)	CN	Description
1,867	98	Paved parking, HSG C
1,687	98	Paved parking, HSG C
602	98	Paved parking, HSG C
1,142	98	Paved parking, HSG C
4,504	74	>75% Grass cover, Good, HSG C
9,802	87	Weighted Average
4,504		45.95% Pervious Area
5,298		54.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, PER TR-55**

Subcatchment 4S: 4



Summary for Subcatchment 5S: 5

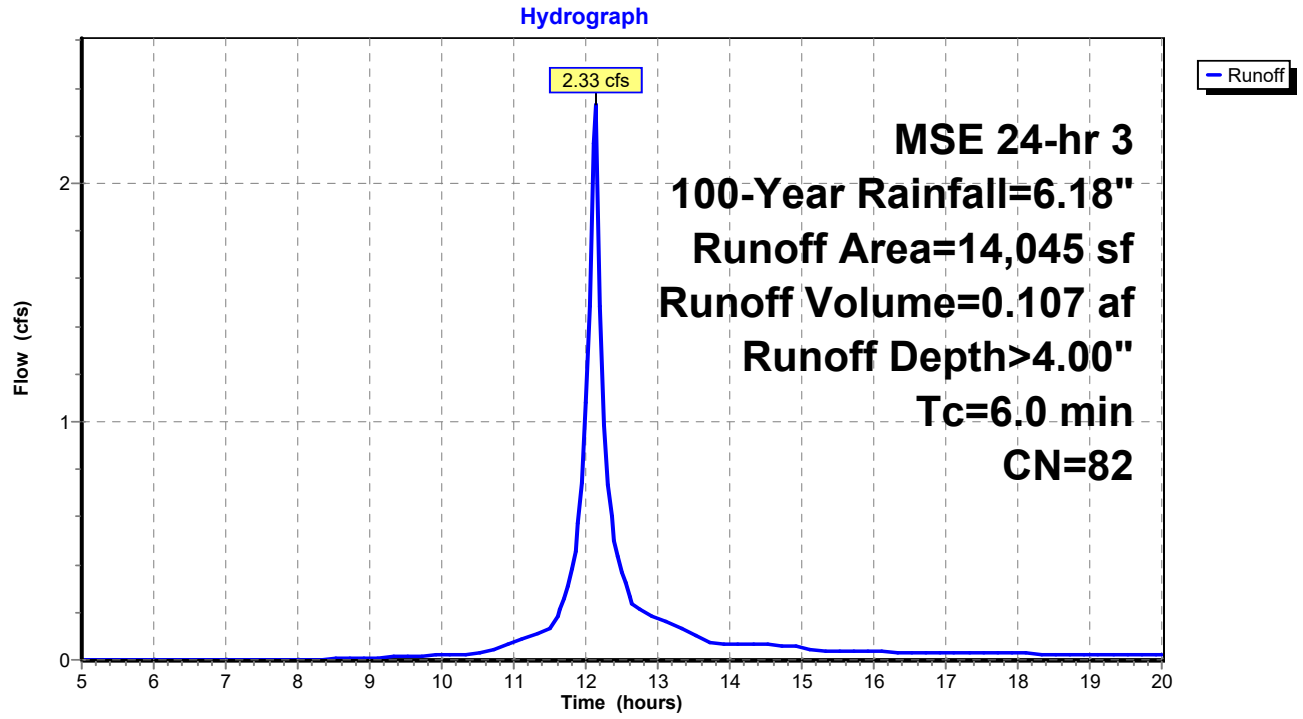
Runoff = 2.33 cfs @ 12.13 hrs, Volume= 0.107 af, Depth> 4.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-Year Rainfall=6.18"

Area (sf)	CN	Description
1,609	98	Paved parking, HSG C
2,002	98	Paved parking, HSG C
487	98	Paved parking, HSG C
849	98	Paved parking, HSG C
9,098	74	>75% Grass cover, Good, HSG C
14,045	82	Weighted Average
9,098		64.78% Pervious Area
4,947		35.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, PER TR-55**

Subcatchment 5S: 5



Summary for Subcatchment 6S: 6

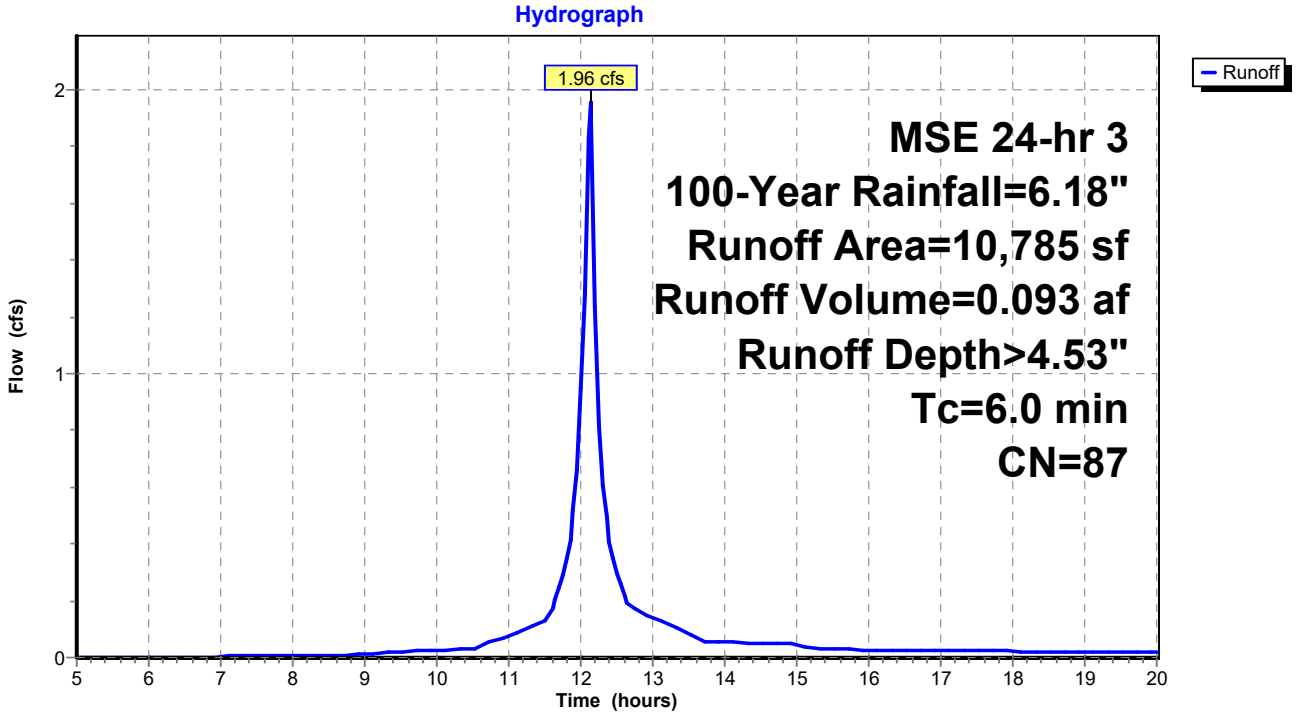
Runoff = 1.96 cfs @ 12.13 hrs, Volume= 0.093 af, Depth> 4.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-Year Rainfall=6.18"

Area (sf)	CN	Description
1,507	98	Paved parking, HSG C
2,759	98	Paved parking, HSG C
494	98	Paved parking, HSG C
1,102	98	Paved parking, HSG C
323	89	Gravel roads, HSG C
4,600	74	>75% Grass cover, Good, HSG C
10,785	87	Weighted Average
4,923		45.65% Pervious Area
5,862		54.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, PER TR-55**

Subcatchment 6S: 6



Summary for Subcatchment 7S: 7

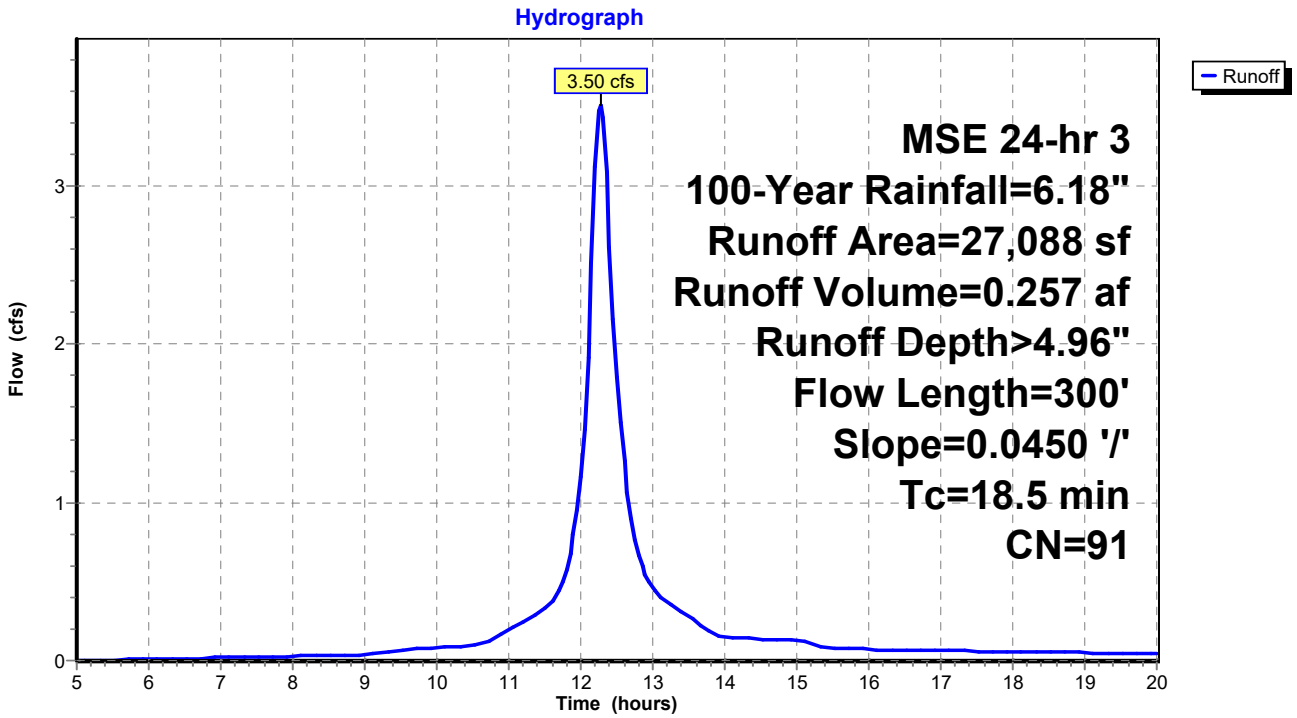
Runoff = 3.50 cfs @ 12.27 hrs, Volume= 0.257 af, Depth> 4.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-Year Rainfall=6.18"

Area (sf)	CN	Description
19,123	98	Paved parking, HSG C
85	98	Paved parking, HSG C
7,880	74	>75% Grass cover, Good, HSG C
27,088	91	Weighted Average
7,880		29.09% Pervious Area
19,208		70.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.5	300	0.0450	0.27		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.72"

Subcatchment 7S: 7



Summary for Pond 5P: BIO 1

[93] Warning: Storage range exceeded by 0.06'
[88] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 0.339 ac, 54.09% Impervious, Inflow Depth > 4.53" for 100-Year event
Inflow = 2.68 cfs @ 12.13 hrs, Volume= 0.128 af
Outflow = 2.70 cfs @ 12.13 hrs, Volume= 0.128 af, Atten= 0%, Lag= 0.2 min
Primary = 1.57 cfs @ 12.13 hrs, Volume= 0.119 af
Secondary = 1.13 cfs @ 12.13 hrs, Volume= 0.009 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 918.76' @ 12.13 hrs Surf.Area= 254 sf Storage= 115 cf

Plug-Flow detention time= 2.0 min calculated for 0.128 af (100% of inflow)
Center-of-Mass det. time= 1.3 min (762.7 - 761.4)

Volume	Invert	Avail.Storage	Storage Description
#1	915.50'	115 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

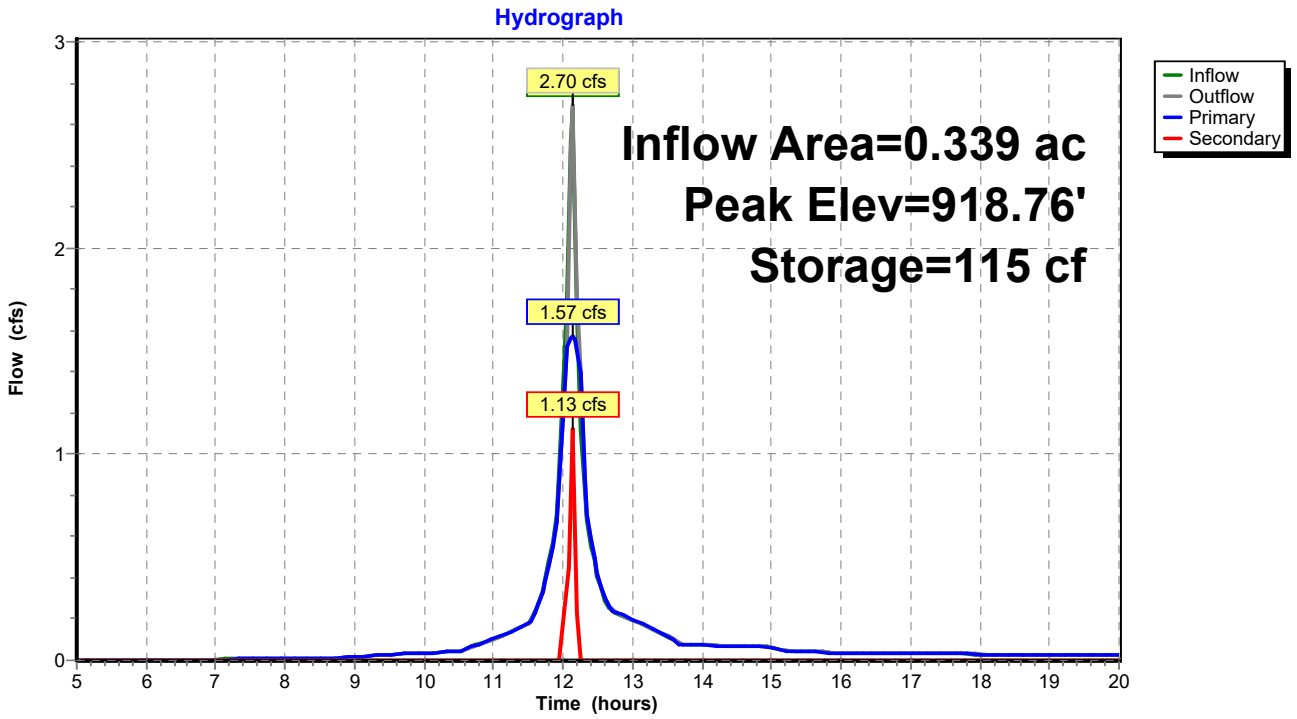
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
915.50	94	0.0	0	0
916.50	94	35.0	33	33
918.50	94	25.0	47	80
918.70	254	100.0	35	115

Device	Routing	Invert	Outlet Devices
#1	Primary	915.75'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	918.60'	**7.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=1.57 cfs @ 12.13 hrs HW=918.75' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 1.57 cfs @ 7.98 fps)

Secondary OutFlow Max=1.01 cfs @ 12.13 hrs HW=918.75' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 1.01 cfs @ 0.98 fps)

Pond 5P: BIO 1


Hydrograph
Inflow Area=0.339 ac
Peak Elev=918.76'
Storage=115 cf
2.70 cfs
1.57 cfs
1.13 cfs
Inflow
Outflow
Primary
Secondary
Flow (cfs)
Time (hours)
0
1
2
3
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Summary for Pond 6P: BIO 5

Inflow Area = 0.622 ac, 70.91% Impervious, Inflow Depth > 4.96" for 100-Year event
Inflow = 3.50 cfs @ 12.27 hrs, Volume= 0.257 af
Outflow = 1.56 cfs @ 12.54 hrs, Volume= 0.253 af, Atten= 55%, Lag= 16.3 min
Primary = 1.56 cfs @ 12.54 hrs, Volume= 0.253 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 920.17' @ 12.54 hrs Surf.Area= 1,915 sf Storage= 3,349 cf

Plug-Flow detention time= 33.4 min calculated for 0.252 af (98% of inflow)
Center-of-Mass det. time= 27.5 min (790.5 - 763.0)

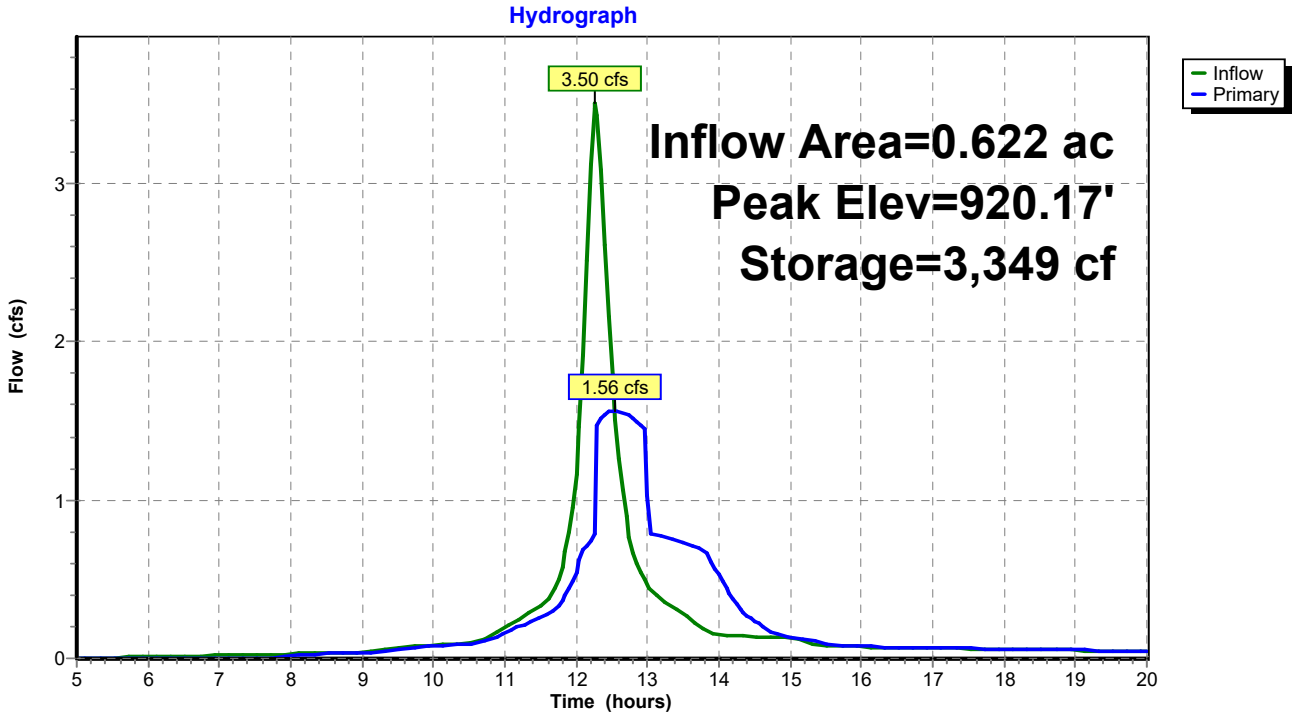
Volume	Invert	Avail.Storage	Storage Description
#1	915.60'	4,017 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
915.60	1,133	0.0	0	0
916.60	1,133	35.0	397	397
918.60	1,133	25.0	567	963
920.50	2,082	100.0	3,054	4,017

Device	Routing	Invert	Outlet Devices
#1	Primary	915.85'	**6.0" Round Culvert** L= 53.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 915.85' / 915.75' S= 0.0019 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf
#2	Device 1	915.85'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	919.50'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.56 cfs @ 12.54 hrs HW=920.16' (Free Discharge)
└**1=Culvert** (Barrel Controls 1.56 cfs @ 7.96 fps)
└**2=Orifice/Grate** (Passes < 0.86 cfs potential flow)
└**3=Orifice/Grate** (Passes < 16.67 cfs potential flow)

Pond 6P: BIO 5


Hydrograph
3.50 cfs
1.56 cfs
Inflow Area=0.622 ac
Peak Elev=920.17'
Storage=3,349 cf
Inflow
Primary
Flow (cfs)
Time (hours)
0
1
2
3
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Summary for Pond 8P: BIO 2

[88] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 0.564 ac, 54.07% Impervious, Inflow Depth > 4.53" for 100-Year event
Inflow = 4.48 cfs @ 12.13 hrs, Volume= 0.213 af
Outflow = 4.51 cfs @ 12.14 hrs, Volume= 0.210 af, Atten= 0%, Lag= 0.4 min
Primary = 1.65 cfs @ 12.14 hrs, Volume= 0.174 af
Secondary = 2.86 cfs @ 12.14 hrs, Volume= 0.036 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 915.49' @ 12.14 hrs Surf.Area= 248 sf Storage= 198 cf

Plug-Flow detention time= 8.9 min calculated for 0.209 af (98% of inflow)
Center-of-Mass det. time= 3.8 min (766.0 - 762.2)

Volume	Invert	Avail.Storage	Storage Description
#1	911.95'	234 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

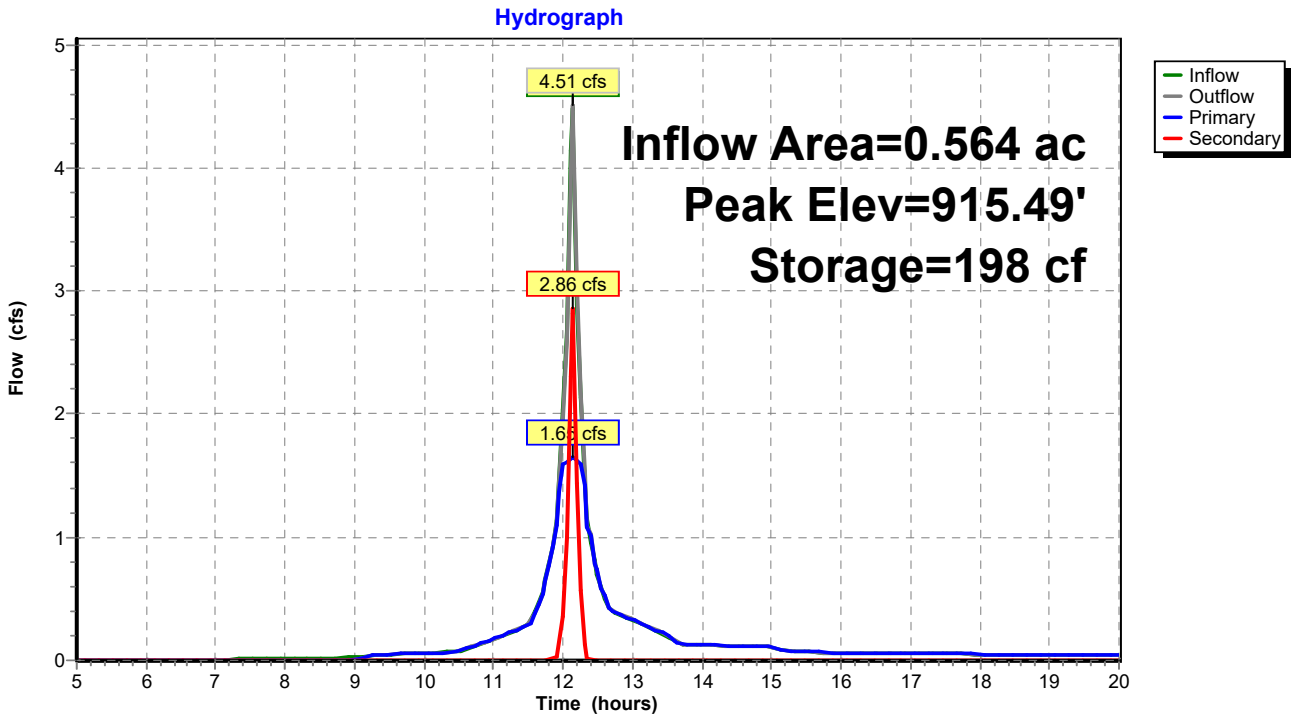
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
911.95	116	0.0	0	0
912.95	116	35.0	41	41
914.95	116	25.0	58	99
915.63	281	100.0	135	234

Device	Routing	Invert	Outlet Devices
#1	Primary	912.20'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	915.20'	**7.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#3	Device 1	915.10'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.65 cfs @ 12.14 hrs HW=915.48' (Free Discharge)
└**1=Orifice/Grate** (Orifice Controls 1.65 cfs @ 8.38 fps)
└**3=Orifice/Grate** (Passes 1.65 cfs of 7.25 cfs potential flow)

Secondary OutFlow Max=2.69 cfs @ 12.14 hrs HW=915.48' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 2.69 cfs @ 1.36 fps)

Pond 8P: BIO 2


Hydrograph
Inflow Area=0.564 ac
Peak Elev=915.49'
Storage=198 cf
4.51 cfs
2.86 cfs
1.63 cfs
Inflow
Outflow
Primary
Secondary
Flow (cfs)
Time (hours)
0
1
2
3
4
5
5
6
7
8
9
10
11
12
13
14
15
16
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18
19
20

Summary for Pond 9P: BIO 3

Inflow Area = 0.322 ac, 35.22% Impervious, Inflow Depth > 5.34" for 100-Year event
Inflow = 5.18 cfs @ 12.14 hrs, Volume= 0.144 af
Outflow = 5.12 cfs @ 12.14 hrs, Volume= 0.143 af, Atten= 1%, Lag= 0.3 min
Primary = 1.65 cfs @ 12.14 hrs, Volume= 0.110 af
Secondary = 3.47 cfs @ 12.14 hrs, Volume= 0.033 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 913.33' @ 12.14 hrs Surf.Area= 359 sf Storage= 369 cf

Plug-Flow detention time= 4.1 min calculated for 0.142 af (99% of inflow)
Center-of-Mass det. time= 2.4 min (762.1 - 759.6)

Volume	Invert	Avail.Storage	Storage Description
#1	909.77'	432 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

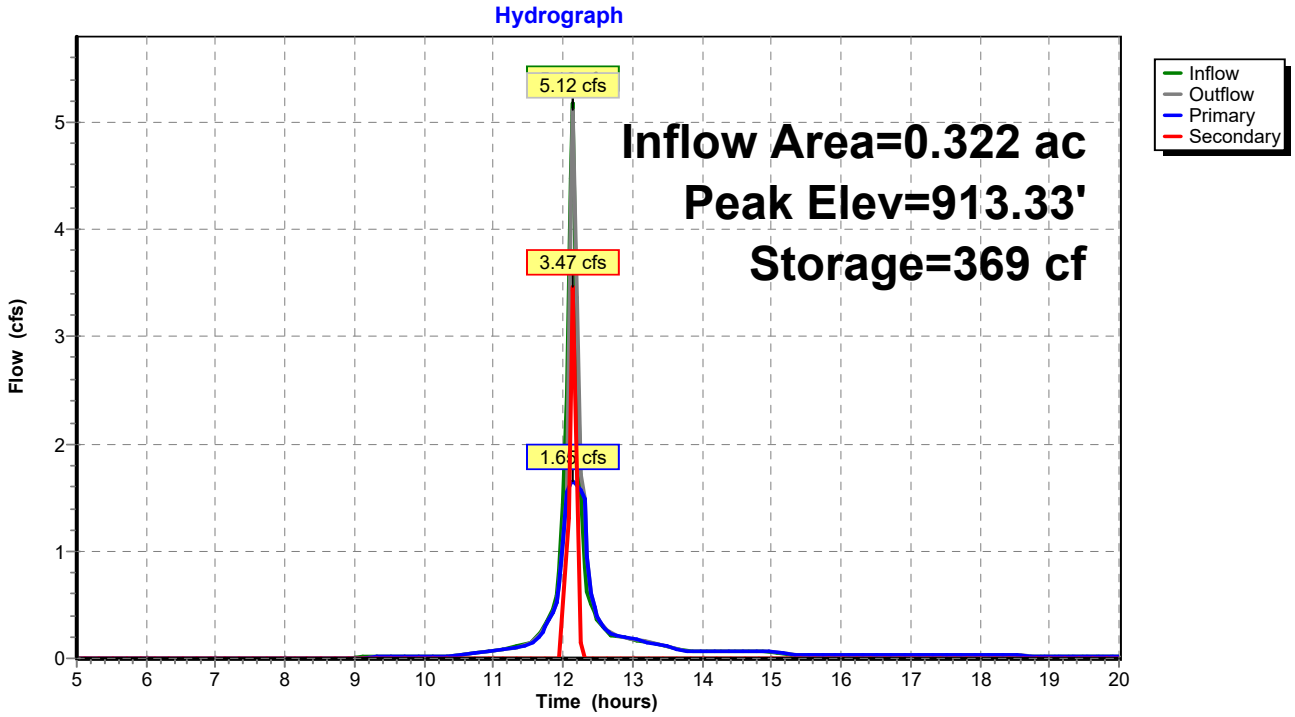
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
909.77	237	0.0	0	0
910.77	237	35.0	83	83
912.77	237	25.0	119	201
913.50	395	100.0	231	432

Device	Routing	Invert	Outlet Devices
#1	Primary	910.02'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	913.00'	**7.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=1.65 cfs @ 12.14 hrs HW=913.32' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 1.65 cfs @ 8.41 fps)

Secondary OutFlow Max=3.28 cfs @ 12.14 hrs HW=913.32' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 3.28 cfs @ 1.46 fps)

Pond 9P: BIO 3


Hydrograph
Inflow
Outflow
Primary
Secondary
5.12 cfs
3.47 cfs
1.65 cfs
Inflow Area=0.322 ac
Peak Elev=913.33'
Storage=369 cf
Flow (cfs)
Time (hours)
0
1
2
3
4
5
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Summary for Pond 10P: BIO 4

[81] Warning: Exceeded Pond 9P by 1.43' @ 12.40 hrs

Inflow Area = 0.570 ac, 43.53% Impervious, Inflow Depth > 4.98" for 100-Year event
Inflow = 7.07 cfs @ 12.14 hrs, Volume= 0.236 af
Outflow = 6.36 cfs @ 12.14 hrs, Volume= 0.236 af, Atten= 10%, Lag= 0.0 min
Primary = 6.36 cfs @ 12.14 hrs, Volume= 0.236 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 912.59' @ 12.14 hrs Surf.Area= 568 sf Storage= 463 cf

Plug-Flow detention time= 2.9 min calculated for 0.236 af (100% of inflow)
Center-of-Mass det. time= 2.0 min (763.8 - 761.8)

Volume	Invert	Avail.Storage	Storage Description
#1	908.80'	614 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

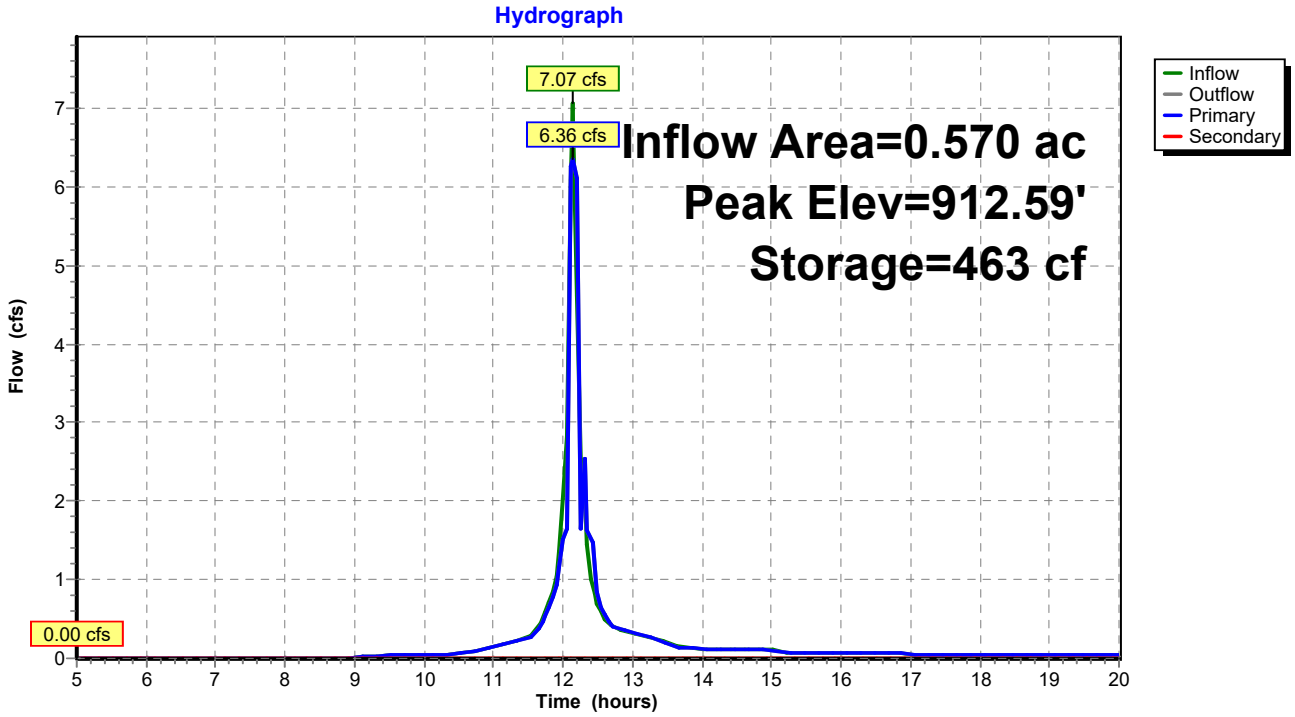
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
908.80	191	0.0	0	0
909.80	191	35.0	67	67
911.80	191	25.0	96	162
912.66	600	100.0	340	502
912.80	1,000	100.0	112	614

Device	Routing	Invert	Outlet Devices
#1	Primary	909.00'	**12.0" Round Culvert** L= 51.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 909.00' / 908.90' S= 0.0020 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Device 1	909.05'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	912.40'	**36.0" Horiz. Orifice/Grate** C= 0.600
#4	Secondary	912.65'	**24.0" x 36.0" Horiz. Orifice/Grate** X 2 rows C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=6.33 cfs @ 12.14 hrs HW=912.57' (Free Discharge)
└**1=Culvert** (Barrel Controls 6.33 cfs @ 8.06 fps)
  ├**2=Orifice/Grate** (Passes < 1.71 cfs potential flow)
  └**3=Orifice/Grate** (Passes < 14.15 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=908.80' (Free Discharge)
└**4=Orifice/Grate** (Controls 0.00 cfs)

Pond 10P: BIO 4

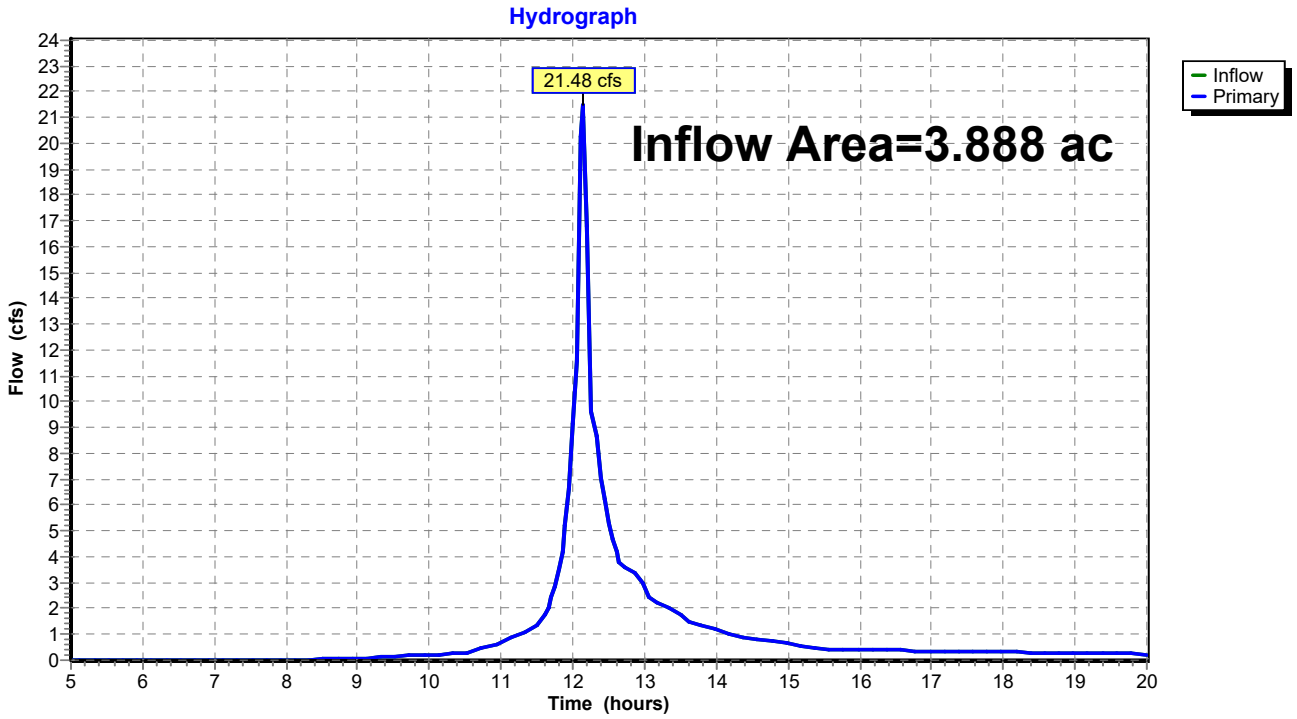


Summary for Link 7L: PROPOSED

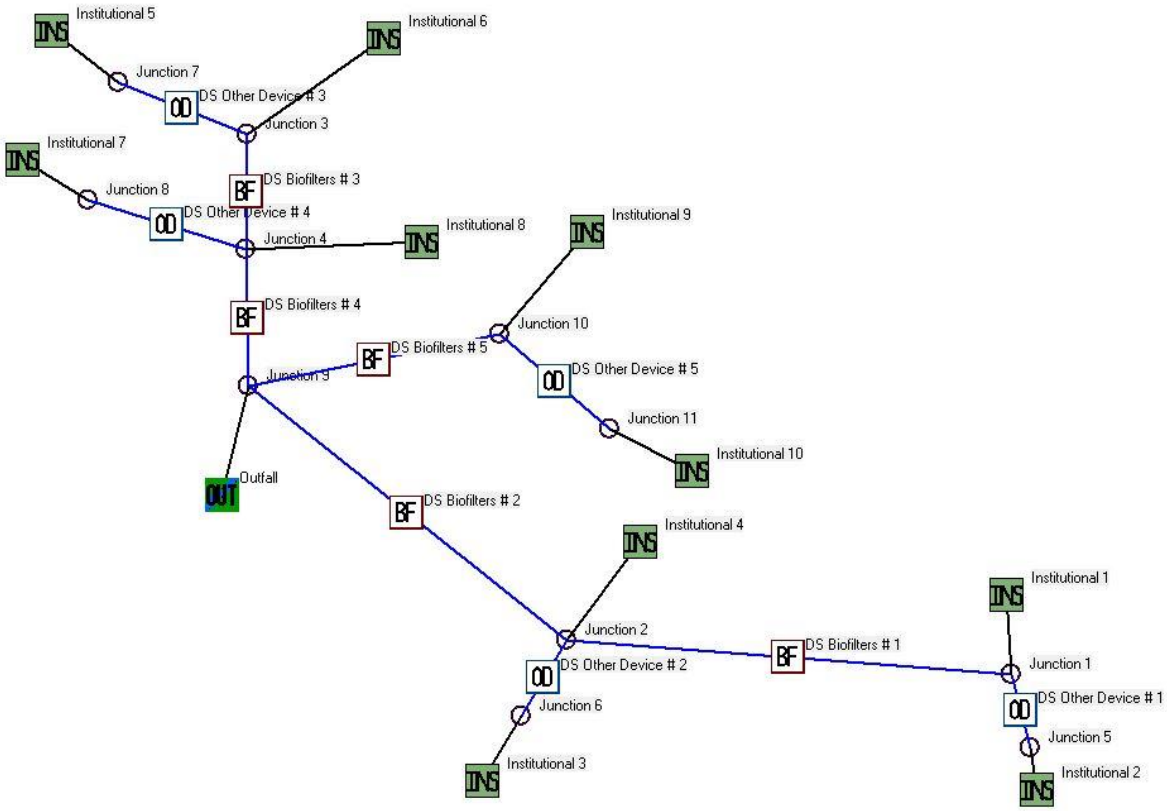
Inflow Area = 3.888 ac, 25.91% Impervious, Inflow Depth > 3.81" for 100-Year event
Inflow = 21.48 cfs @ 12.13 hrs, Volume= 1.234 af
Primary = 21.48 cfs @ 12.13 hrs, Volume= 1.234 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 7L: PROPOSED



WinSLAMM Schematic



Data file name: I:\Eppstein Uhen\20411 Waukesha Memorial Driveway\060 CAD\100_Civil\500_SWMP\040_WinSLAMM\20411 - WinSLAMM.mdb
WinSLAMM Version 10.4.1
Rain file name: C:\WinSLAMM Files\Rain Files\WI Milwaukee 69.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_Com Inst Indust Dec06.std
Commercial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Industrial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust 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\Freeway 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: 01/05/69 Study period ending date: 12/31/69
Start of Winter Season: 12/08 End of Winter Season: 03/28
Date: 01-18-2022 Time: 14:31:55
Site information:

LU# 1 - Institutional: Institutional 1 Total area (ac): 0.144
  13 - Paved Parking 1: 0.079 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
  14 - Paved Parking 2: 0.065 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 2 - Institutional: Institutional 2 Total area (ac): 0.195
  31 - Sidewalks 1: 0.034 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
  32 - Sidewalks 2: 0.005 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
  51 - Small Landscaped Areas 1: 0.156 ac. Normal Clayey Low Density Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 3 - Institutional: Institutional 3 Total area (ac): 0.143
  31 - Sidewalks 1: 0.014 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

32 - Sidewalks 2: 0.026 ac.   Connected   Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
51 - Small Landscaped Areas 1: 0.103 ac.   Normal Clayey   Low Density Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 4 - Institutional: Institutional 4   Total area (ac): 0.082
13 - Paved Parking 1: 0.043 ac.   Connected   Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
14 - Paved Parking 2: 0.039 ac.   Connected   Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 5 - Institutional: Institutional 5   Total area (ac): 0.239
31 - Sidewalks 1: 0.011 ac.   Connected   Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
32 - Sidewalks 2: 0.019 ac.   Connected   Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
33 - Sidewalks 3: 0.021 ac.   Connected   Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
51 - Small Landscaped Areas 1: 0.188 ac.   Normal Clayey   Low Density Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 6 - Institutional: Institutional 6   Total area (ac): 0.083
25 - Driveways 1: 0.037 ac.   Connected   Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
26 - Driveways 2: 0.046 ac.   Connected   Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 7 - Institutional: Institutional 7   Total area (ac): 0.149
31 - Sidewalks 1: 0.011 ac.   Connected   Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
32 - Sidewalks 2: 0.025 ac.   Connected   Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
33 - Sidewalks 3: 0.007 ac.   Connected   Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
51 - Small Landscaped Areas 1: 0.106 ac.   Normal Clayey   Low Density Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 8 - Institutional: Institutional 8   Total area (ac): 0.098
13 - Paved Parking 1: 0.035 ac.   Connected   Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
14 - Paved Parking 2: 0.063 ac.   Connected   Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 9 - Institutional: Institutional 9   Total area (ac): 0.263

13 - Paved Parking 1: 0.263 ac.   Connected   Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 10 - Institutional: Institutional 10   Total area (ac): 0.344
13 - Paved Parking 1: 0.172 ac.   Connected   Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
31 - Sidewalks 1: 0.002 ac.   Connected   Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
51 - Small Landscaped Areas 1: 0.170 ac.   Normal Clayey   Low Density Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

Control Practice 1: Biofilter CP# 1 (DS) - DS Biofilters # 1
1. Top area (square feet) = 254
2. Bottom aea (square feet) = 94
3. Depth (ft): 3.2
4. Biofilter width (ft) - for Cost Purposes Only: 10
5. Infiltration rate (in/hr) = 0.04
6. Random infiltration rate generation? No
7. Infiltration rate fraction (side): 1
8. Infiltration rate fraction (bottom): 1
9. Depth of biofilter that is rock filled (ft) 2
10. Porosity of rock filled volume = 0.35
11. Engineered soil infiltration rate: 3.6
12. Engineered soil depth (ft) = 1
13. Engineered soil porosity = 0.25
14. Percent solids reduction due to flow through engineered soil = 80
15. Biofilter peak to average flow ratio = 3.8
16. Number of biofiltration control devices = 1
17. Particle size distribution file: Not needed - calculated by program
18. Initial water surface elevation (ft): 0
Soil Data Soil Type Fraction in Eng. Soil
User-Defined Soil Type 1.000
Biofilter Outlet/Discharge Characteristics:
Outlet type: Broad Crested Weir
1. Weir crest length (ft): 7
2. Weir crest width (ft): 2
3. Height of datum to bottom of weir opening: 3.1
Outlet type: Drain Tile/Underdrain
1. Underdrain outlet diameter (ft): 0.5
2. Invert elevation above datum (ft): 0.25
3. Number of underdrain outlets: 1

Control Practice 2: Biofilter CP# 2 (DS) - DS Biofilters # 2
1. Top area (square feet) = 281
2. Bottom aea (square feet) = 116

3. Depth (ft): 3.28
4. Biofilter width (ft) - for Cost Purposes Only: 10
5. Infiltration rate (in/hr) = 0.04
6. Random infiltration rate generation? No
7. Infiltration rate fraction (side): 1
8. Infiltration rate fraction (bottom): 1
9. Depth of biofilter that is rock filled (ft) 2
10. Porosity of rock filled volume = 0.35
11. Engineered soil infiltration rate: 3.6
12. Engineered soil depth (ft) = 1
13. Engineered soil porosity = 0.25
14. Percent solids reduction due to flow through engineered soil = 80
15. Biofilter peak to average flow ratio = 3.8
16. Number of biofiltration control devices = 1
17. Particle size distribution file: Not needed - calculated by program
18. Initial water surface elevation (ft): 0

Soil Data Soil Type Fraction in Eng. Soil
User-Defined Soil Type 1.000

Biofilter Outlet/Discharge Characteristics:
Outlet type: Broad Crested Weir
1. Weir crest length (ft): 7
2. Weir crest width (ft): 2
3. Height of datum to bottom of weir opening: 3.25

Outlet type: Vertical Stand Pipe
1. Stand pipe diameter (ft): 3
2. Stand pipe height above datum (ft): 3.15

Outlet type: Drain Tile/Underdrain
1. Underdrain outlet diameter (ft): 0.5
2. Invert elevation above datum (ft): 0.25
3. Number of underdrain outlets: 1

Control Practice 3: Biofilter CP# 3 (DS) - DS Biofilters # 3
1. Top area (square feet) = 395
2. Bottom aea (square feet) = 237
3. Depth (ft): 3.25
4. Biofilter width (ft) - for Cost Purposes Only: 10
5. Infiltration rate (in/hr) = 0.04
6. Random infiltration rate generation? No
7. Infiltration rate fraction (side): 1
8. Infiltration rate fraction (bottom): 1
9. Depth of biofilter that is rock filled (ft) 1
10. Porosity of rock filled volume = 0.35
11. Engineered soil infiltration rate: 3.6
12. Engineered soil depth (ft) = 2
13. Engineered soil porosity = 0.25
14. Percent solids reduction due to flow through engineered soil = 80
15. Biofilter peak to average flow ratio = 3.8
16. Number of biofiltration control devices = 1
17. Particle size distribution file: Not needed - calculated by program

18. Initial water surface elevation (ft): 0
Soil Data Soil Type Fraction in Eng. Soil
User-Defined Soil Type 1.000
Biofilter Outlet/Discharge Characteristics:
Outlet type: Broad Crested Weir
1. Weir crest length (ft): 7
2. Weir crest width (ft): 2
3. Height of datum to bottom of weir opening: 3.23
Outlet type: Drain Tile/Underdrain
1. Underdrain outlet diameter (ft): 0.5
2. Invert elevation above datum (ft): 0.25
3. Number of underdrain outlets: 1

Control Practice 4: Other Device CP# 1 (DS) - DS Other Device # 1
Fraction of drainage area served by device (ac) = 1.00
Particulate Concentration reduction fraction = 1.00
Filterable Concentration reduction fraction = 0.00
Runoff volume reduction fraction = 0

Control Practice 5: Other Device CP# 2 (DS) - DS Other Device # 2
Fraction of drainage area served by device (ac) = 1.00
Particulate Concentration reduction fraction = 1.00
Filterable Concentration reduction fraction = 0.00
Runoff volume reduction fraction = 0

Control Practice 6: Other Device CP# 3 (DS) - DS Other Device # 3
Fraction of drainage area served by device (ac) = 1.00
Particulate Concentration reduction fraction = 1.00
Filterable Concentration reduction fraction = 0.00
Runoff volume reduction fraction = 0

Control Practice 7: Other Device CP# 4 (DS) - DS Other Device # 4
Fraction of drainage area served by device (ac) = 1.00
Particulate Concentration reduction fraction = 1.00
Filterable Concentration reduction fraction = 0.00
Runoff volume reduction fraction = 0

Control Practice 8: Biofilter CP# 4 (DS) - DS Biofilters # 4
1. Top area (square feet) = 1000
2. Bottom aea (square feet) = 191
3. Depth (ft): 4
4. Biofilter width (ft) - for Cost Purposes Only: 10
5. Infiltration rate (in/hr) = 0.04
6. Random infiltration rate generation? No
7. Infiltration rate fraction (side): 1

8. Infiltration rate fraction (bottom): 1
9. Depth of biofilter that is rock filled (ft) 1
10. Porosity of rock filled volume = 0.35
11. Engineered soil infiltration rate: 3.6
12. Engineered soil depth (ft) = 2
13. Engineered soil porosity = 0.25
14. Percent solids reduction due to flow through engineered soil = 80
15. Biofilter peak to average flow ratio = 3.8
16. Number of biofiltration control devices = 1
17. Particle size distribution file: Not needed - calculated by program
18. Initial water surface elevation (ft): 0

Soil Data | Soil Type Fraction in Eng. Soil
User-Defined Soil Type | 1.000

Biofilter Outlet/Discharge Characteristics:

Outlet type: Broad Crested Weir
1. Weir crest length (ft): 7
2. Weir crest width (ft): 2
3. Height of datum to bottom of weir opening: 3.99

Outlet type: Vertical Stand Pipe
1. Stand pipe diameter (ft): 3
2. Stand pipe height above datum (ft): 3.6

Outlet type: Drain Tile/Underdrain
1. Underdrain outlet diameter (ft): 0.5
2. Invert elevation above datum (ft): 0.25
3. Number of underdrain outlets: 1

Control Practice 9: Biofilter CP# 5 (DS) - DS Biofilters # 5
1. Top area (square feet) = 2082
2. Bottom aea (square feet) = 1133
3. Depth (ft): 4.9
4. Biofilter width (ft) - for Cost Purposes Only: 10
5. Infiltration rate (in/hr) = 0.04
6. Random infiltration rate generation? No
7. Infiltration rate fraction (side): 1
8. Infiltration rate fraction (bottom): 1
9. Depth of biofilter that is rock filled (ft) 2
10. Porosity of rock filled volume = 0.35
11. Engineered soil infiltration rate: 3.6
12. Engineered soil depth (ft) = 1
13. Engineered soil porosity = 0.25
14. Percent solids reduction due to flow through engineered soil = 80
15. Biofilter peak to average flow ratio = 3.8
16. Number of biofiltration control devices = 1
17. Particle size distribution file: Not needed - calculated by program
18. Initial water surface elevation (ft): 0

Soil Data | Soil Type Fraction in Eng. Soil
User-Defined Soil Type | 1.000

Biofilter Outlet/Discharge Characteristics:

Outlet type: Broad Crested Weir

1. Weir crest length (ft): 10
2. Weir crest width (ft): 5
3. Height of datum to bottom of weir opening: 4.8

Outlet type: Vertical Stand Pipe

1. Stand pipe diameter (ft): 1
2. Stand pipe height above datum (ft): 3.9

Outlet type: Drain Tile/Underdrain

1. Underdrain outlet diameter (ft): 0.5
2. Invert elevation above datum (ft): 0.25
3. Number of underdrain outlets: 1

Control Practice 10: Other Device CP# 5 (DS) - DS Other Device # 5

Fraction of drainage area served by device (ac) = 1.00
Particulate Concentration reduction fraction = 1.00
Filterable Concentration reduction fraction = 0.00
Runoff volume reduction fraction = 0

SLAMM for Windows Version 10.4.1

Data file name: I:\Eppstein Uhen\20411 Waukesha Memorial Driveway\060 CAD\100_Civil\500_SWMP\040_WinSLAMM\20411 - WinSLAMM.mdb
Data file description:
Rain file name: C:\WinSLAMM Files\Rain Files\WI Milwaukee 69.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_Com Inst Indust Dec06.std
Commercial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Industrial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust 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\Freeway 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
Start of Winter Season: 12/08 End of Winter Season: 03/28
Model Run Start Date: 01/05/69 Model Run End Date: 12/31/69
Date of run: 01-18-2022 Time of run: 14:33:04
Total Area Modeled (acres): 1.740
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:	85036	-	81.94	435.0	-
Outfall Total with Controls:	73984	13.00%	26.65	123.1	71.70%
Annualized Total After Outfall Controls:	75011			124.8	

Appendix D

Stormwater Maintenance Agreement

Long-Term Stormwater Management Maintenance Agreement

Site Name:
Waukesha Memorial Boulevard
742 Lawndale Ave,
Waukesha, WI 53188

Biofiltration Basins

Inspection:
Inspect the biofiltration basins monthly during the growing season (March – November) for the following:

1. Inspect basin for erosion damage.
2. Inspect for litter.
3. Inspect the basin inlets and outlet riser for blockage and structural integrity on an annual basis.
4. Inspect the basin for the presence of weeds.
5. Inspect condition of plants in basin for plants that appear to be dead or dying.
6. Inspect basin for visible indication of engineered soil clogging or overtopping of the basin.

Maintenance

1. Remove litter on a regular basis.
2. Repair any noted erosion damage. Apply topsoil/seed/much/geotextile as necessary to stabilize repaired areas.
3. Water plants as regularly during first growing season; plants should only need watering during periods of drought after establishment.
4. Water plants as needed during drought periods.
5. Remove weeds regularly during the establishment period (first two years) and as needed thereafter; hand weed to prevent compaction of and minimize disturbance of plants; weed after watering or after rain event to minimize disturbance and aid in removal.
6. Remove invasive weeds (Canada thistle, garlic mustard, tree seedlings) immediately; hand weed to prevent compaction of and minimize disturbance of plants; weed after watering or after rain event to minimize disturbance and aid in removal.
7. Remove/replace diseased, dying, or dead plantings as needed.
8. There shall be no standing water in the basin 3 days after rainfall. When standing water is observed in the basin floor 3 days after rainfall event it is an indication that the engineered soils have clogged and lost their infiltration capacity and soil maintenance is required; soil maintenance shall consist of remove sediment and replacement top 2 to 3 inches of engineered soil and deep tilling and replacement/re-establishment of plants damaged during soil maintenance activities.
9. Remove any blockage from outlet structure/overflow riser.
10. Repair any structural damage to outlet structure/overflow riser.
11. A minimum of 70% soil cover made up of approved plants must be maintained.

Storm Inlets/Catch Basins

Inspection:

1. Inspect inlets/catch basin on a semi-annual basis.
2. Inspect for level of debris/sediment build up in sump.
3. Inspect for blockage of outlet.
4. Inspect for structural integrity of structure/pipe connections.

Maintenance:

To ensure the proper function of the storm inlets/catch basins described above, the following activities must be completed on a semi-annual basis (April and October):

1. Remove sediment/debris when it reaches a level within six inches of the discharge pipe invert.
2. Remove blockage of discharge pipe as required.
3. Repair any structural damage observed to inlet/catch basin structure/pipe connections, etc.

Duty to Provide Maintenance

In the event the Owner fails to perform its obligations under this agreement, the Village of Grafton shall have the authority to inspect and maintain all components of the stormwater system. In such an event, all associated costs will be assessed back as a special charge against the property pursuant to Sec. 66.0627 Wis. Stats. **Said charge shall be a lien on the property and shall be collected with the real estate taxes.**

[Signatures on next page]

Signatures

The undersigned agree to the provision set forth in this agreement.
For the Owner:

_____
Name

_____
Title

_____
Signature

_____
Date

STATE OF WISCONSIN)
) S.S.
MILWAUKEE COUNTY)

Personally came before me this _____ day of _____, 2021, the above named _____ to me known to be the person who executed the foregoing instrument and acknowledged the same.

_____
Notary Public
State of Wisconsin
My Commission expires _____

This document was drafted by:

The Sigma Group, Inc.
1300 W. Canal Street
Milwaukee, WI 53233
414-643-4200

Exhibit A - 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 two biofiltration basins, porous pavement, all associated pipes, and other components of these practices.

Development Name: Waukesha Memorial Boulevard
Storm water Practices: Biofiltration Basins and Catch Basins
Location of Practices: 742 Lawndale Ave, Waukesha, WI
Owner: Prohealth Waukesha Memorial Hospital

Exhibit B - Location Map (cont.)