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February 13, 2024

Town of Hamilton Planning Board
Town Hall
577 Bay Road
Hamilton, MA 01936

Attn: Mr. Patrick Reffett, Director of Planning and Inspectional Services

Re: Hamilton-Wenham Regional High School Athletic Campus Redevelopment
Stormwater Management– Response to Comments
Gale JN 718601

Dear Mr. Reffett,

On behalf of the Hamilton-Wenham Regional School District (HWRSD), Gale Associates, Inc. (Gale) is submitting this letter in response to the Town of Hamilton Planning Board and Peer Reviewer comments regarding the Stormwater Management Package, which were received January 23, 2024, for the project referenced above. Below you will find the peer review comments in **bold** font and Gale's responses in plain text.

SOIL COMMENTS:

1. **Excavate a minimum of 5 test pits within the softball field and provide test pit logs prepared by a Massachusetts Soil Evaluator in order to determine the Rawls rate for infiltration and the depth to groundwater.**

   Response: As noted at the hearing on 1/23/2024, soils within the existing fields at the south end of the site previously subject to geotechnical evaluation appear to be generally consistent. For the purposes of design, this consistency will be assumed to extend into the softball field. However, test pits will be conducted at the softball field prior to construction and, if required, the field drainage design will be adjusted accordingly.

2. **Excavate a minimum of 2 test pits within the infiltration trench at the tennis courts and provide logs prepared by a Massachusetts Soil Evaluator in order to determine the Rawls rate for infiltration and the depth to groundwater. The test pits should extend a minimum of 4-ft. below the bottom of stone or the bottom of the drywell structures.**

   Response: As noted at the hearing on 1/23/24, soils within the existing fields appear to be fairly consistent. Additionally, per the September 30, 2022 Geotechnical Report, boring #B-105 in this area indicated groundwater at ±5.5ft below existing

grade. However, test pits will be conducted at the tennis court area prior to construction and, if required, the field drainage design will be adjusted accordingly.

3. **Add a plan note requiring that a Massachusetts Civil Professional Engineer inspect the subgrade of each synthetic turf field prior to placement of the gravel layer.**

   Response: This note has been added to the plans; refer to Plan Sheet G002, the Grading Notes Section, Note 8.

MASSACHUSETTS STORMWATER STANDARDS COMMENTS:

Standard 1: No New Untreated Discharges

4. **Calculate the discharge velocity from each level spreader and determine the erosive properties of the soil at the point of discharge.**

   Response: The discharge velocity from each level spreader at the peak flow from a 100-year storm is shown below:

Table 1: Level Spreader Peak Flow Velocity

Level Spreader Location	Peak Flow Velocity (ft/s)
Baseball Field (east)	0.65
Baseball Field (west)	0.81
Football/Multi-Purpose Field	1.22
Softball Field	0.60

   The level spreaders each discharge directly into the resource area buffer zones surrounding the site. The threshold for non-erosive peak flow into wetlands is about 1.50 ft/s, and the level spreader flow velocities are less than that amount.

5. **Inspect the existing level spreader to be reused west of the proposed tennis courts for any signs of erosion. Modify the existing level spreader if required to control erosion.**

   Response: The existing level spreader has been field evaluated as requested and will be upgraded due to its poor condition. The proposed discharge velocity for the associated flared end outlet is provided above.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

6. **Submit a detailed phasing of construction plan which limits the extent of the site disturbed at any one time. Each phase should be stabilized prior to initiating work on the next phase. Perimeter erosion controls and other measures should be provided for each phase as sediment and erosion are best controlled at the source.**

Response: As discussed at the hearing on 1/23/2024, this project will be constructed all at one time. Once erosion controls are in place, topsoil removal will begin, followed by anchor curb installation, which will be built around each field and contain runoff from those areas. Refer to the Construction Phasing Summary attached.

7. **Include a plan note requiring the stormwater contractor to attend a preconstruction conference with the Conservation Agent and the Town Planner.**

   Response: This note has been added to the plans; refer to Plan Sheet G002, the Erosion Control Notes Section, Note 11. This is also a condition of the Order of Conditions.

8. **Note to provide fencing or other barriers around the synthetic turf fields to prevent compaction of the subgrade by precluding use of the synthetic turf field areas by construction equipment and trucks.**

   Response: The construction project will have construction fencing, as needed, to prevent entry to the worksite. However, it is not standard practice to put fencing or barriers around the fields during construction. Trucks will have a designated route in and out of each field. Additionally, the precast concrete anchor curb installed prior to installation of the drainage materials and base stone will create a barrier between the turf field limits and the surrounding site. Note, per the specifications, the subgrade will be compacted prior to the installation of base stone.

9. **Note to provide erosion controls to prevent sediment laden water from washing onto the artificial turf fields.**

   Response: As discussed at the hearing on 1/23/2024, sediment laden water will be prevented from washing onto the fields due to the anchor curb that will be constructed around each field early in the construction phase.

10. **Show one or more refueling areas, each being level and underlain by an impervious surface with a berm of graded to provide containment of a fuel spill.**

    Response: This note has been added to the plans; refer to Plan Sheet G002. Note that a pre-construction meeting will be conducted with the selected contractor, at which time they will provide their proposed location for the refueling area, laydowns areas, etc.

11. **Stockpiles should not be located within any synthetic turf field to avoid compaction of the subgrade.**

    Response: As part of standard practice for turf field construction during the removal of topsoil, material will be temporarily stockpiled on site until it is trucked offsite. Note that, per the specifications, the subgrade requires some compaction to avoid depressions.

12. **Add a plan note requiring sweeping of the on-site access drives connecting to the Project Site and proximate segments of Bay Road whenever sediment is visible. Daily sweeping is likely required during export of topsoil and demolition debris.**

    Response: This note has been added to the plans; refer to Plan Sheet G002.

13. **Due to the proximity of wetlands, add a plan note that dust control during earthwork is to be controlled by the application of potable water. Sodium chloride shall not be used to control dust.**

    Response: This note has been added to the plans; refer to Plan Sheet G002.

14. **In order to limit dust during transport, add a plan note requiring that all trucks carrying earth materials or demolition debris be covered prior to entering or leaving the site.**

    Response: This note has been added to the plans; refer to Plan Sheet G002, the General Construction Notes Section, Note 7.

15. **Provide a plan for preparing and stabilizing the site in advance of a larger storm event (2-inches in 24 hours).**

    Response: Prior to any predicted large storm, erosion controls will be inspected and reinforced, if necessary. Additional controls will be provided, should any areas appear unstable at the time of the storm. Note that, under the SWPPP-EPA NPDES Stormwater Construction Permit, the contractor will be required to have a designated erosion controls inspector and is required to inspect erosion controls weekly and provide reports as specified.

Standard 9: Operation and Maintenance Plan

Section II: Post-Development Activities

16. **Provide a plan drawn to scale that shows the location of all stormwater BMPs in each treatment train along with the discharge point.**

    Response: Refer to the BMP Location Plan attached.

17. **Provide a description and delineation of public safety features.**

    Response: Construction fencing will be provided to avoid access to the site while under construction. Post construction will include chain link fencing with locking gates to prevent unauthorized access to the athletic campus.

18. **Provide an estimated operations and maintenance budget.**

    Response: Gale is working with HWRSD to develop an estimated Operation and Maintenance budget, as requested. It includes field maintenance, BMP inspections, and water quality testing required by the Order of Conditions to be provided to the Planning Board.

19. **Include maintenance requirements for the level spreaders.**

    Response: An Inspection and Maintenance Log has been included. Refer to the updated Operation and Maintenance Plan.

20. **Specify maintenance requirements for artificial turf including washing, vacuuming, and brushing including the required frequency for each task.**

    Response: The synthetic turf fields will be brushed periodically (average once/month). As discussed at the hearing on 1/23/2024, outdoor turf fields are not washed or vacuumed and the sun's UV rays act as a cleaning agent, the same as for a natural grass field.

21. **Protectorant may be required that is sprayed on artificial turf to maintain color. If applicable, specify frequency of application. Specify the chemical composition of the protectorant and any related human health and environmental issues.**

    Response: Neither Gale nor turf manufacturers for synthetic turf fields specify any type of protectorant to maintain color.

Section III: Long Term Pollution Prevention Plan

22. **Revise the Long Term Pollution Prevention Plan to state that use of road salt (sodium chloride) within the limits of the Athletic Campus portion of the site is prohibited.**

    Response: The Long Term Pollution Prevention Plan has been revised. Refer to the Operation and Maintenance Plan, Section 3.

STORMWATER MANAGEMENT SYSTEM AND BMPS COMMENTS:

Athletic Field Infiltration System

23. **Add a plan note specifying the minimum allowable permeability of the artificial turf.**

    Response: This note has been added to the plans; refer to Plan Sheets C101, C102, and C103, Layout and Materials Notes, Note 3. Permeability testing requirements are also included in the Synthetic Turf Field Specification included in the construction documents.

24. **Add a plan note requiring submittal of laboratory test reports of permeability for the artificial turf prior to installation.**

    Response: This note has been added to the plans; refer to Plan Sheets C101, C102, and C103, Layout and Materials Notes, Note 3.

25. **Provide specifications or a construction detail for the 12-in flat panel drains.**

    Response: Refer to Detail 3 on Plan Sheet C507.

26. **Specify whether geotextile wrap is required for the flat panel drains.**

    Response: The proposed geotextile is placed below the flat panel drains and they are not wrapped, as shown in Detail 3 on Plan Sheet C507. Only the collector drains are wrapped, as shown in Detail 1 on Plan Sheet C509, Detail 4 on Plan Sheet C515, and Detail 4 of Plan Sheet C523.

27. **Show a detail of the flat panel drain connections to the collector pipes.**

    Response: Refer to Detail 4 on Plan Sheet C506.

Outlet Control Structures

28. **For Outlet Control Structure #1, update the pipe riser horizontal orifice elevation and the invert out elevation.**

    Response: Outlet Control Structure 1 has been updated; refer to Table 2.

29. **For Outlet Control Structure #2, update the pipe riser horizontal orifice elevation.**

    Response: Outlet Control Structure 2 has been updated; refer to Table 2.

30. **For Outlet Control Structure #3, update the pipe riser horizontal orifice elevation.**

    Response: Outlet Control Structure 3 has been updated; refer to Table 2.

31. **For Outlet Control Structure #4, update the pipe riser horizontal orifice elevation and the invert out elevation.**

    Response: Outlet Control Structure 4 has been updated; refer to Table 2.

Table 2 - Outlet Control Structure Elevations

Structure	Drawing Plan View	Drawing Construction Detail	HydroCAD Calculations
Outlet Control Structure #1 - Football Field			
Riser Pipe Discharge Orifice	44.86	44.86	44.86
Invert Out	42.19	42.19	42.19
Outlet Control Structure #2 - Baseball Field			
Riser Pipe Discharge Orifice	41.84	41.84	41.84
Invert Out	39.17	39.17	39.17
Outlet Control Structure #3 - Baseball Field			
Riser Pipe Discharge Orifice	41.43	41.43	41.43
Invert Out	38.76	38.76	38.76
Outlet Control Structure #4 - Softball Field			
Riser Pipe Discharge Orifice	41.83	41.83	41.83
Invert Out	39.07	39.07	39.07

Tennis Court Infiltration Trench

32. **A minimum of two test pits is required.**

    Response: Test pits will be conducted in the area of the proposed infiltration trench prior to construction and, if required, trench design will be modified accordingly. Note that the design of the trench has been updated to be shallower in an effort to meet the 2-ft. groundwater separation.

33. **Based upon the supplemental test pit ESHGW data, redesign the infiltration trench, as required, to provide a minimum 2-ft. separation to seasonal high groundwater.**

    Response: See the infiltration trench on Plan Sheet C202. The trench has been redesigned to provide 2-ft separation between the bottom of the trench and the seasonal high groundwater.

34. **Based upon the supplemental test pit saturated hydraulic conductivity data, redesign the infiltration trench as required providing a time to drain of 72 hours or less.**

    Response: The infiltration trench design provides 3,342 cf of storage (including freeboard), the surrounding soil conservatively has a saturated hydraulic conductivity 0.085 ft/hr, and the area of the bottom of the trench is 1,931 sf. This yields a drawdown time of approximately 20.36 hrs.

35. **Provide a construction detail for the infiltration trench showing all components.**

Response: This detail has been added to the plans, see Plan Sheet C519, Detail 1 for the Tennis Court Area Drain in Infiltration Trench Detail.

36. **Provide fencing or other barriers around the trench to prevent compaction of the subgrade by construction equipment and trucks.**

    Response: This note has been added to the plans; refer to Plan Sheet G002, the General Utility Notes Section, Note 10.

37. **Add a plan note requiring that construction of the trench be deferred until the rest of the site is stabilized.**

    Response: This note has been added to the plans; refer to Plan Sheet G002, the General Utility Notes Section, Note 11.

38. **If feasible, provide some pretreatment.**

    Response: The infiltration trench has been moved 25' north of the tennis courts. This allows for the runoff to flow through grassed area before entering the infiltration trench, providing pretreatment.

OTHER BMPS:

39. **Raise the invert of the 6-inch HDPE roof drain from the amenities Building to approximately 91.25 so that it is above the crown of the 24-in. diameter drain because the angle of the connection is made counter to flow in the though pipe.**

    Response: This area of the storm drainage pipes has been redesigned. See Sheet C202B.

40. **Specify that all HDPE pipe is smooth interior wall.**

    Response: All HDPE pipes are to have smooth interior walls specified in the storm drainage specification. Also, a note has been added to Plan Sheet G002, General Utility Notes, Note 12.

41. **The HWRSD page 52 drainage system plan shows a drain line extending from structure 761 across the softball field to outfall at the east edge of the softball field. The diameter, pipe material, and inverts of this line should be shown in order to avoid construction conflicts.**

    Response: The existing drain line has been provided in the Existing Conditions Plan, Sheet 1 of 3, Plan Sheet C001. The location where the existing and proposed pipes cross, as well as the existing pipe details, are shown on Plan C201. There is 0.17' of clearance at the crossing.

PFAS COMMENTS:

42. **Based upon criteria to be provided by a consultant having specialized expertise, specify artificial turf having the lowest practicable levels of PFAS.**

    Response: As noted in PSC's peer review comments, it is our understanding that HWRSD's council has proposed a letter to the Select Board/Town manager setting fourth their opinion on limitations that involve the Planning Board's scope of review, particularly PFAS chemicals. Therefore, HWRSD does not plan to engage a toxicologist at this time. However, as discussed by Gale at the hearing on 1/23/2024, PFAS testing of the turf material is to be conducted prior to installation, in accordance with the most current testing methods and regulations.

MILES RIVER COMMENTS:

The Miles River is located in the Ipswich River Basin and is listed as impaired for organic enrichment/low dissolved oxygen and pathogens. Replacement of natural turf fields with artificial turf fields will reduce the application of fertilizers.

43. **Evaluate the impacts of the Proposed Project on runoff and groundwater for the above water contaminants.**

    Response: Under Order of Conditions #38, stream sampling will be conducted at least 100 ft. upstream of where the project stormwater discharges from the turf field and enters the waterway, at the area the stormwater will enter the stream, and at the mouth of the stream just prior to, and just after it reaches the waters of the Miles River Marsh. Required analysis is specified in the Order of Conditions and includes various PFAS, in accordance with the current regulated testing methods.

We hope you find our responses to your comments acceptable. Please do not hesitate to contact the undersigned, at kdh@gainc.com or (508) 259-3534, if you require additional information or clarification.

Best regards,

GALE ASSOCIATES, INC.

Kathleen D. Hervol/cmh

Kathleen D. Hervol
Director of Athletics

KDH/cmh

Enclosures:

- Construction Phasing Summary
- Updated Stormwater Report, Operation and Maintenace Plan, and Long Term Pollution Prevention Plan (including BMP Location Plan)

- Ipswich River Watershed Association Response to Comments Letter
- Revised Plan Set

CC:

- Mr. Thomas Houston, Peer Reviewer – Professional Services Corp.
- Mr. Thomas Geary – Hamilton-Wenham Regional School District

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Hamilton-Wenham Regional High School

Athletic Campus Improvements

Construction Phasing Summary

The construction sequence detailed below is typical for a single (1) synthetic turf field. For the proposed project, which includes three (3) separate synthetic turf fields, it is anticipated the General Contractor will stagger the sequencing below to account for labor availability. For example, the "earth moving" crew will proceed to rough grade the second turf field once the first turf field has been rough graded, and will proceed to the third once the second has been rough graded. This staggered approach will continue throughout the construction of all three fields in the general order of the actions sequence listed below (anchor curb installation, drainage installation, geotextile installation, etc.).

1. Setup the erosion and sediment controls (silt fence, construction entrance, etc.) as required per the permit conditions and construction documents.
2. Miscellaneous demolition, as needed within the limit of work (i.e. irrigation lines or fencing).
3. Earthwork including the removal of existing topsoil and rough grading the site.
4. Installation of perimeter anchor curbing for the field.
5. Installation of perimeter header pipes, drainage structures and outlets.
6. Installation of geotextile fabric over final subgrade.
7. Installation of flat panel drains and base stone.
8. Installation of top stone, laser grading, and field testing (infiltration, planarity)
9. Installation of shock pad
10. Installation of synthetic turf carpet and infill material
11. Completed field HIC and GMax testing.

SITE PLAN REVIEW APPLICATION
AND ACCOMPANYING STORMWATER MANAGEMENT REPORT

HAMILTON-WENHAM REGIONAL SCHOOL DISTRICT
HAMILTON-WENHAM REGIONAL HIGH SCHOOL ATHLETIC CAMPUS IMPROVEMENTS
HAMILTON, MASSACHUSETTS 01982

February 2024

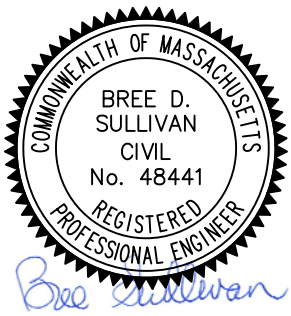
Hamilton-Wenham Regional School District

Prepared for:

Hamilton-Wenham Regional School District
5 School Street
Wenham, Massachusetts 01984

Prepared by:

Gale Associates, Inc.
300 Ledgewood Place – Suite 300
Rockland, MA 02370
Gale JN: 718601



Prepared by: Ryan Thackeray
Ryan D. Thackeray, E.I.T.

Reviewed by: Bree Sullivan
Bree D. Sullivan, P.E.

SITE PLAN REVIEW APPLICATION
AND ACCOMPANYING STORMWATER MANAGEMENT REPORT

HAMILTON-WENHAM REGIONAL SCHOOL DISTRICT
HAMILTON-WENHAM REGIONAL HIGH SCHOOL ATHLETIC CAMPUS IMPROVEMENTS
SOUTH HAMILTON, MASSACHUSETTS 01982

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ATTACHMENTS

1.0 REQUIRED FORMS

TOWN OF HAMILTON
PLANNING BOARD

REQUEST FOR FINDINGS OF FACT
SITE PLAN REVIEW

Date Submitted:

Applicant Name: Hamilton Wenham Regional School District Phone: (978) 468-5310

Site Plan Review for Property Located at: 775 Bay Road, Hamilton, MA

1. If the proposed is an addition or alteration to an existing building, please provide the following information:
   a. Square footage of proposed new floor area: Proposed Amenities Building: 800 SF - Team Room/Storage, Concessions, Ticketing 800 SF - Restrooms
   b. Square footage of the current ground floor area of the existing building. (See Section 2b of the Site Plan Review By-Law for more information.): Not Applicable
   c. Estimated cost of proposed work: Estimated Cost for the entire project, as proposed, is +/- 14,000,000
   d. Current 100% assessed valuation of building: Not Applicable

2. How does the proposed development fit into the existing neighborhood in the following areas?
   a. Neighborhood character: The current site consists of existing track and ball fields adjacent to Hamilton-Wenham Regional High School. A majority of these fields will be renovated to provide synthetic turf fields, tennis courts, along with a variety of amenities including athletic lighting, grandstands with press box, amenities building, all of which are consistent with the current use of the site.
   b. Scale: One-inch equals thirty feet (1" = 30') and One-inch equals twenty feet (1" = 20')
   c. Appearance: The proposed project will provide the athletic campus at Hamilton-Wenham Regional High School with upgrades throughout, and will provide significant improvements to the appearance of the athletic campus.
   d. Natural features: Portions of the work are proposed within protected areas, such as the 100' wetland buffer zone, protected under the Massachusetts Department of Environmental Protection's Wetland Protection Act, as well as wetland buffer zones protected by the Town's Wetland Regulations. Notice of Intents for all proposed work have been filed and were approved by the Hamilton Conservation Commission.
   e. Use: Athletic campus.

Hamilton Planning Board
Site Plan Review Checklist

Applicant: Hamilton-Wenham Regional School District
Address: 775 Bay Road, Hamilton, MA
Zone: R-1B Single Residential District
Date Received:
Existing Structures: A track and football, baseball and softball fields at Hamilton-Wenham Regional High School
Proposal: Synthetic turf fields, grandstands and press box, new track, athletic lighting, amenities building, and ADA access (See Permit Plan Set attached).

Previous Proposals: Not Applicable
Requirements:

- Locations and boundaries of existing and proposed lots ✓ No new lots proposed
- Locations of adjacent streets or ways ✓
- Locations of any easements ✓
- Adjacent property owners' names. ✓ See Certified Abutters List attached
- Size of lot Not Applicable
- Frontage and yards ✓ Where Applicable
- Existing and proposed buildings and structures ✓
- Dimension of buildings and structures ✓
- Elevation drawings of building(s) with additions from each side Not Applicable
  - Additions/alterations need to show only affected side Not Applicable
- Locations and dimensions of all parking areas Not Applicable - Parking unaltered
- Number of parking spaces compared to requirement Not Applicable - Parking unaltered
- Handicapped parking Not Applicable - Parking unaltered
- Locations and dimensions of all loading areas Not Applicable - No new loading zones proposed
- Locations and dimensions of driveways/walkways ✓
- Locations and dimensions of access/egress ✓
- Relation to street traffic ✓
- Grading and site work ✓
- Proposed and existing topographical lines at 2' intervals ✓
- Location/description of proposed and existing sewage disposal system not shown
- Location/description of underground storage tanks Not Applicable
- Location/description of water supply ✓
- Location/description of storm drainage ✓
- Location/description of utilities ✓
- Location/description of dumpsters No new dumpsters proposed
- Location inc. height, dimension, appearance of lighting ✓ See Lighting Plans attached
- Natural Features ✓
- Location/description of landscaping inc.large trees ✓
- Location/description of proposed screening/buffers/fencing ✓
- Location/description of open space/recreation areas. ✓

Other permits required Notice of Intents from the Conservation Commission have been approved.

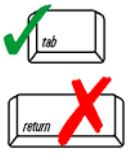
2.0 CHECKLIST FOR STORMWATER REPORT

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature

Bree Sullivan 2/13/2024

Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☐ New development

☑ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☐ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☑ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☐ Use of "country drainage" versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☑ Other (describe): Subsurface Infiltration Systems

Standard 1: No New Untreated Discharges

- ☑ No new untreated discharges
- ☑ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☐ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☑ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☑ Soil Analysis provided.

☑ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☑ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☐ Static ☑ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☑ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☑ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☑ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☑ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☑ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☑ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☐ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☐ The BMP is sized (and calculations provided) based on:

- ☐ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☑ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☑ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☑ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☑ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☐ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☑ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☑ Name of the stormwater management system owners;
- ☑ Party responsible for operation and maintenance;
- ☑ Schedule for implementation of routine and non-routine maintenance tasks;
- ☑ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☑ Description and delineation of public safety features;
- ☑ Estimated operation and maintenance budget; and
- ☑ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☑ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☑ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

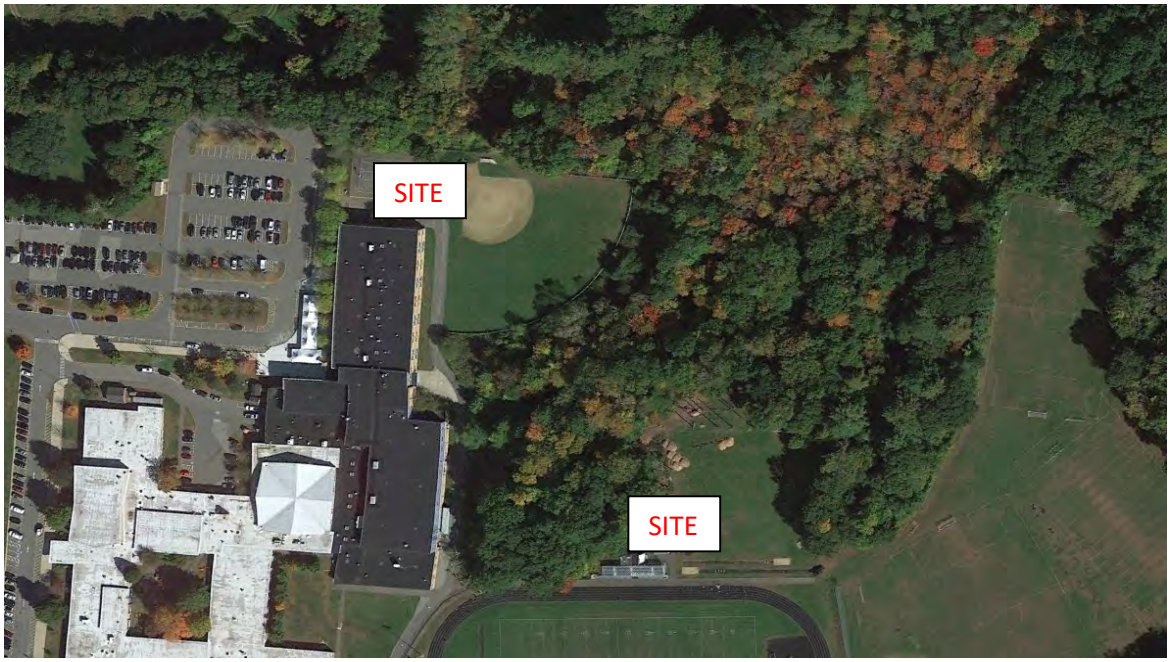
3.0 PROJECT DESCRIPTION

The Hamilton-Wenham Regional School District (HWRSD) is proposing to renovate the existing athletic campus located at Hamilton-Wenham Regional High School (HWRHS). The proposed improvements include installing an infilled synthetic turf softball field, baseball/multi-purpose field, and football field, as well as the reconstruction of the bituminous concrete running track, four new bituminous concrete tennis courts, a new amenities building, new grandstand seating and press box, relocation of various track and field events, and other associated improvements. This report has been prepared in accordance with both the Massachusetts Stormwater Handbook and the Town of Hamilton Planning Board Regulations.

3.1 Existing Conditions

The athletic campus is located at HWRHS. The existing site consists of a natural grass softball field, a natural grass baseball field, a natural grass football field surrounded by a bituminous concrete track, spectator seating, as well as an open grass area with track and field events. The softball field is bound by HWRHS to the west, and wetlands the north, south, and east. The remaining athletic campus area is south of the softball field and is bound by HWRHS to the west, wetlands to the north, east, southeast, and residential to the southwest. The parcel is zoned Residential Zone 1B (R-1B).

Locus Map



3.2 Site Soils

Site Soil information was taken from the USDA Natural Resources Conservation Service (NRCS) Soil Survey Report, as well as from onsite testing. The NRCS soils mapping lists the entire softball field area, as well as the northwestern corner of the track and field area as 260A – Sudbury fine sandy loam, which generally consists of moderately well drained sandy loam (Hydrologic Soil Group B soil). The proposed tennis court area, the western half of the proposed baseball field, and the southwestern corner of the track and field is listed as 254A or 254B - Merrimac fine sandy loam which generally consists of somewhat excessively drained fine sandy loam (Hydrologic Soil Group A soil). The eastern half of the proposed baseball field and the proposed track and field event area are listed as 242A – Hinckley loamy sand which generally consists of excessively drained gravelly loamy sand (Hydrologic Soil Group A soil). The remaining track and field area, is listed as 651 – Udorthents, which generally consists of urban land built over sand and gravel.

A site soil evaluation consisting of a total of five (5) test borings (performed by Nobis Group) and seven (7) test pits (performed by Gale Associates, Inc.) was completed (Refer to Attachment 5). Four (4) test borings were performed at the four proposed athletic lighting foundations at the proposed synthetic turf softball field for soil and lighting foundation evaluation. One (1) test boring was performed in the open space area in the proposed tennis court location for soil evaluation. The boring logs and test pits indicate that the soils vary between sand, loamy sand, and sandy loam. Field observations showed the estimated seasonal high-water table (ESHWT) to be an average of 6.5 feet below grade. Curve Number (CN) values for the infiltration computations were based on the hydraulic soil group (A-B) and the surface cover material (i.e. grass, pavement). The complete list of selected curve numbers is included in the drainage calculations (Refer to Attachment 7).

4.0 STORMWATER MANAGEMENT CONCEPT

To gain an understanding of the site hydrology in its current condition, Gale completed an on-site assessment and reviewed as built and design plans for the school campus. The following section describes the watershed analysis and current hydrologic condition of the site. Rainfall events were obtained from the Northeast Regional Climate Center (NRCC).

The U.S.D.A. Soil Conservation Service (SCS) Technical Release 55 (TR-55), 1986, was used as the procedure for estimating runoff. HydroCAD, a SCS TR-20-based computer program was used for estimating peak discharges. TR-55 is a generally accepted model for use on small sites and begins with a rainfall amount uniformly imposed on the watershed over a specified time distribution. Mass rainfall is converted to mass runoff by using a runoff curve number (CN). The CN is based on soils, ground cover, impervious areas, interception, and surface storage. Runoff is then transformed into a hydrograph that depends on runoff travel time through segments of the watershed. HydroCAD modifies the CN value for watersheds that are comprised of 30% or less unconnected impervious area, which is impervious area that is not connected directly to the drainage system. This modified value is known as the UI Adjusted CN.

Stormwater management computations for the full-build were performed using SCS-based HydroCAD, as well as for existing and proposed conditions curve numbers, times of concentrations and unit hydrograph computations.

4.1 Pre-Development Condition

The project site and surrounding areas have been broken down into six (6) existing sub watersheds that reflect the contributing areas of runoff to the design points. Existing topography was used to determine the watersheds. Refer to Sheets "PRE" for the Existing Watershed Map (Attachment 6).

4.1.1 Pre-Development Watershed Areas

Existing Watershed Area 1 (EWS-1):

EWS-1 includes runoff from the existing bituminous concrete access road, a small area of the existing parking lot to the west of the track and field, a small shed, and associated vegetated areas surrounding the access road. The runoff from this watershed flows overland in the northern direction into the existing drainage system that discharges into the Bordering Vegetated Wetlands at Design Point 1 (DP-1).

Sub-Watershed	EWS-1
Total Contributary Area (SF)	21,230
Curve Number (CN)	79
Time of Concentration (min)	6.9
Hydrologic Soil Group	A/B

Existing Watershed Area 2 (EWS-2):

EWS-2 consists of an existing natural grass football field surrounded by a bituminous concrete track, spectator seating, associated bituminous concrete walkways, and grassed and wooded areas. Runoff from this area flows northeast into the existing on-site drainage system which discharges directly into the wetlands at Design Point 1 (DP-1).

Sub-Watershed	EWS-2
Total Contributary Area (SF)	168,164
Curve Number (CN)	58
Time of Concentration (min)	12.1
Hydrologic Soil Group	A/B

Existing Watershed Area 3 (EWS-3):

EWS-3 consists of an open grassed area with two existing impervious long/triple jump areas, two concrete pads for discus and shotput, two existing garages, a press box, spectator seating, and associated bituminous concrete walkways. Runoff from this area flows north directly into the wetlands at Design Point 1 (DP-1).

Sub-Watershed	**EWS-3**
Total Contributary Area (SF)	64,420
Curve Number (CN)	50
UI Adjusted CN	45
Time of Concentration (min)	12.6
Hydrologic Soil Group	A/B

Existing Watershed Area 4 (EWS-4):

EWS-4 consists of the western half of the existing baseball field that consists of grassed area, a clay infield area, and associated fencing. Runoff from this area flows northeast directly into the wetlands at Design Point 2 (DP-2).

Sub-Watershed	**EWS-4**
Total Contributary Area (SF)	62,247
Curve Number (CN)	40
UI Adjusted CN	39
Time of Concentration (min)	12.6
Hydrologic Soil Group	A

Existing Watershed Area 5 (EWS-5):

EWS-5 consists of the eastern half of the existing baseball field that consists of grassed area, a clay infield area, fencing, and associated grassed areas and wooded areas. Runoff from this area flows southeast directly into the wetlands at Design Point 3 (DP-3).

Sub-Watershed	**EWS-5**
Total Contributary Area (SF)	214,321
Curve Number (CN)	41
UI Adjusted CN	39
Time of Concentration (min)	14.1
Hydrologic Soil Group	A

Existing Watershed Area 6 (EWS-6):

EWS-6 includes runoff from the existing grass softball field, including the clay infield area. The runoff from this watershed flows overland in the southern direction and directly into the Bordering Vegetated Wetlands at Design Point 1 (DP-1).

Sub-Watershed	EWS-6
Total Contributary Area (SF)	58,557
Curve Number (CN)	67
UI Adjusted CN	66
Time of Concentration (min)	7.1
Hydrologic Soil Group	B

4.2 Post-Development Condition

The HWRHS Athletic Campus Improvement Project generally includes the following scope as it relates to stormwater management:

- Installation of a synthetic turf softball field, baseball/multipurpose field, and football field with base stone and subsurface drainage system including the following:
  - Permeable turf "carpet"
  - Uniformly graded stone layer with average thickness varying by field
  - Flat panel collector drains
  - Perforated pipe collection system
- Installation of four bituminous concrete tennis courts with associated bituminous concrete access walkways.
- Reconstruction of a bituminous concrete track with associated spectator seating, track and field events, and bituminous concrete walkways and access road.
- Construction of new amenities building with associated walkways and patio areas.

The synthetic turf fields are comprised of permeable turf "carpet" installed on top of a uniformly graded stone base with a 36% void space for stormwater storage. The stone base will have an average thickness of 11" for the football field and 8" for both the baseball/multipurpose and softball fields. Stormwater enters the synthetic turf carpet and drains vertically into the stone base to recharge into the existing subsurface soils. During significant storms, the stormwater that does not infiltrate into subsurface soils is stored within the void space of the stone base. Excess stormwater is collected via flat panel drains which are installed within the stone base. The flat panel drains convey water to perimeter perforated collector pipes which provide additional storage and infiltration of stormwater.

4.2.1 Post-Development Watershed Areas

The proposed development results in watershed characteristics that differ from the pre-development condition as a result of revised grading and drainage patterns as well as runoff characteristics of the proposed improvement areas. The post-development Design Point 1 (DP-1), Design Point 2 (DP-2), and Design Point 3 (DP-3) are the same as the pre-development Design Points. While runoff paths and drainage areas have changed, all watersheds still discharge stormwater into the same surrounding wetlands. Refer to Sheets "POST" for the Post-Development Watershed Map (Attachment 6).

Proposed Watershed Area 1 (PWS-1):

PWS-1 includes runoff from the existing bituminous concrete access road, a small area of the existing parking lot to the west of the track and field, a new amenities building, concrete walkways, and patio and grassed areas. The runoff from this watershed flows overland in the northern direction and into the existing drainage system that discharges into the Bordering Vegetated Wetlands at Design Point 1 (DP-1).

Sub-Watershed	**PWS-1**
Total Contributary Area (SF)	34,493
Curve Number (CN)	73
Time of Concentration (min)	10.1
Hydrologic Soil Group	A/B

Proposed Watershed Area 2 (PWS-2):

PWS-2 consists of a proposed synthetic turf football field, bituminous concrete track, spectator seating, and bituminous concrete walkways. Although synthetic turf is highly permeable, the synthetic turf field area is modeled using a CN of 98, which is the same as a pond. Runoff from the turf field area enters the base stone directly. The voids in the base stone provide storage while allowing infiltration into the subsurface soils. Stormwater runoff is collected in trench and slot drains and directed into the base stone of the synthetic turf field. Once the infiltration system reaches capacity, excess stormwater leaves the turf field to the northeast and outfalls at Design Point 1 (DP-1)

Sub-Watershed	**PWS-2**
Total Contributary Area (SF)	167,451
Curve Number (CN)	94
Time of Concentration (min)	6.0
Hydrologic Soil Group	A/B

Proposed Watershed Area 3 (PWS-3):

PWS-3 consists of the proposed tennis courts and surrounding bituminous concrete walkways, spectator seating areas, existing garage, and grassed area upland from the tennis courts. Runoff from these areas flows overland to the north on the tennis courts where it is directed to the open grassed area adjacent to the tennis courts. From the northeastern edge of the tennis courts, runoff flows into an infiltration trench consisting of drywells and a perforated pipe laid level in a stone trench to attenuate peak flow. In heavier rain events, this system overflows and excess runoff flows overland in the open grassed area in the northern direction towards the wetlands located at Design Point 1 (DP-1), the same location as existing conditions.

Sub-Watershed	**PWS-3**
Total Contributary Area (SF)	64,336
Curve Number (CN)	69
Time of Concentration (min)	6.0
Hydrologic Soil Group	A/B

Proposed Watershed Area 4 (PWS-4):

PWS-4 consists of a small area to the north of the proposed baseball field that includes several track and field events, bituminous concrete walkways, and grassed areas. Stormwater runoff flows overland to the north towards the wetlands located at Design Point 2 (DP-2).

Sub-Watershed	**PWS-4**
Total Contributary Area (SF)	26,450
Curve Number (CN)	53
UI Adjusted CN	49
Time of Concentration (min)	6.0
Hydrologic Soil Group	A

Proposed Watershed Area 5 (PWS-5):

PWS-5 consists of the western portion of the proposed synthetic turf baseball field, bituminous concrete walkways, dugouts, and spectator seating area. Although synthetic turf is highly permeable, the synthetic turf field area is modeled using a CN of 98, which is the same as a pond. Runoff from the turf field area enters the base stone directly. The voids in the base stone provide storage while allowing infiltration into the subsurface soils. Stormwater runoff from the surrounding area is collected in trench and slot drains, and directed into the base stone of the synthetic turf field. Once the infiltration system reaches capacity, excess stormwater leaves the turf field to the northeast and outfalls at Design Point 2 (DP-2).

Sub-Watershed	PWS-5
Total Contributary Area (SF)	46,159
Curve Number (CN)	92
Time of Concentration (min)	6.0
Hydrologic Soil Group	A

Proposed Watershed Area 6 (PWS-6):

PWS-6 consists of the eastern portion of the proposed synthetic turf baseball field, bituminous concrete walkways, and dugout. Although synthetic turf is highly permeable, the synthetic turf field area is modeled using a CN of 98, which is the same as a pond. Runoff from the turf field area enters the base stone directly. The voids in the base stone provide storage while allowing infiltration into the subsurface soils. Stormwater runoff from the surrounding area is collected in trench and slot drains, and directed into the base stone of the synthetic turf field. Once the infiltration system reaches capacity, excess stormwater leaves the turf field to the southeast and outfalls at Design Point 3 (DP-3).

Sub-Watershed	PWS-6
Total Contributary Area (SF)	77,639
Curve Number (CN)	98
Time of Concentration (min)	6.0
Hydrologic Soil Group	A

Proposed Watershed Area 7 (PWS-7):

PWS-7 consists of the open grassed area to the east of the baseball field that includes a concrete pad for discus. Runoff from this area flows southeast directly into the wetlands at Design Point 3 (DP-3).

Sub-Watershed	PWS-7
Total Contributary Area (SF)	115,052
Curve Number (CN)	41
UI Adjusted CN	40
Time of Concentration (min)	12.9
Hydrologic Soil Group	A

Proposed Watershed Area 8 (PWS-8):

PWS-8 consists of the proposed synthetic turf softball field. Although synthetic turf is highly permeable, the synthetic turf field area is modeled using a CN of 98, which is the same as a pond. Runoff from the turf field area enters the base stone directly. The voids

in the base stone provide storage while allowing infiltration into the subsurface soils. Once the infiltration system reaches capacity, excess stormwater leaves the turf field to the northeast and outfalls at Design Point 1 (DP-1) to the northeast of the softball field.

Sub-Watershed	PWS-8
Total Contributary Area (SF)	45,899
Curve Number (CN)	98
Time of Concentration (min)	6.0
Hydrologic Soil Group	B

Proposed Watershed Area 9 (PWS-9):

PWS-9 consists of proposed concrete pads for spectator seating, softball field dugouts, a batting cage to the north of the field, access drive, bituminous concrete walkways, and grassed areas surrounding the proposed softball field. The stormwater drains overland to the north towards the wetlands located at Design Point 1 (DP-1).

Sub-Watershed	PWS-9
Total Contributary Area (SF)	17,752
Curve Number (CN)	76
Time of Concentration (min)	6.0
Hydrologic Soil Group	B

5.0 COMPLIANCE WITH STORMWATER STANDARDS (MASWMS)

5.1 Untreated Stormwater (Standard 1)

The project is designed so that stormwater conveyances (outfalls/discharges) do not discharge untreated stormwater into or cause erosion to downstream properties, to the maximum extent practicable. The turf field and stone base attenuates peak flow and detains stormwater runoff for infiltration. The BMPs will reduce the runoff into the adjacent wetlands and prevent erosion.

5.2 Post-Development Peak Rates (Standard 2)

A Hydrologic Study was performed to determine the rate of runoff for the 2, 10 and 100-year storm events under pre-development (existing) and proposed conditions. From these analyses, it was estimated that the proposed project would not increase the peak runoff rates above existing levels for all storm events modeled. It is the intent of the Stormwater Management System to minimize impacts to drainage patterns, downstream property, and wetlands, while simultaneously provide treatment to runoff prior to its release from the site or its discharge to wetlands.

5.2.1 Proposed Conditions

As described under Section 6.2, the post-development curve numbers are greater than pre-development, which generally increases the runoff potential of the site. In the HydroCAD software, synthetic turf is modeled with a CN of 98, to model the direct contribution of stormwater into the dynamic base stone beneath the synthetic turf field. The dynamic base stone serves to collect, detain, and control the release of stormwater runoff, thereby attenuating the peak rate of runoff. The stone base promotes infiltration and groundwater recharge to the maximum extent feasible.

5.2.2 Peak Rate Summary

Table 6.2.3 shows the peak rate of runoff for the existing and proposed site for the 2, 10 and 100-year design storms. While proposed conditions include two Design Points (DP-1 & DP-2), both Design Points drain into the surrounding wetlands, therefore the runoff numbers below represent the total runoff into the wetlands.

TABLE 6.2.3

Analysis Point	Design Storm	Existing Runoff (CFS)	Proposed Runoff (CFS)
1*	2-yr	1.5	1.1
	10-yr	5.4	3.4
	100-yr	14.0	10.7
*Analysis Point 1 represents the total runoff from DP-1, DP-2 & DP-3 from the site into the surrounding wetlands.			

5.3 Recharge to Groundwater (Standard 3)

The project controls the stormwater runoff from the site by attenuating and treating the runoff in the base stone. After permeating through the base stone, the runoff infiltrates into the soils beneath the field, with minimal stormwater draining through perforated flat panel under drains and perforated collector pipes. An outlet control structure is used to control runoff outflow to the existing drainage system by retaining stormwater in the base stone, therefore allowing infiltration.

The total amount of impervious area in the project area = 3.206 acres = 139,660 sf. Some of these impervious surfaces are existing but were included in these calculations in an effort to be conservative. Of the 3.206 acres of impervious area, 2.750 acres are in HSG A, and 0.456 acres are in HSG B.

Required Recharge Volume for the entire site was calculated in accordance with Standard 3:

Rv = (F(A) * HSG A impervious area (acres)) + (F(B) * HSG B impervious area (acres))
Rv =((0.6/12) * 2.750 ac) + ((0.35/12) * 0.456 ac) = 0.1508 Ac-ft = 6,569 CF

Rv = Required Recharge Volume
F(A) = Target Depth Factor for HSG A = 0.6 inches
F(B) = Target Depth Factor for HSG B = 0.35 inches

The 36% voids within the stone base below the riser pipe inlet of all three synthetic turf fields will provide approximately 30,022 CF of storage which exceeds the Required Recharge Volume of 6,569 CF.

Required minimum surface area of the bottom of the infiltration structure was calculated in accordance with the Simple Dynamic Method, as outlined in the Massachusetts Stormwater Management Standards:

A = Rv / (D + KT)
A = 6,569 CF / (0.33 ft + 0.085 ft/h * 2h) = 13,138 SF

A = Minimum required surface area of the bottom of the infiltration structure
Rv = Required Recharge Volume = 6,569 CF
D = Depth of the Infiltration Facility capable of stormwater retention = 4 inches = 0.33 ft
K = Saturated Hydraulic Conductivity = 1.02 in/h = 0.085 ft/h
T = Allowable drawdown during the peak of the storm (2h)

The synthetic turf field's base stone is used to meet this standard, as it is separated by a minimum of two feet (2') from the Estimated Seasonal High Groundwater (ESHGW) table and therefore will provide infiltration capabilities. The surface area of the synthetic turf fields is approximately 243,985 SF in surface area. This amount of infiltrative surface area allows for the vertical transport of stormwater into the underlying base stone, which contains 36% voids equivalent to storage area, and exceeds the minimum required surface area of the bottom of the infiltration structure of 13,138 SF.

The drawdown time from the dynamic base stone for the required recharge volume is calculated as follows:

$\mathbf{Time_{drawdown}}$ **= Rv / [(K)*(Bottom Area)]**
= (6,569 ft^3) / [(0.085 ft/hr)*(243,985 ft^2)]
= 0.32 hours or 19 minutes

Rv = Storage Volume (ft^3)
K = Saturated Hydraulic Conductivity (ft/hr)
Bottom Area = Bottom Area of Recharge Structure (ft^2)

The drawdown time for the infiltration areas was calculated to be 0.32 hours, or 19 minutes, less than the required drawdown time of 72 hours.

5.4 Water Quality (Standard 4)

The proposed synthetic turf athletic field has low potential for accumulation of total suspended solids (TSS). The turf is not subject to fertilization, sedimentation, irrigation, or rigorous maintenance, thus lessening the ability to acquire TSS. Runoff generated by the synthetic turf field will travel vertically, through approximately eight inches (8") of stone base, where it will infiltrate into the soils below. All of the runoff directed into the synthetic turf field is relatively "clean", because the impervious surfaces will not be subjected to vehicular loading, sanding, or salting. Therefore, they do not need to be treated for TSS removal. Despite not needing to be treated, a TSS removal worksheet was completed for the synthetic turf system, see Attachment 5.

5.5 Land Uses with Higher Potential Pollutant Loads (Standard 5)

The project is not a LUHPPL.

5.6 Critical Areas (Standard 6)

The site does not lie within a critical area and is not listed in the DEP ACEC's List, Latest Edition.

5.7 Redevelopment (Standard 7)

This project is a redevelopment project. However, the project, as designed, meets the stormwater standards for new construction.

5.8 Erosion and Sedimentation Controls (Standard 8)

An Erosion and Sedimentation Control Plan is provided as part of the plan set submitted as part of the stormwater management report to the town.

The project is covered under the Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System (NPDES) Construction General Permit (CGP) and a will require a Stormwater Pollution Prevention Plan (SWPPP). The contractor will file a Notice of Intent (NOI) for work under the CGP and provide a SWPPP prior to the start of construction.

5.9 Operation and Maintenance Plan (Standard 9)

An Operation and Maintenance Plan is provided as part of this NOI (Refer to Attachment 8).

5.10 Prohibition of Illicit Discharges (Standard 10)

There are no illicit discharges to the proposed Stormwater Management System. A template for an illicit discharge compliance statement is included in the Operation and Management Plan. A completed statement will be submitted by the contractor prior to the discharge of stormwater to the post-construction Stormwater Management System (Refer to Attachment 8).

6.0 SUMMARY

The HWRHS Athletic Campus Improvements Project is intended to improve the quality of the athletic and recreational surfaces for the residents of the Town of Hamilton, students of HWRHS and the students at neighboring schools. The project is estimated to provide water quality improvements and peak flow reduction within the watershed. The proposed synthetic turf field eliminates the need for routine maintenance and watering of the existing natural grass field, which can negatively impact the quality of the stormwater runoff, and cause aquifer drawdown through irrigation. The proposed base stone storage capacity will provide peak runoff control and water quality improvements.

The project, as proposed, is the “best fit” for this site, and an improvement to the adjacent areas. The project proves to be a betterment to the environment by exceeding all the Massachusetts Stormwater Management Standards.

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ATTACHMENT 1

USGS Map

Project Locus Map

HAMILTON-WENHAM REGIONAL HIGH SCHOOL
ATHLETIC CAMPUS IMPROVEMENTS
HAMILTON, MA

Reference: MassGIS MassMapper - USGS Topographic Map Layer – Hamilton

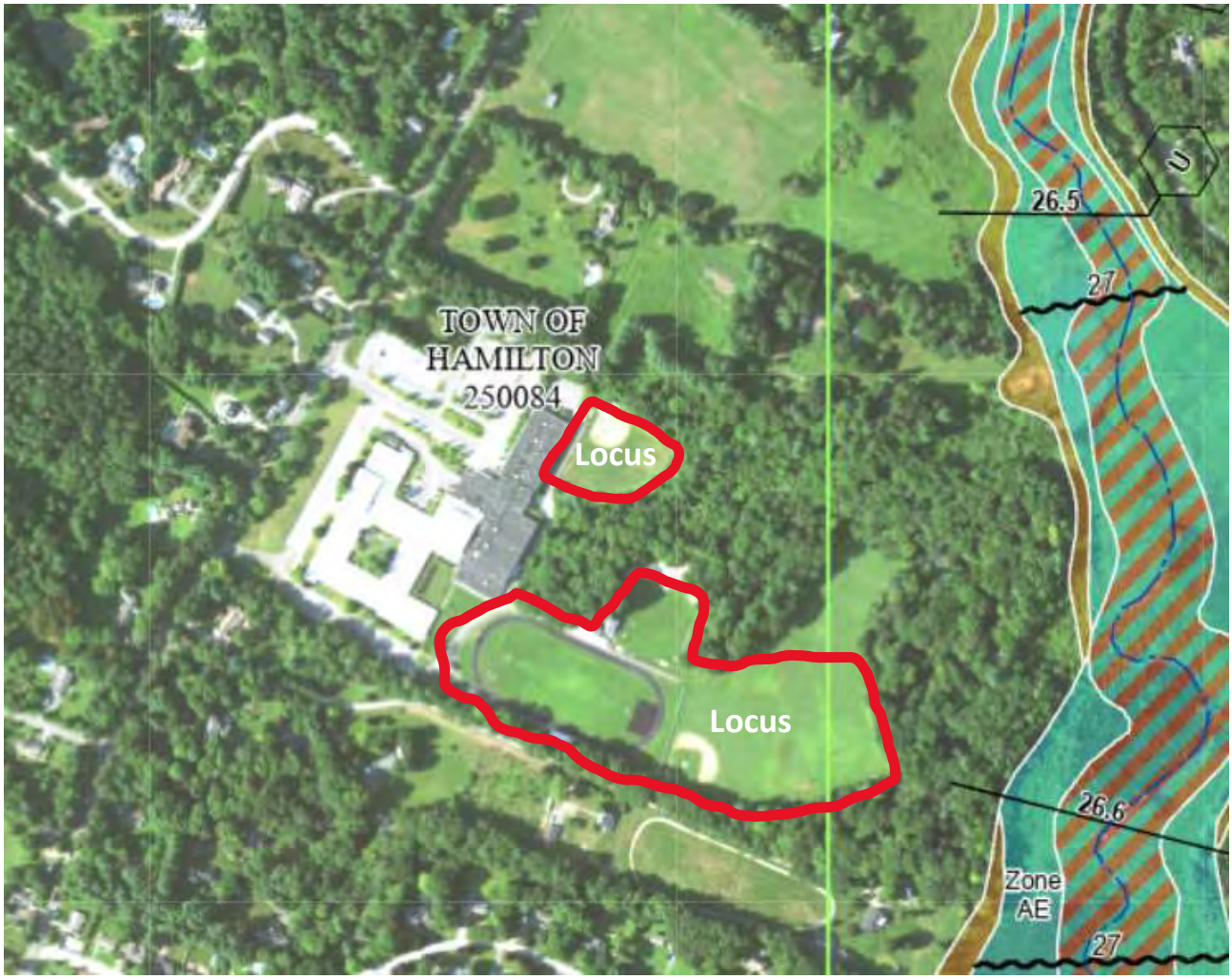
Attachment 1

ATTACHMENT 2

Flood Map (FEMA)

Flood Hazard Zones

HAMILTON-WENHAM REGIONAL HIGH SCHOOL
ATHLETIC CAMPUS IMPROVEMENTS
HAMILTON, MA



Reference: FEMA National Flood Hazard Layer (NFHL) Viewer

Legend

- 1% Annual Chance Flood (100-year)
- 0.2% Annual Chance Flood (500-year)
- Regulatory Floodway

Attachment 2

ATTACHMENT 3

Nobis Geotechnical Report
Gale Associates Soil Test Pit Logs
NRCS Soil Map

September 30, 2022
File No. 100451.000

Gale Associates, Inc.
Ms. Kathleen D. Hervol
Project Manager
163 Libbey Parkway
Weymouth, MA 02189

Re: **Geotechnical Engineering Report**
Hamilton-Wenham Regional High School Athletic Facilities Improvements
775 Bay Road
South Hamilton, Massachusetts

Dear: Ms. Hervol:

Nobis Group® (Nobis) has completed geotechnical engineering services for the above referenced project. Services were performed in general accordance with our proposal dated March 16, 2022, and your subsequent authorization. This geotechnical engineering report presents the results of the subsurface explorations and provides geotechnical recommendations concerning the design and construction of athletic field lighting and the proposed tennis courts. This report is subject to the limitations contained in **Appendix A**.

We appreciate the opportunity to be of service to you on this project. If you have questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
NOBIS GROUP®

Brien T. Waterman, PE
Senior Project Manager

Alfred Jones, PE
Reviewer

Nobis Group®
18 Chenell Drive
Concord, NH 03301
(603) 224-4182

nobis

TABLE OF CONTENTS

Attachments

EXECUTIVE SUMMARY

The executive summary should be used in conjunction with the entire report for design and/or construction purposes. It should be recognized that specific details are not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. **Appendix A** should be read for an understanding of the report limitations.

Nobis Group® (Nobis) has completed a subsurface exploration program for the proposed Hamilton-Wenham Regional High School Athletic Facilities Improvements project located at 775 Bay Road in South Hamilton, Massachusetts. Our geotechnical engineering scope of services included advancing four (4) test borings for proposed light poles around the baseball field and one (1) test boring for proposed tennis courts. During a previous boring program, boring B-2 was advanced near the proposed tennis court.

Based on the information obtained from our subsurface explorations, the following geotechnical considerations were identified:

- Subsurface conditions observed around the proposed baseball field lighting generally consist of topsoil and fill underlain by organic deposits, naturally deposited sand and gravel, sand and silt, and silts and clays. Organic deposits were observed up to 8 feet below current ground surface. Groundwater was encountered from approximately 5.3 to 8.5 feet below existing grade.
- Subsurface conditions within the existing baseball field area are generally favorable for supporting the proposed field light assemblies on drilled pier foundations or conventional shallow spread footings. For shallow spread footings we recommend a maximum net allowable bearing pressure of 3,000 pounds per square foot.
- Based on the Massachusetts State Building Code, 9th Edition, the seismic site classification for the baseball field is Site Class D. The site does not appear to be susceptible to liquefaction in the event of an earthquake.
- Subsurface conditions observed at the proposed tennis court consisted of topsoil over naturally deposited sand, silt and sand, and silts and clays. Groundwater was observed at a depth of approximately 5.5 feet below existing grade. We understand up to approximately 1-feet of fill is proposed for the tennis court area. Due to the presence of clay we estimate approximately 1.6-inches of settlement over 20 years. A

preload/surcharge could be used to reduce the post-construction settlement, as discussed in this report.

Earthwork on the project should be evaluated by the geotechnical engineer of record (GER). The evaluation of earthwork should include review of engineered fill, subgrade preparation, and other geotechnical conditions exposed during construction. The observation and testing of engineered fill should be accomplished by a qualified testing agency.

1.0 INTRODUCTION

This report presents the results of our geotechnical engineering evaluations performed for the proposed athletic facilities improvements at Hamilton-Wenham Regional High School in Hamilton, Massachusetts. Our geotechnical engineering scope of services included advancing four (4) test borings for proposed baseball field lighting and one (1) test boring for the proposed tennis courts. During a previous boring program, boring B-2 was advanced near the proposed tennis court. Test borings, identified as B-101 through B-105, were advanced to depths ranging from approximately 17 to 24 feet below existing grade. This report is subject to the limitations contained in **Appendix A**.

The project utilizes two different surveys. The area of the existing baseball field is around El. 43 feet and is based on the North American Vertical Datum of 1988 (NAVD 88). The area of the proposed tennis court is around El. 97 feet and appears to be based on an arbitrary site datum (ASD).

A **Site Locus Plan** and an **Exploration Location Plan** are included as **Figure 1** and **Figure 2**, respectively. Exploration logs are included in **Appendix B**. The purpose of our services is to provide information and geotechnical engineering recommendations related to the following:

- Subsurface soil conditions
- Foundation design and construction
- Seismic design considerations
- Groundwater conditions
- Earthwork construction

2.0 PROJECT INFORMATION

2.1 Site Location and Description

Location	The project is located on the campus of Hamilton-Wenham Regional High School at 775 Bay Rd in South Hamilton, Massachusetts.
Existing Improvements & Current Ground Cover	The project area is currently developed with a grassed baseball field in the area of proposed lighting and a grassed field in the area of proposed tennis courts.
Existing Topography	The baseball field appears relatively level near elevation (El) 42 feet (NAVD 88) in the vicinity of the project area. The area of

	the proposed tennis courts is relatively level at about El. 97 feet (ASD).

2.2 Project Description

Project Description	We understand the project consists of constructing four new field light assemblies at the northern baseball field and proposed new tennis courts which are to be located in an existing flat grassed area northeast of the running track.
Grading/Cut and Fill Slopes	Based on the provided 75% grading plans, there will be no grade raises in the area of the proposed light assemblies. However, the proposed tennis courts will be at approximate El. 98 feet, which consists of an approximate grade raise of 1-foot.

3.0 SUBSURFACE CONDITIONS

3.1 Typical Subsurface Profile

Based on the results of the explorations, subsurface conditions within the area of the subsurface explorations generally consist of a surficial layer of topsoil and/or fill underlain by organic deposits, sand and gravel, and silts and clays. Not all strata were encountered at all locations. Subsurface conditions can be generalized as follows.

Stratum	Approximate Depth to Bottom of Stratum (feet)	Approx. Thickness (feet)	Material Description	Density/ Consistency
Fill [(1)]	4 to 5	3.5 to 4.7	Generally described as fine to coarse SAND, varying amounts of Gravel and Silt.	Medium dense to Very Dense
Buried Topsoil/ Organic Deposits [(1)(2)]	5.1 to 8	0.1 to 4	Generally described as SAND, SILT or Organic SILT of varying composition.	Loose to Medium Dense
Sands and Gravels[(1)]	8.5 to 13.5	2 to 7.8	Generally described as fine to coarse SAND with varying amounts of gravel and silt.	Generally Medium Dense to Very Dense

Silt / Sand & Silt[3]	8 to >18.5	5 to >8.5	Generally described as silt with varying amounts of sand or sand with varying amounts of silt.	Generally Medium Dense to Dense
Silts and Clays	>24.0	>16	Varies from SILT with some fine to medium Sand to Silty CLAY.	Very Stiff to Very Soft / Medium Dense

1. Not encountered in B-105.
2. Not encountered in B-104.
3. Not encountered in B-102 and B-103

Details for each of the explorations can be found on the test boring logs in **Appendix B**. Visual soil classifications and conditions encountered at each exploration location are indicated on the individual test boring logs. Stratification boundaries on the logs represent the approximate location of changes in soil types; in-situ, the transition between materials may be gradual. A discussion of field sampling procedures is included in **Appendix B**.

3.2 Groundwater

At the time of the subsurface explorations, groundwater was observed at depths ranging approximately 5.3 to 8.5 feet below existing grades. Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff, and other factors not evident at the time the explorations were performed. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

3.3 Geotechnical Laboratory Testing

Laboratory testing was performed on select soil samples obtained from the explorations to assist in classification and evaluating physical engineering characteristics. Geotechnical laboratory testing included particle size distribution (sieve analysis) and Atterberg Limits test performed by ConTest Consultants, Inc. (ConTest) of Goffstown, New Hampshire. Individual test reports provided by ConTest are included in **Appendix C**.

4.0 PROPOSED TENNIS COURTS

4.1 Settlement Evaluation

Based on boring B-105, compressible clay was encountered from a depth of approximately 8 feet below grades to a boring termination depth of 24 feet. Previously performed boring B-2 encountered clay from approximately 15 feet below grades to the termination depth of 22 feet. We understand that a raise in grades of approximately 1-foot is proposed in the northern portion of the proposed tennis court (i.e. the raise in grades starts at around the tennis court net-line and extends north).

We utilized a 3-dimensional settlement software by RocScience, Inc. to estimate the consolidation settlement in the area of the proposed tennis courts. Several assumptions were required to complete the analysis since the test boring terminated in clay. In our model we assumed that the clay was 50 feet thick. We estimate that load induced by the raise in grades will result in approximately 1.6-inches of consolidation settlement over 20 years. We anticipate that the northern portion of the tennis courts would experience most of the settlement (i.e. area of most of the proposed fill).

We also evaluated the use of a preload and surcharge. Assuming a preload duration of 9 months, with a 1-foot surcharge, we estimate approximately 1-inch of post-construction settlement over 20 years. We recommend that the surcharge load cover approximately half the area of the proposed tennis courts (i.e. starting at the tennis court net-line and extending north).

We recommend that a preload/surcharge be used and monitored with a minimum of four (4) settlement platforms. The contractor should collect measurements daily for the first two weeks, then weekly up to month 3, then monthly until the end of the preload. The actual duration of the preload should be based on the settlement platform readings.

The use of a geotextile below the recommended pavement section should be considered. A geotextile won't reduce the amount of settlement; however, it may help to reduce the impact of differential settlement across the tennis court.

4.2 Recommended Pavement Section

Nobis recommends a pavement section consisting of a court surfacing over 1 ½-inch layer of bituminous wearing surface, 2 ½-inch bituminous binder course, and an 8-inch layer of dense graded aggregate.

5.0 FIELD LIGHTING FOUNDATIONS

We understand the project consists of construction four field light assemblies for the baseball field; however, the project is in conceptual design and the light locations have not been finalized. Based on the results of our subsurface explorations and understanding of the project, it is our opinion the proposed field light assemblies can be supported on drilled pier foundations end bearing in the naturally deposited soils. Alternatively, field light assemblies can be supported on shallow foundations bearing on native sand and gravel, as discussed herein.

Geotechnical engineering recommendations for foundation systems and other earth-connected phases of the project are outlined below. The recommendations contained in this report are based upon the results of field testing, engineering analyses and our current understanding of the proposed development.

5.1 Drilled Pier Foundations

The proposed field light assemblies can be supported on drilled pier foundations bearing on the naturally-deposited non-organic soils. It is anticipated that the length of drilled piers will be based on either compression or the lateral capacity required to resist live loading such as a combination of wind and ice. Allowable deflection at the top of the drilled pier of 0.5 inch is recommended for calculating lateral capacity. Design recommendations for drilled pier foundations are presented below.

5.1.1 Drilled Pier Design Recommendations

Description	Value [1]	
End Bearing Material	Natural Sand and Gravel or Silt and Clay	
Net Allowable End Bearing Capacity [2,3]	Depth ≥10 feet:	3,000 psf
Minimum Pier Diameter	24 inches	
Ultimate Average Unit Side Friction	Depth <4 feet: Depth >4 feet:	neglect 65 + 5(z) psf [4,5,6,7]
Ultimate Coefficient of Friction (tanδ) [6]	Fill: Sand and Gravel: Silt and Clay:	0.30 0.30 0.30
Coefficient of Lateral Subgrade Reaction	Fill/Sand and Gravel: Silt and Clay:	40 (z/D) kcf [6,7] 20 (z/D) kcf
Angle of Internal Friction	Fill: Sand and Gravel: Silt and Clay:	30 degrees 30 degrees 0 degrees
Undrained Shear Strength (c_u)	Silts and Clays:	1,000 psf
Estimated In-Situ Soil Unit Weight (γ_{moist})	Existing Fill: Sand and Gravel: Silt and Clay:	120 pcf 120 pcf 105 pcf
Recommended Design Groundwater Depth	5 feet	

1. Variations in subsurface conditions may occur between borings, across the site, and due to modifying effects of weather. Subsurface conditions below a depth of 24 feet for the proposed field lighting have not been verified. If design shaft lengths are greater than the exploration depth at the planned foundation location, supplemental explorations and/or recommendations will be necessary.
2. Based on our understanding of the project and experience with similar projects, drilled pier foundations are anticipated to bear approximately 15 feet below existing grade.
3. The allowable end bearing pressure assumes that unsuitable soil at the base of the pier has been removed.
4. psf – pounds per square foot; psi – pounds per square inch; pcf – pounds per cubic foot; kcf – kips per cubic foot
5. Contribution to vertical capacity of the pier from soil within the frost depth of 4 feet should be ignored. The uplift capacity of the pier will be based on side friction and the dead weight of the pier.
6. Friction values are for mass concrete; for pre-cast concrete the friction coefficient is 80 percent of the values for mass concrete.
7. z is defined as the depth below the ground surface and D is the diameter of the pier, both in feet.

Side friction and lateral subgrade modulus values presented above are ultimate parameters based on data presented on the attached test boring logs, published values, and our experience with

similar soil conditions, and do not include a factor of safety. The recommended net allowable end bearing pressure includes a factor of safety of 3.

The recommended design parameters presented above are for cast-in-place drilled pier foundations. If alternative construction methods are selected, such as installing precast piers in drilled holes, the design parameters presented above will be partially dependent on annular space backfill materials and should be re-evaluated.

The uplift capacity of the pier will be based on allowable friction of the soil and the dead weight of the pier. Compression capacity is based on side end bearing. Drilled piers designed to resist tension loads should have reinforcing steel installed the entire length of the pier.

5.2 Shallow Foundations

As an alternative to drilled pier foundations, the field light assemblies may be supported on conventional spread footing or pad-and-pier foundations bearing on a minimum 6-inch-thick layer of compacted crushed stone placed above undisturbed non-organic native sand and gravel subgrades. Due to the depth of the native sand and gravel in boring B-103 (i.e., greater than 8 feet below grade) shallow spread footings in these areas may not be feasible.

The use of crushed stone will help facilitate dewatering and provide a stable working surface. Crushed stone should be separated from soil subgrades, excavation sidewalls and backfill by a geotextile separation fabric such as Mirafi 140N, or equivalent.

5.2.1 Shallow Foundation Design Recommendations (Light Assemblies)

Bearing Material [1]	Minimum 6-inch-thick layer of compacted crushed stone placed above undisturbed sand and gravel subgrades provided subgrades are prepared as discussed herein.	
Maximum Net Allowable Bearing Pressure[2]	3,000 pounds per square foot (psf) (DL+LL)	
Minimum Foundation Depth [3]	48 inches (frost protection)	
Minimum Foundation Width	*Isolated Spread Footings*:	36 inches
Estimated Settlement [4]	*Total*:	1-inch
Ultimate Coefficient of Friction, tanδ [5]	Native Sand and Gravel	0.30
	Structural Fill/Crushed Stone:	0.60

1. Crushed stone should be separated from soil subgrades, excavation sidewalls and backfill using a geotextile separation fabric such as Mirafi 140N, or equivalent. 2. The recommended net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the foundation base elevation. Assumes unsuitable or soft soil, where present, will be replaced with compacted structural fill or crushed stone. 3. Minimum foundation depth for frost protection for exterior foundations and foundations below unheated interior spaces. 4. Foundation settlement will depend upon the variations within the subsurface soil profile, the structural loading conditions, the embedment depth of the foundation, the thickness of compacted fill, and the quality of the earthwork operations. 5. Friction values are for mass concrete; for pre-cast concrete the friction coefficient is 80 percent of the values for mass concrete.

The allowable foundation bearing pressure applies to dead loads plus design live load conditions. The weight of the foundation concrete below grade may be neglected in dead load computations.

6.0 SEISMIC DESIGN CRITERIA

Code Used	Massachusetts State Building Code, 9th Edition
Site Class	Site Class D [(1)(2)]
Maximum Considered Earthquake (MCE) Spectral Acceleration (5 percent damping)	S_s= 0.253g (0.2 second spectral response acceleration) S_1= 0.075g (1.0 second spectral response acceleration)
Liquefaction Potential	Not considered susceptible to liquefaction.

1. In general accordance with the Massachusetts State Building Code, 9th Edition (780 CMR) with reference to the 2015 International Building Code (IBC); Site Class is based on the average characteristics of the upper 100 feet of the subsurface profile. The Code requires a site soil profile determination extending a depth of 100 feet for seismic site classification. The current scope does not include the required 100-foot soil profile determination. Test borings extended to a maximum depth of 21 feet below existing grade. The seismic site class definition considers that similar soil conditions continue below the maximum depth of the subsurface explorations.
2. The recommended seismic site class of D is for the proposed light assembly area. For the proposed tennis court area we recommend a seismic site class of E, if required.

7.0 GENERAL CONSTRUCTION CONSIDERATIONS

The following sections present recommendations for site preparation, excavation, subgrade preparation, and placement of fill for the project. The recommendations presented for design and

construction of earth-supported elements are contingent upon the recommendations outlined in this section.

7.1 Earthwork in Wet Environments

Excavated onsite soil will generally consist of existing topsoil, fill, and organic deposits. Excavated onsite soil may be selectively reused as common fill provided it is free of deleterious material and particles larger than 6 inches in diameter, and it is relatively dry such that it can be adequately compacted. Portions of the excavated onsite soil are anticipated to have an elevated percentage of silt and will be sensitive to moisture. This recommendation is applicable during periods of construction when the climate and moisture are favorable for reusing silty soil.

Contractors experienced in earthwork construction in New England should be aware of silty soil behavior and the effects that moisture and season have on its workability. If a contractor bids construction knowing that earthwork must begin during seasonally wet months, the owner should expect a contingency by the contractor to create a suitable working surface for equipment, the use of off-site suitable fill and disposal of on-site soil.

Care must be taken by the contractor to avoid the disturbance of subgrades by minimizing construction traffic (including foot traffic) to the extent practical. Subgrades disturbed by construction traffic should be over-excavated and replaced with suitable backfill material.

7.2 Drilled Pier Construction Considerations

Drilled piers should be aligned vertically. The drilling method or combination of methods selected by the contractor should be submitted for review by the geotechnical engineer, prior to mobilization of drilling equipment. Temporary casing may be required to reduce the likelihood of caving of the granular soil, particularly below the water table. Concrete should be placed by tremie methods if the drilled pier is more than 10 feet deep or concrete is placed in the wet.

Consideration should be given to the possibility of encountering cobbles and/or boulders during construction of the drilled pier foundations. The augers did not encounter refusal, however, that does not preclude the possibility of obstructions in the area.

7.3 Subgrade Preparation (Shallow Foundations)

Following excavation to rough grade and before constructing foundations or placing new fill, the subgrades should be firm, stable, and unyielding. Subgrades should be proof-rolled with at least six passes in perpendicular directions using a minimum 10-ton vibratory roller in open areas, or a 1-ton vibratory roller or large plate compactor, such as a Wacker DPU4545 or equivalent, in confined areas and/or trenches. Proof-rolling subgrades in close proximity to the water table may need to be accomplished statically to reduce the potential for disturbance. Excavations should be accomplished using a smooth edge bucket to reduce the potential for subgrade disturbance.

Where fill, buried topsoil, organics, or other unsuitable material is encountered at or below proposed foundation subgrade it should be over-excavated and replaced with compacted crushed stone or compacted structural fill. Over-excavation below foundations should include the foundation bearing zone, defined as the area beneath 1 horizontal to 1 vertical (1H:1V) lines extending downward and outward from foundation edges.

The GER, or their representative, should review the subgrade during the proof-rolling process. Soft/unstable zones should be over-excavated to competent material and replaced with compacted structural fill or crushed stone as necessary. Following proof-rolling, crushed stone may be placed and compacted to achieve design elevation. Where subgrades become wet, unstable and/or difficult to proof-roll, they should be over-excavated to more competent material and backfilled with crushed stone. Crushed stone should be separated from the excavation subgrade, sidewalls, and granular backfill above the stone with a geotextile separation fabric, such as Mirafi 140N or equivalent. Excavated subgrades should not be left exposed overnight unless the forecast calls for above-freezing, clear conditions.

7.4 Subgrade Preparation (Proposed Tennis Court)

Following excavation to rough grade and before placing new fill, the subgrades should be firm, stable, and unyielding. Subgrades should consist of non-organic natural granular soils. Subgrades should be proof-rolled with at least six passes in perpendicular directions using a minimum 10-ton vibratory roller in open areas, or a 1-ton vibratory roller or large plate compactor, such as a Wacker DPU4545 or equivalent, in confined areas. Proof-rolling subgrades in close proximity to the water table may need to be accomplished statically to reduce the potential for disturbance. Excavations should be accomplished using a smooth edge bucket to reduce the potential for subgrade disturbance.

Where buried topsoil, organics, or other unsuitable material is encountered at or below proposed tennis court subgrade it should be over-excavated and replaced with compacted crushed stone or compacted structural fill.

After removal of organics, or other unsuitable materials, then the recommended surcharge fill should be placed a minimum 1-feet above proposed final grades in the area described in the above in the proposed Tennis Courts Section (Section 4.1). After completion of the preload/surcharge, the area should be excavated to natural sandy material below the proposed tennis court pavement section.

7.5 Fill and Placement

7.5.1 Reuse of Onsite Soil – Common Fill

Excavated onsite soil may be selectively reused as common fill outside of foundation bearing zones and as backfill above foundations, provided it is free of deleterious material and particles larger than 6 inches, and it can be adequately compacted. Common fill may also be used to raise grades for the recommended 1-foot surcharge in the proposed tennis court area. We recommend that the proposed surcharge fill obtain a minimum dry density of 110 pounds per cubic foot, as determined by a modified Proctor.

7.5.2 Imported Structural Fill

Placement/Location	Material Properties
Recommended below footings, within footing bearing zones and under settlement-sensitive structures.	Imported structural fill should meet the following gradation: **Sieve Size** — **Percent Passing by Weight** 6-inch — 100* 3-inch — 70-100** ¾-inch — 45-95 No. 4 — 30-90 No. 10 — 25-80 No. 40 — 10-50 No. 200 — 0-10 * Maximum particle size limited to 2/3 the loose lift thickness. ** Maximum 3-inch particle size within 12 inches of the underside of footings.

7.5.3 Imported Common Fill

Placement/Location	Material Properties
May be used for site grading and fill outside footing bearing zones. Common fill should not be used under settlement sensitive structures.	The maximum particle size is recommended to be limited to 6 inches. Imported common fill should be limited to no more than 30 percent by weight should pass the No. 200 sieve.

7.5.4 Crushed Stone

Placement/Location	Material Properties
Recommended below footings, within footing bearing zones, under settlement-sensitive structures, or as drainage.	Crushed stone shall meet the requirements defined by the Massachusetts Department of Transportation (MassDOT) Standard Specifications for Highways and Bridges, Section M2.01.4 (¾-inch).
1. Crushed stone, if used, should be separated from soil subgrades, excavation sidewalls, and soil backfill with a geotextile separation fabric such as Mirafi 140N, or equivalent.	

7.6 Compaction Requirements

Fill Lift Thickness	*Vibratory Rollers:*	12 inches or less in loose thickness
	Plate Compactors:	8 inches or less in loose thickness
Compaction Requirements	*Structural Fill:*	95% maximum dry density
	Base/Subbase Course:	95% maximum dry density
	Common Fill:	92% maximum dry density
	Crushed Stone:	Compacted to a non-yielding state
Moisture Content	± 3% of Optimum Moisture Content	

1. Maximum dry density as determined by ASTM D-1557, Method C (Modified Proctor).
2. Fill should be tested for moisture content and percent compaction during placement. If in-place density test results indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested, as required, until the specified moisture and compaction requirements are achieved.

7.7 Temporary Excavations, Grading and Drainage

The individual contractor(s) is responsible for designing and constructing stable, temporary excavations or temporary bracing, as required, to maintain stability of the excavation sides and

the excavation bottom. Instability in the form of slope raveling, caving, and sloughing should be expected in all excavations and trenches which extend into the granular materials with little to no cohesion. Excavations should be sloped or shored in the interest of safety following local and federal regulations, including current Occupational Safety and Health Administration (OSHA) excavation and trench safety standards. Lateral earth support systems, if used, should be designed by a licensed engineer.

Construction slopes should be reviewed for signs of mass movement. If potential stability problems are observed, work should cease and the GER should be contacted immediately. The responsibility for excavation safety and stability of temporary construction slopes should lie solely with the contractor.

Stockpiles should be placed well away from the edge of the excavation and their height should be controlled so they do not surcharge the sides of the excavation. Positive drainage should be provided during construction and maintained throughout the life of the development. Infiltration of water into utility trenches or foundation excavations should be prevented during construction.

7.8 Dewatering

Based on observed groundwater levels and seasonal variations, anticipated finish grades, and anticipated excavation depths, dewatering may be needed for construction of the light pole foundations. Regardless of excavation depths, construction dewatering will likely be required to maintain a stable subgrade during construction and prevent surface water runoff from collecting in excavations. If dewatering becomes necessary, the contractor should select a dewatering method to lower groundwater at least 2 feet below the excavation subgrade in order to minimize bearing surface disturbance during excavation, fill placement and compaction.

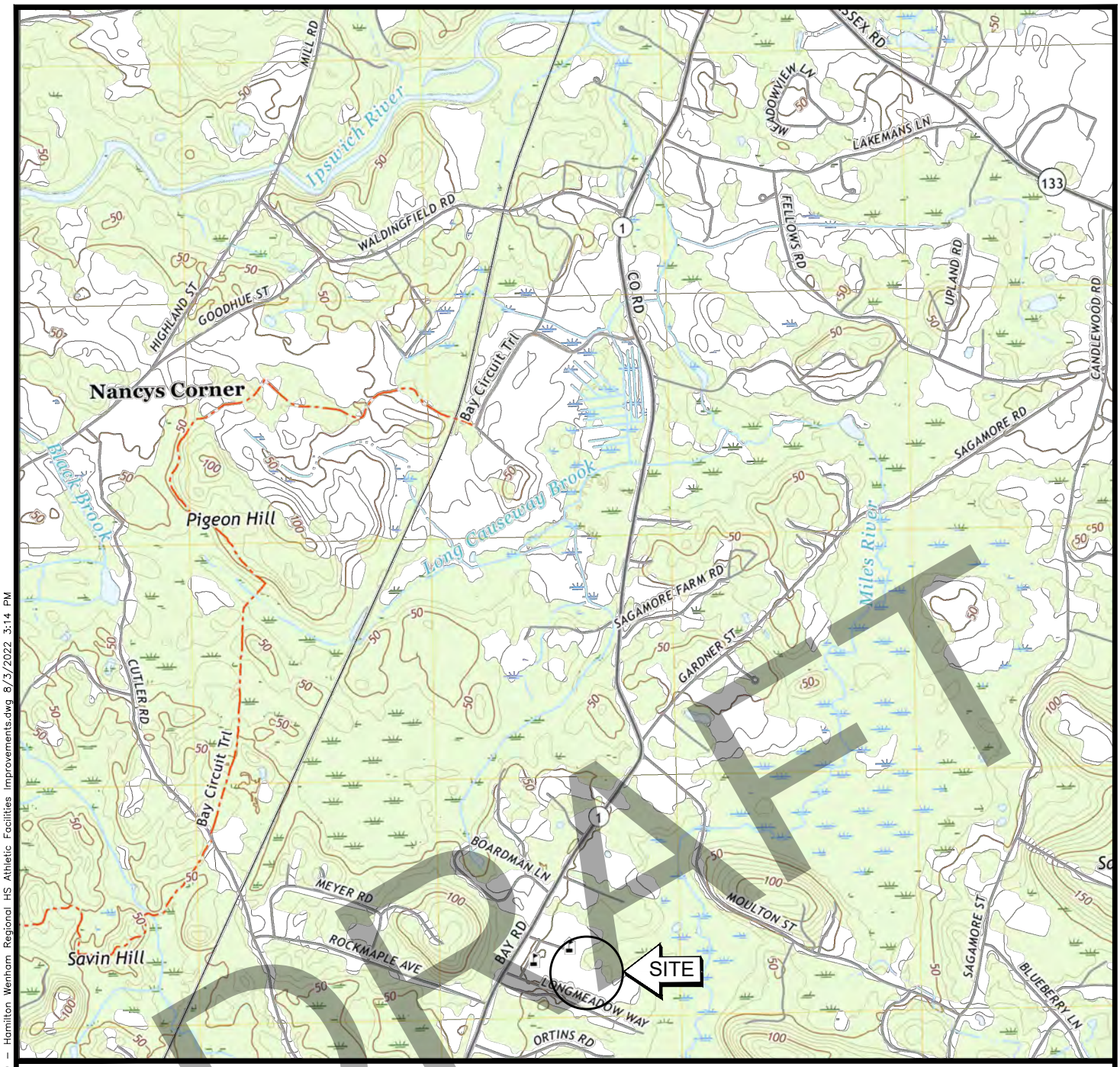
Subgrade soil that becomes unstable should be replaced with crushed stone or structural fill as necessary. Crushed stone, where used, should be enveloped with a non-woven geotextile, such as Mirafi 140N or equivalent, to avoid separation of fines from the subgrade and backfill. Discharged water should be managed in accordance with local, state and federal government requirements.

8.0 DESIGN SERVICES AND CONSTRUCTION OBSERVATION

Nobis should be retained to review final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the

design and specifications. The GER and an independent testing agency should also be retained to provide observation and testing services during grading, excavation, foundation construction and other earth-related construction phases of the project.

FIGURES



NORTH

2021 USGS TOPOGRAPHIC MAP

IPSWICH QUADRANGLE
HAMILTON, MASSACHUSETTS
NORTH AMERICAN VERTICAL DATUM OF 1988
CONTOUR INTERVAL 10 FEET

APPROXIMATE SCALE
1 INCH = 2,000 FEET

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QUADRANGLE LOCATION

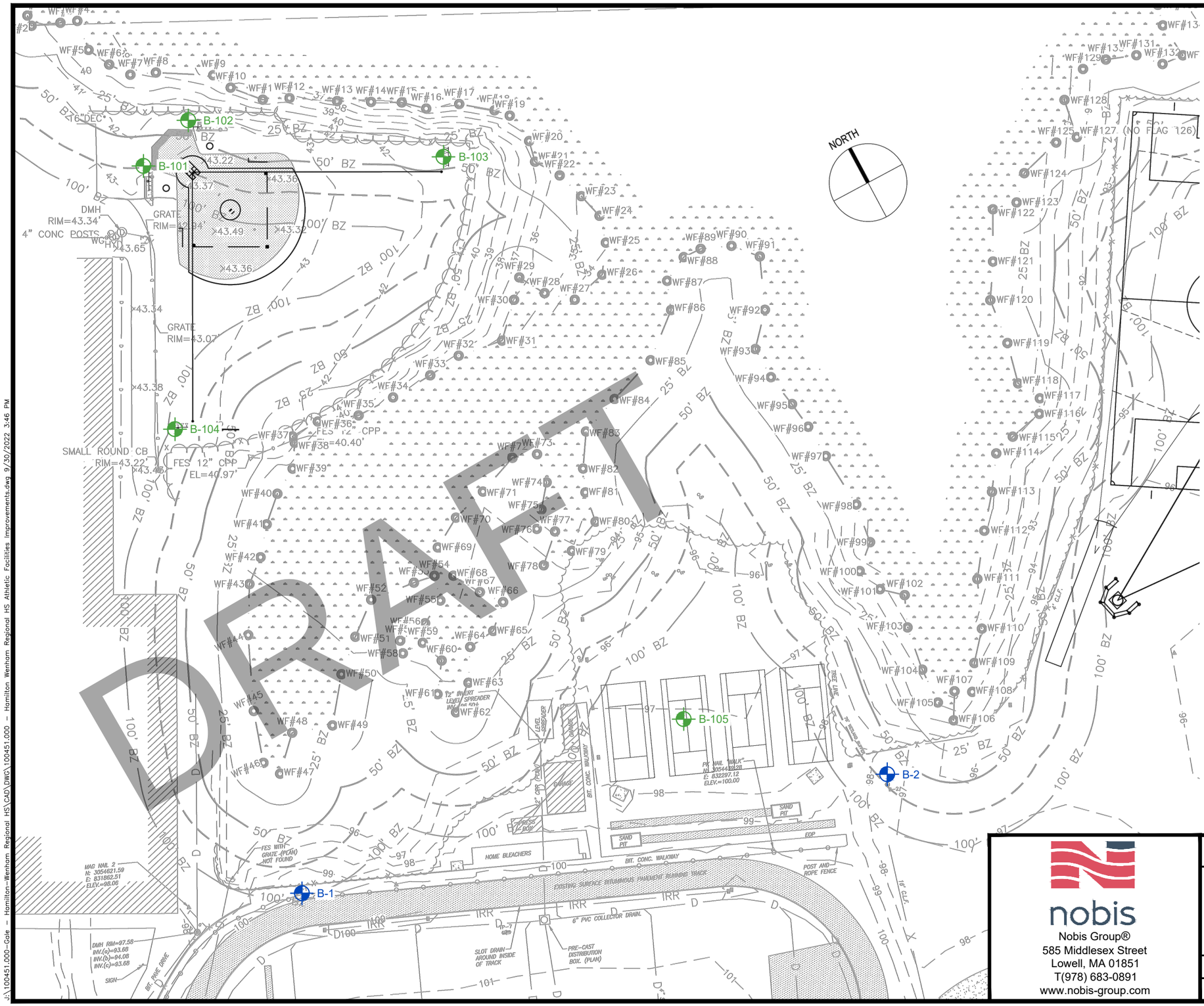
FIGURE 1

SITE LOCUS PLAN

GEOTECHNICAL ENGINEERING REPORT
HAMILTON-WENHAM REGIONAL HIGH SCHOOL
ATHLETIC FACILITIES IMPROVEMENTS
HAMILTON, MASSACHUSETTS

DRAWN BY: SNP	CHECKED BY: BTW
PROJECT NO. 100451.000	DATE: AUGUST 2022

J:\100451.000-Gale - Hamilton-Wenham Regional HS\CAD\DWG\100451.000 - Hamilton Wenham Regional HS Athletic Facilities Improvements.dwg 8/3/2022 3:14 PM



NOTES:

1. THE BASE PLAN WAS PREPARED BY GALE ASSOCIATES, INC DATED 10 FEBRUARY 2022.
2. LOCATIONS AND SITE FEATURES DEPICTED ARE APPROXIMATE AND GIVEN FOR ILLUSTRATIVE PURPOSES.
3. SOIL BORINGS WERE DRILLED BY NEW ENGLAND BORING CONTRACTORS, OF DERRY, NEW HAMPSHIRE AND OBSERVED BY NOBIS ON 07 JULY 2022.
4. THE PROJECT UTILIZES TWO DIFFERENT SURVEYS. THE AREA OF THE EXISTING BASEBALL FIELD IS AROUND EL. 43 FEET AND IS BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88). THE AREA OF THE PROPOSED TENNIS COURT IS AROUND EL. 97 FEET AND APPEARS TO BE BASED ON AN ARBITRARY SITE DATUM.

LEGEND

B-101 — APPROXIMATE BORING LOCATION OBSERVED BY NOBIS ON 07 JULY 2022

B-1 — APPROXIMATE BORING LOCATION OBSERVED BY NOBIS ON 11 AUGUST 2016

0 80' 160'

GRAPHIC SCALE

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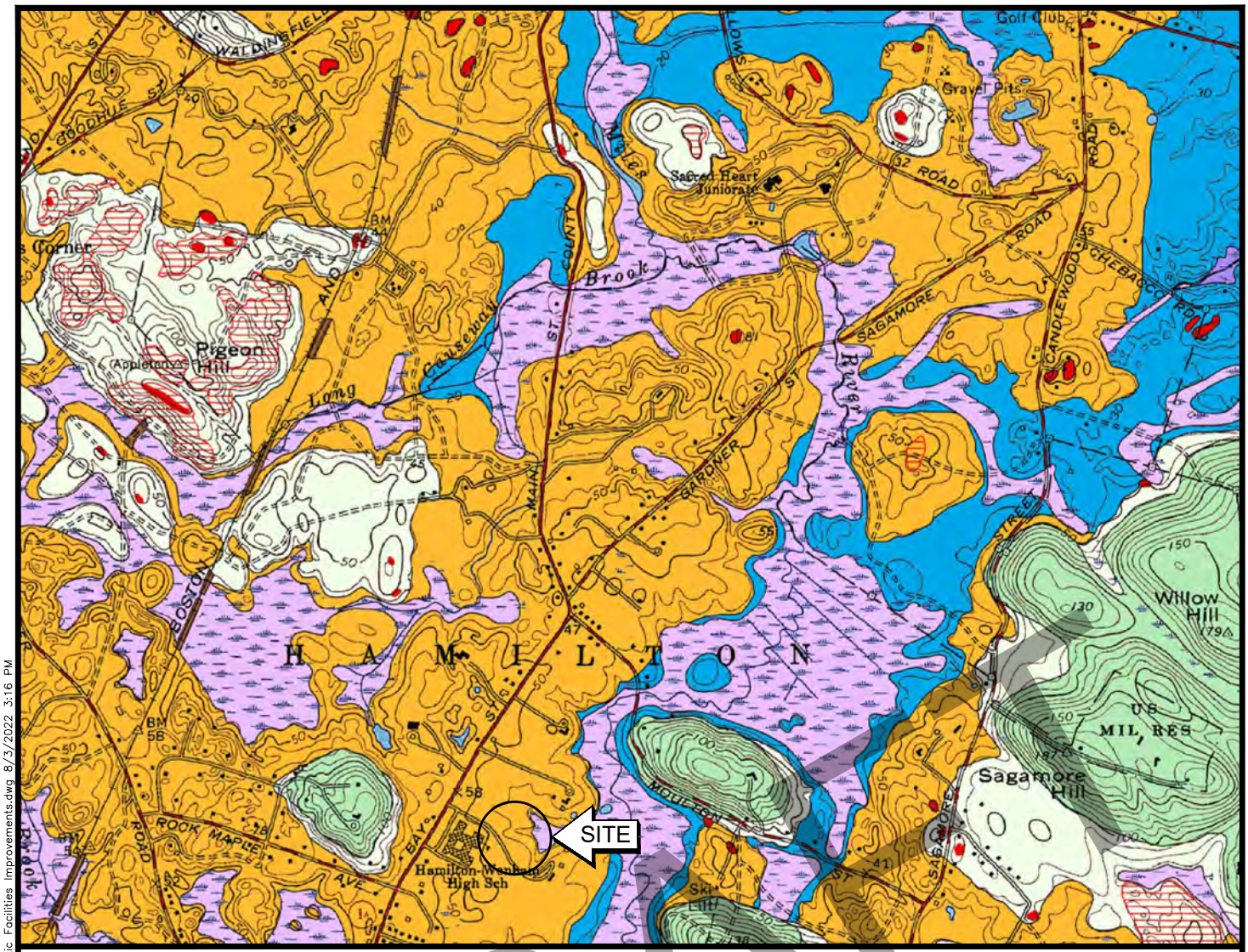
FIGURE 2

SUBSURFACE EXPLORATION PLAN
GEOTECHNICAL ENGINEERING REPORT
HAMILTON-WENHAM REGIONAL HIGH SCHOOL
ATHLETIC FACILITIES IMPROVEMENTS
HAMILTON, MASSACHUSETTS

DRAWN BY: SNP	CHECKED BY: BTW
PROJECT NO. 100451.000	DATE: SEPTEMBER 30, 2022

J:\100451.000-Gale – Hamilton-Wenham Regional HS\CAD\DWG\100451.000 – Hamilton Wenham Regional HS Athletic Facilities Improvements.dwg 9/30/2022 3:46 PM



Coarse deposits consist of *gravel deposits*, *sand and gravel deposits*, and *sand deposits*, not differentiated in this report. *Gravel deposits* are composed of at least 50 percent gravel-size clasts; cobbles and boulders predominate; minor amounts of sand occur within gravel beds, and sand comprises a few separate layers. Gravel layers generally are poorly sorted, and bedding commonly is distorted and faulted due to postdepositional collapse related to melting of ice. *Sand and gravel deposits* occur as mixtures of gravel and sand within individual layers and as layers of sand alternating with layers of gravel. Sand and gravel layers generally range between 25 and 50 percent gravel particles and between 50 and 75 percent sand particles. Layers are well sorted to poorly sorted; bedding may be distorted and faulted due to postdepositional collapse. *Sand deposits* are composed mainly of very coarse to fine sand, commonly in well-sorted layers. Coarser layers may contain up to 25 percent gravel particles, generally granules and pebbles; finer layers may contain some very fine sand, silt, and clay

Glaciomarine fine deposits include clay, silty clay, fine sand, and some fine gravel deposited in a higher-level sea in environments of low wave energy along the coast and in river estuaries. Fine to very fine sand, massive and laminated, commonly is present at the surface and grades downward into interbedded very fine sand, silt, silty clay, and clay. The lower silty clay and clay is massive and thinly laminated. Total thickness is generally a few feet to 75 ft

Thick till—Nonsorted, nonstratified matrix of sand, some silt, and little clay containing scattered pebbles, cobbles, and boulders in the shallow subsurface; at greater depths consists of compact, nonsorted matrix of silt, very fine sand, and some clay containing scattered small gravel clasts. Mapped in areas where till is greater than 10 to 15 ft thick, mostly in drumlin landforms in which till thickness commonly exceeds 100 ft (maximum recorded thickness is 230 ft). Although upper till of late Wisconsinan age is the surface deposit, lower till of probable Illinoian age constitutes the bulk of the material in thick-till areas. Lower till is moderately to very compact and is commonly finer grained and less stony than upper till. An oxidized zone, the lower part of a soil profile formed during a period of interglacial weathering, is generally present in the upper part of the lower till. This zone commonly shows closely spaced joints that are stained with iron and manganese oxides

Swamp deposits—Organic muck and peat that contain minor amounts of sand, silt, and clay, are stratified and poorly sorted, and occur in swamps and freshwater marshes, in kettle depressions, or in poorly drained areas. Unit is shown only where deposits are estimated to be at least 3 ft thick; most deposits are less than 10 ft thick. Swamp deposits overlie glacial deposits or bedrock. They locally overlie glacial till even where they occur within thin glacial meltwater deposits

2018 USGS SURFICIAL GEOLOGIC MAP

NORTH

SURFICIAL GEOLOGIC MAP OF THE IPSWICH QUADRANGLE
HAMILTON, MASSACHUSETTS
NORTH AMERICAN VERTICAL DATUM OF 1988
CONTOUR INTERVAL 10 FEET

APPROXIMATE SCALE
1 INCH = 2,000 FEET

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FIGURE 3

SURFICIAL GEOLOGY PLAN
HAMILTON-WENHAM REGIONAL HIGH SCHOOL
ATHLETIC FACILITIES IMPROVEMENTS
HAMILTON, MASSACHUSETTS

DRAWN BY: SNP	CHECKED BY: BTW
PROJECT NO. 100451.000	DATE: JULY 2022

APPENDIX A
Limitations

GEOTECHNICAL LIMITATIONS

Explorations and Subsurface Conditions

1. The analyses and design recommendations submitted in this report are based in part upon the data obtained from subsurface explorations. The nature and extent of variations between these explorations may not become evident until construction. If variations then appear evident, it will be necessary to reevaluate the recommendations of this report.

   In preparing this report, Nobis relied on certain information provided by the Client and other parties referenced therein which were made available to Nobis at the time of our evaluation. Nobis did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of this evaluation.

2. The generalized soil profile described in the text is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized and have been developed by interpretations of widely spaced explorations and samples; actual soil transitions are probably more erratic. For specific information, refer to the exploration logs.

3. Water level readings have been made in the explorations at times and under conditions stated on the logs. These data have been reviewed and interpretations have been made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, and other factors occurring since the time measurements were made. The water table encountered in the course of the work may differ from that indicated in the Report.

   Recommendations for foundation drainage, waterproofing, and moisture control address the conventional geotechnical engineering aspects of seepage control. These recommendations may not preclude an environment that allows the infestation of mold or other biological pollutants.

4. Nobis' geotechnical services did not include an assessment of the presence of oil or hazardous materials at the property. Consequently, we did not consider the potential impacts (if any) that contaminants in soil or groundwater may have on construction activities, or the use of structures on the property.

Additional Services

5. Nobis recommends that we be retained to provide services during future site observations, design, implementation activities, construction and/or property development/ redevelopment. This will allow us the opportunity to: i) observe conditions and compliance with our recommendations, design concepts and/or opinions; ii) allow for changes in the event that conditions are other than anticipated; iii) provide modifications to our design recommendations; and iv) assess the consequences of changes in technologies and/or regulations.

Use of Report

6. Nobis prepared this report on behalf of, and for the exclusive use of our Client for the stated purpose(s) and location(s) identified in our proposal and/or report. Use of this report, in whole or in part, at other locations, or for other purposes, may lead to inappropriate conclusions; and we do not accept any responsibility for the consequences of such use(s). Reliance by any party not expressly identified in the agreement, for any use, without our prior written permission, shall be at that party's sole risk, and without any liability to Nobis.

   This report is for design purposes only and is not sufficient to prepare an accurate construction bid. Contractors wishing a copy of the report may secure it with the understanding that its scope is limited to design considerations only.

7. Nobis' findings and conclusions are based on the work conducted as part of the scope of work set forth in our proposal and/or report, and reflect our professional judgment. These findings and conclusions must be considered not as scientific or engineering certainties, but rather as our professional opinions considering the limited data gathered during the course of our work. If conditions other than those described in this report are found at the subject location(s), or the project design has been altered in any way, Nobis shall be so notified and afforded the opportunity to revise the report, as appropriate, to reflect the unanticipated changed conditions.

8. Nobis' services were performed using the degree of skill and care ordinarily exercised by qualified professionals performing the same type of services, at the same time, under similar conditions, at the same or a similar property. No warranty, expressed or implied, is made.

Compliance with Codes and Regulations

9. Nobis used reasonable care in identifying and interpreting applicable codes and regulations. These codes and regulations are subject to various, and possibly contradictory, interpretations. Compliance with codes and regulations by other parties is beyond our control.

Opinion of Cost

10. This report may contain or be based on comparative cost opinions for the purpose of evaluating alternative foundation schemes. These opinions may also involve approximate quantity evaluations. It should be noted that quantity estimates may not be accurate enough for construction bids. In addition, since we are not professional estimators of labor and materials cost, the evaluation of construction costs should be considered as approximate guidelines and could vary significantly from actual costs. Nobis does not guarantee the accuracy of our cost opinions as compared to contractor's bids for construction costs.

END OF LIMITATIONS

APPENDIX B
Description of Field Explorations
Exploration Logs

DESCRIPTION OF FIELD EXPLORATIONS

In total, five test borings, identified as B-101 through B-105 were advanced within the project area on July 7, 2022. As part of a previous project at the site Nobis had advanced five test borings, identified as B-1 through B-5 on August 11, 2016.

Test borings performed in 2022 were advanced to depths ranging from approximately 17 to 24 feet below the existing ground surface by New England Boring Contractors of Derry, New Hampshire using track-mounted drilling equipment and hollow-stem auger techniques. Test boring soil samples were obtained nearly continuously from the ground surface to a depth of 12 feet and at 5-foot intervals thereafter, using a standard 2-inch outside-diameter split-barrel sampler. Standard Penetration Tests (SPTs) were performed in general accordance with industry standards. Density of soil samples are based on N-values, which is determined by the number of hammer blows required to advance the sampler from 6 to 18 inches.

An automatic SPT hammer was used to advance the split-barrel sampler in the borings performed on this site. A greater efficiency is typically achieved with the automatic hammer compared to the conventional safety hammer operated with a cathead and rope. Published correlations between the SPT values and soil properties are based on the lower efficiency cathead and rope method. This higher efficiency affects the standard penetration resistance blow count (N) value by increasing the penetration per hammer blow over what would be obtained using the cathead and rope method. The effect of the automatic hammer's efficiency has been considered in the interpretation and analysis of the subsurface information for this report.

Explorations were located in the field by using available site plans, paced measurement and line-of-site referencing existing site features. The accuracy of exploration locations should only be assumed to the level implied by the method used.

Visual classifications of soil are shown on the individual exploration logs included in **Appendix B** which include boring B-2 from the previous explorations. Groundwater conditions were evaluated in each exploration at the time of site exploration program.

BORING LOG

Project:	Hamilton-Wenham Regional High School Athletic Facilities Improvements
Location:	Hamilton, Massachusetts
Nobis Project No.:	100451.000
Boring No.:	**B-101**
Boring Location:	See Exploration Location Plan
Checked by:	K.Stanway
Date Start:	July 7, 2022
Date Finish:	July 7, 2022
Contractor:	New England Boring Contractors
Driller:	M. Thompson
Nobis Rep.:	S. Pape
Rig Type / Model:	ATV Track Rig / Mobile B-57
Hammer Type:	Automatic Hammer
Hammer Hoist:	Automatic
Ground Surface Elev.:	(+/-) 43
Datum:	NAVD 88

	Drilling Method	Sampler
Type	Hollow Stem Auger	Split-Spoon
Size ID (in.)	2-1/4	1-3/8
Advancement	Augered	140-lb Hammer

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time
▼ 07/07/22	08:40	7.5	4	8	While Sampling
▼ 07/07/22	09:00	6.5	10	12	While Sampling
▽ 07/07/22	09:40	5.3	OUT	Not Obs	5 min

Depth (ft.)	Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	Ground Water	Graphic	Stratum Elev. / Depth (ft.)	SAMPLE DESCRIPTION AND REMARKS (Classification System: Modified Burmister)	NOTES
1	S-1	20	0-2	4 10			42.7 / 0.3 TOPSOIL	S-1A (3"): Dense, brown, fine SAND AND SILT, very few fine roots. Dry. (TOPSOIL). S-1B (17"): Dense, brown, fine to coarse SAND, some Silt, little fine to coarse Gravel. Dry. (FILL).	
2				31 38					
3	S-2	15	2-4	34 27			FILL	S-2: Dense, brown, fine to coarse SAND, some fine to coarse Gravel, some Silt, very few roots. Organic odor observed. Dry to moist. (FILL).	
4				19 22					
5	S-3	21	4-6	7 7			38.0 / 5.0	S-3A (12"): Medium dense, brown, fine to coarse SAND, some fine to coarse Gravel, little Silt. Organic odor observed. Moist. (FILL).	
6				7 9	▽		37.9 / 5.1 BURIED TOPSOIL	S-3B (1"): Medium dense, dark brown, Organic SILT, very few fine roots. Organic odor observed. (TOPSOIL).	
7	S-4	12	6-8	19 19	▼		CLAYEY SILT 37.0 / 6.0	S-3C (8"): Medium dense, gray with orange mottling, CLAY & SILT, some fine to coarse Sand, little fine to coarse Gravel. Wet. (CLAY).	
8				20 22	▼			S-4: Dense, orangish brown, fine to coarse SAND and fine to coarse Gravel, little Silt. Wet. (SAND AND GRAVEL).	
9	S-5	13	8-10	27 21				S-5: Dense, orangish brown, fine to coarse SAND and fine to coarse Gravel, little Silt. Wet. (SAND AND GRAVEL).	
10				19 19			SAND AND GRAVEL WITH SILT		
11	S-6	8	10-12	2 8				S-6: Medium dense, orange-brown, fine to coarse GRAVEL and fine to coarse Sand, little Silt. Wet. (SAND AND GRAVEL).	
12				15 24					
13									
14							29.5 / 13.5		
15									
16	S-7	12	15-17	5 17			SAND & SILT	S-7: Dense, orange-brown, fine SILT, some fine Sand. Wet. (SILT). Laboratory Analysis - Grain Size Sieve Only [0.2% GRAVEL, 31.6% SAND, 68.2% FINES].	
17				20 19					
18									
19							24.5 / 18.5		
20									
21	S-8	17	20-22	13 11			SILTS & CLAYS	S-8A (10"): Very stiff, gray, CLAY & SILT. Wet. (CLAY).	
22				7 9			21.0 / 22.0	S-8B (7"): Very stiff, gray, Silty CLAY. Wet. (CLAY).	
23								Boring terminated at 22 feet.	1
24									
25									

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:
1) Borehole backfilled with soil cuttings.

Soil descriptions, and lithology, are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

BORING LOG

Project:	Hamilton-Wenham Regional High School Athletic Facilities Improvements
Location:	Hamilton, Massachusetts
Nobis Project No.:	100451.000
Boring No.:	**B-102**
Boring Location:	See Exploration Location Plan
Checked by:	K.Stanway
Date Start:	July 7, 2022
Date Finish:	July 7, 2022
Contractor:	New England Boring Contractors
Driller:	M. Thompson
Nobis Rep.:	S. Pape
Rig Type / Model:	ATV Track Rig / Mobile B-57
Hammer Type:	Automatic Hammer
Hammer Hoist:	Automatic
Ground Surface Elev.:	(+/-) 42.5
Datum:	NAVD 88

	Drilling Method	Sampler
Type	Hollow Stem Auger	Split-Spoon
Size ID (in.)	2-1/4	1-3/8
Advancement	Augered	140-lb Hammer

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time
▽ 07/07/22	10:25	8.5	5	9	While Sampling

Depth (ft.)	Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	Ground Water	Graphic	Stratum Elev. / Depth (ft.)	SAMPLE DESCRIPTION AND REMARKS (Classification System: Modified Burmister)	NOTES
1	S-1	10	0-2	4			42.2 / 0.3 TOPSOIL	S-1A (4"): Dense, brown, SILT, some fine to coarse Sand, Numerous fine roots. Dry. (TOPSOIL).	
				14				S-1B (6"): Dense, brown, fine to coarse SAND, some fine to coarse Gravel, little Silt. Dry. (FILL).	
2				24				S-2: Dense, brown, fine to coarse SAND, some fine to coarse Gravel, little Silt. Dry to moist. (FILL).	
				32					
3	S-2	12	2-4	18			FILL		
				17					
4				17					
				14					
5							37.5 / 5.0		
6	S-3	17	5-7	2			ORGANIC DEPOSITS 36.8 / 5.7	S-3A (6"): Medium dense, dark brown, SILT and fine to medium Sand, some Organic Fibers. Organic odor observed. Wet. (ORGANIC DEPOSITS).	
				6				S-3B (11"): Medium dense, orangish brown, fine to coarse SAND and fine to coarse Gravel, little Silt. Wet. (SAND AND GRAVEL).	
7				13				S-4: Very dense, orange-brown, fine to coarse SAND, some fine to coarse Gravel, little Silt. Wet. (SAND AND GRAVEL).	
				32					
8	S-4	17	7-9	28					
				30					
9				20	▽				
				25					
10							SAND AND GRAVEL		
11	S-5	10	10-12	16				S-5: Dense, orange-brown, fine to coarse GRAVEL, some fine to coarse Sand, some Silt. Wet. (SAND AND GRAVEL).	
				20					
12				14					
				12					
13									
14							29.0 / 13.5		
15									
16	S-6	16	15-17	12			SILTS & CLAYS	S-6: Very stiff, orange-brown, Clayey SILT, trace fine to medium Sand. Redoximorphic staining present around 15 to 16 feet. Wet. (CLAY).	
				12					
17				15					
				15			25.5 / 17.0		
18								Boring terminated at 17 feet.	1
19									
20									
21									
22									
23									
24									
25									

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:
1) Borehole backfilled with soil cuttings.

Soil descriptions, and lithology, are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

BORING LOG

Project:	Hamilton-Wenham Regional High School Athletic Facilities Improvements
Location:	Hamilton, Massachusetts
Nobis Project No.:	100451.000
Boring No.:	**B-103**
Boring Location:	See Exploration Location Plan
Checked by:	K.Stanway
Date Start:	July 7, 2022
Date Finish:	July 7, 2022
Contractor:	New England Boring Contractors
Driller:	M. Thompson
Nobis Rep.:	S. Pape
Rig Type / Model:	ATV Track Rig / Mobile B-57
Hammer Type:	Automatic Hammer
Hammer Hoist:	Automatic
Ground Surface Elev.:	(+/-) 41.5
Datum:	NAVD 88

	Drilling Method	Sampler
Type	Hollow Stem Auger	Split-Spoon
Size ID (in.)	2-1/4	1-3/8
Advancement	Augered	140-lb Hammer

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time
▼ 07/07/22	12:00	14.2	20	22	While Sampling
▼ 07/07/22	12:10	9	12	Not Obs	5 min
▽ 07/07/22	12:25	7.8	OUT	Not Obs	10 min

Depth (ft.)	SAMPLE INFORMATION Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	Ground Water	LITHOLOGY Graphic	Stratum Elev. / Depth (ft.)	SAMPLE DESCRIPTION AND REMARKS (Classification System: Modified Burmister)	NOTES
1	S-1	14	0-2	2			TOPSOIL 41.0 / 0.5	S-1A (5"): Loose, tan, SILT and fine Sand. Few fine roots. Dry. (TOPSOIL).	
				14				S-1B (9"): Dense, brown, fine to coarse GRAVEL, some fine to coarse Sand, little Silt. Dry. (FILL).	
2				18					
				18			FILL		
3	S-2	11	2-4	11				S-2: Medium dense, brown, fine to coarse SAND, little fine to coarse Gravel, little Silt. Dry. (FILL).	
				10					
4				9					
				11			37.5 / 4.0		
5									
	S-3	20	5-7	3				S-3: Loose, dark brown, fine to coarse SAND AND SILT, trace fine to coarse Gravel, trace Organic Silt. Moist. (ORGANIC DEPOSITS).	
6				5			ORGANIC DEPOSITS		
				5					
7				5					
	S-4	18	7-9	3				S-4A (6"): Loose, dark brown, fine to coarse SAND AND SILT, trace fine to coarse Gravel, trace Organic Silt. Moist. (ORGANIC DEPOSITS).	
8				3	▽		33.5 / 8.0	S-4B (6"): Loose, black, Organic SILT, some fine to coarse Sand, some Silt, few partially decomposed organic fibers. Moist to wet. (ORGANIC DEPOSITS).	
				12				S-4C (6"): Medium dense, gray, fine to coarse SAND, some fine to coarse Gravel, some Silt. Wet. (SAND AND GRAVEL).	
9				15	▼		SAND AND GRAVEL WITH SILT		
10							31.5 / 10.0		
	S-5	13	10-12	7				S-5: Very stiff, orange-brown, Clayey SILT, trace fine Sand. Redoximorphic staining present. Wet. (CLAY).	
11				9					
				10					
12				10					
13									
14									
15					▼				
	S-6	15	15-17	3				S-6: Very stiff, orange-brown, SILT & CLAY. Redoximorphic staining present. Wet. (CLAY).	
16				7			SILTS & CLAYS		
				10					
17				11					
18									
19									
20									
	S-7	22	20-22	5				S-7A (6"): Medium dense, brown, SILT, trace fine Sand. Wet. (SILT).	
21				8				S-7B (16"): Stiff, gray, SILT & CLAY. Wet. (CLAY).	
				5					
22				4			19.5 / 22.0		
23								Boring terminated at 22 feet.	1
24									
25									

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:
1) Borehole backfilled with soil cuttings.

Soil descriptions, and lithology, are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

BORING LOG

nobis

Project: Hamilton-Wenham Regional High School
Athletic Facilities Improvements
Location: Hamilton, Massachusetts
Nobis Project No.: 100451.000

Boring No.: **B-104**
Boring Location: See Exploration Location Plan
Checked by: K.Stanway
Date Start: July 7, 2022
Date Finish: July 7, 2022

Contractor: New England Boring Contractors
Driller: M. Thompson
Nobis Rep.: S. Pape

Rig Type / Model: ATV Track Rig / Mobile B-57
Hammer Type: Automatic Hammer
Hammer Hoist: Automatic

Ground Surface Elev.: (+/-) 43
Datum: NAVD 88

	Drilling Method	Sampler
Type	Hollow Stem Auger	Split-Spoon
Size ID (in.)	2-1/4	1-3/8
Advancement	Augered	140-lb Hammer

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time
▽ 07/07/22	13:43	6	7	17	5 min

Depth (ft.)	Sample Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	Ground Water	Graphic	Stratum Elev. / Depth (ft.)	Sample Description and Remarks (Classification System: Modified Burmister)	Notes
1	S-1	15	0-2	3 11			TOPSOIL 42.5 / 0.5	S-1A (7"): Dense, brown, Organic SILT and fine to medium Sand. Few fine roots. Dry. (TOPSOIL).	
2				28 11				S-1B (8"): Dense, brown, fine to coarse SAND, little fine to coarse Gravel, little Silt. Dry. (FILL).	
3	S-2	10	2-3	35 80			FILL	S-2: Very dense, brown, fine to coarse SAND, little fine to coarse Gravel, little Silt. Dry. (FILL).	
4									
5							38.0 / 5.0		
6	S-3	14	5-7	11 25	▽		CLAYEY SILT 37.5 / 5.5	S-3A (3"): Hard, gray, Clayey SILT, trace fine Sand. Redoximorphic staining present. Moist. (CLAY).	
7				21 21			SAND AND GRAVEL	S-3B (11"): Dense, brown, fine to coarse SAND and fine to coarse Gravel, little Silt. Moist to wet. (SAND AND GRAVEL).	
8	S-4	14	7-9	10 11				S-4A (12"): Medium dense, brown, fine to coarse SAND, some fine to coarse Gravel, little Silt. Wet. (SAND).	
9				13 14			34.5 / 8.5		
10								S-4B (2"): Medium dense, tan, SILT, some fine to medium Sand. Wet. (SILT).	
11	S-5	23	10-12	6 13				S-5: Medium dense, orange-brown, SILT, trace fine Sand. Wet. (SILT).	
12				15 20					
13							SANDY SILT		
14									
15									
16	S-6	22	15-17	4 10				S-6: Medium dense, orange-brown, SILT, little fine Sand. Redoximorphic staining present. Wet. (SILT).	
17				14 18			26.0 / 17.0		
18								Boring terminated at 17 feet.	1
19									
20									
21									
22									
23									
24									
25									

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:
1) Borehole backfilled with soil cuttings.

Soil descriptions, and lithology, are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

BORING LOG

Project: Hamilton-Wenham Regional High School
Athletic Facilities Improvements
Location: Hamilton, Massachusetts
Nobis Project No.: 100451.000

Boring No.: **B-105**
Boring Location: See Exploration Location Plan
Checked by: K.Stanway
Date Start: July 7, 2022
Date Finish: July 7, 2022

Contractor: New England Boring Contractors
Driller: M. Thompson
Nobis Rep.: S. Pape

Rig Type / Model: ATV Track Rig / Mobile B-57
Hammer Type: Automatic Hammer
Hammer Hoist: Automatic

Ground Surface Elev.:
Datum: NAVD 88

	Drilling Method	Sampler
Type	Hollow Stem Auger	Split-Spoon
Size ID (in.)	2-1/4	1-3/8
Advancement	Augered	140-lb Hammer

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time
▽ 07/07/22	15:22	5.5	OUT	24	5 min

Depth (ft.)	Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	Ground Water	Graphic	Stratum Elev. / Depth (ft.)	SAMPLE DESCRIPTION AND REMARKS (Classification System: Modified Burmister)	NOTES
1	S-1	14	0-2	4 11			TOPSOIL / 1.0	S-1A (10"): Medium dense, light brown, SILT, some fine to coarse Sand, very few fine roots. Dry. (TOPSOIL).	
2				20 25				S-1B (4"): Dense, brown, fine to coarse SAND, little Silt, little fine Gravel. Dry. (SAND).	
3	S-2	17	2-4	19 17				S-2A (3"): Dense, brown, fine to coarse SAND, little Silt, little fine Gravel. Dry. (SAND). S-2B (14"): Dense, tan, fine to coarse SAND, little Silt, trace fine Gravel. Dry to moist. (SAND).	
4				18 20			SAND		
5									
6	S-3	18	5-7	5 7	▽		/ 6.0	S-3A (9"): Medium dense, brown, fine to medium SAND, trace fine Gravel, trace Silt. Wet. (SAND).	
7				9 10			SILT AND SAND	S-3B (9"): Medium dense, brown, fine to medium SAND & SILT, trace fine Gravel. Wet. (SAND).	
8	S-4	16	7-9	9 9			/ 8.0	S-4A (8"): Medium dense, brown, fine to medium SAND & SILT, trace fine Gravel. Wet. (SAND).	
9				10 13				S-4B (8"): Very stiff, tan-gray, Clayey SILT, little fine Sand. Redoximorphic staining present. Wet. (CLAY).	
10									
11	S-5	11	10-12	5 7				S-5: Very stiff, gray-tan, Clayey SILT, little fine Sand. Redoximorphic staining present. Wet. (CLAY).	
12				10 12					
13									
14									
15									
16	S-6	10	15-17	9 3			SILTS & CLAYS	S-6A (2"): Medium stiff, tan, Clayey SILT, little fine Sand. Wet. (CLAY). S-6B (8"): Medium stiff, gray, SILT & CLAY. Wet. (CLAY).	
17				2 5					
18									
19									
20									
21	S-7	24	20-22	WOH /12"				S-7: Very soft, gray, Silty CLAY. Wet. (CLAY). Small Torvane: 500-750 psf, Medium Torvane: 500-700 psf, Laboratory Analysis - Atterberg [LL=42, PL=26, PI=16].	1
22				1 2					
23	S-8	24	22-24	WOH /18"				S-8: Very soft, gray, Silty CLAY. Wet. (CLAY). Medium Torvane: 600 psf at top to 200 psf at bottom.	
24				2			/ 24.0		
25								Boring terminated at 24 feet.	2

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:
1) The Torvane is intended for use on undisturbed soils. Split-spoon samples are disturbed. Values provided should be considered a lower limit of potential in-situ shear strengths.
2) Borehole backfilled with soil cuttings.

Soil descriptions, and lithology, are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

BORING LOG

Nobis — Engineering a Sustainable Future

Project: Hamilton Wenham Regional High School
775 Bay Road
Location: South Hamilton, Massachusetts
Nobis Project No.: 91770

Boring No.: B-2
Boring Location: See Site Plan
Checked by: SMC
Date Start: August 11, 2016
Date Finish: August 11, 2016

Contractor: New England Boring Contractors
Driller: M. Soucy
Nobis Rep.: J. Keohane

Rig Type / Model: ATV Track Rig / CME 55
Hammer Type: Safety Hammer
Hammer Hoist: Rope & Cathead

Ground Surface Elev.: (+/-) 97
Datum: Site Datum (Assumed)

	Drilling Method	Sampler
Type	Hollow Stem Auger	Split-Spoon
Size ID (in.)	2-1/2	1-3/8
Advancement	Augered	140-lb Hammer

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time
▼ 08/11/16	00:00	7	5	7	WS

Depth (ft.)	Sample Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	Ground Water	Graphic	Stratum Elev. / Depth (ft.)	Sample Description and Remarks (Classification System: Modified Burmister)	Notes
1	S-1	15	0-2	4 10 26 29			96.8 / 0.2 TOPSOIL	3 inches topsoil moist. (TOPSOIL). S-1: Dense, brown, fine to medium SAND, little Gravel, little Silt. dry.	
2									
3							SAND		
4									
5							92.0 / 5.0		
6	S-2	18	5-7	8 10 12 15				S-2: Medium dense, brown, fine SAND, some Silt. moist. sample wet at 7 feet.	
7					▼				
8									
9									
10							SILTY SAND		
11	S-3	18	10-12	14 16 21 17				S-3: Dense, alternating seams of brown and gray, fine SAND, some Silt. wet.	
12									
13									
14									
15							82.0 / 15.0		
16	S-4	24	15-17	6 7 7 6				S-4: Stiff, gray, Clayey SILT, trace fine Sand. wet.	
17									
18							CLAYEY SILT		
19									
20							77.0 / 20.0		
21	S-5	24	20-22	3 3 3 3				S-5: Medium stiff, gray, Silty CLAY. wet.	
22							SILTY CLAY 75.0 / 22.0		
23								Boring terminated at 22 feet.	
24									
25									

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:
1) Borehole backfilled with auger cuttings upon completion.
2) WS - While Sampling

Soil descriptions are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

APPENDIX C
Laboratory Test Reports

ConTest Consultants, Inc.

Providing Inspection/Testing & Consulting Services

LETTER OF TRANSMITTAL

TO: Nobis Group – Brien Waterman

DATE: 7/26/2022

PROJECT: Hamilton-Wenham HS Fields (100451.000) – Hamilton, MA

CTC PROJECT NO.: 222165

Attached are the following for your use:

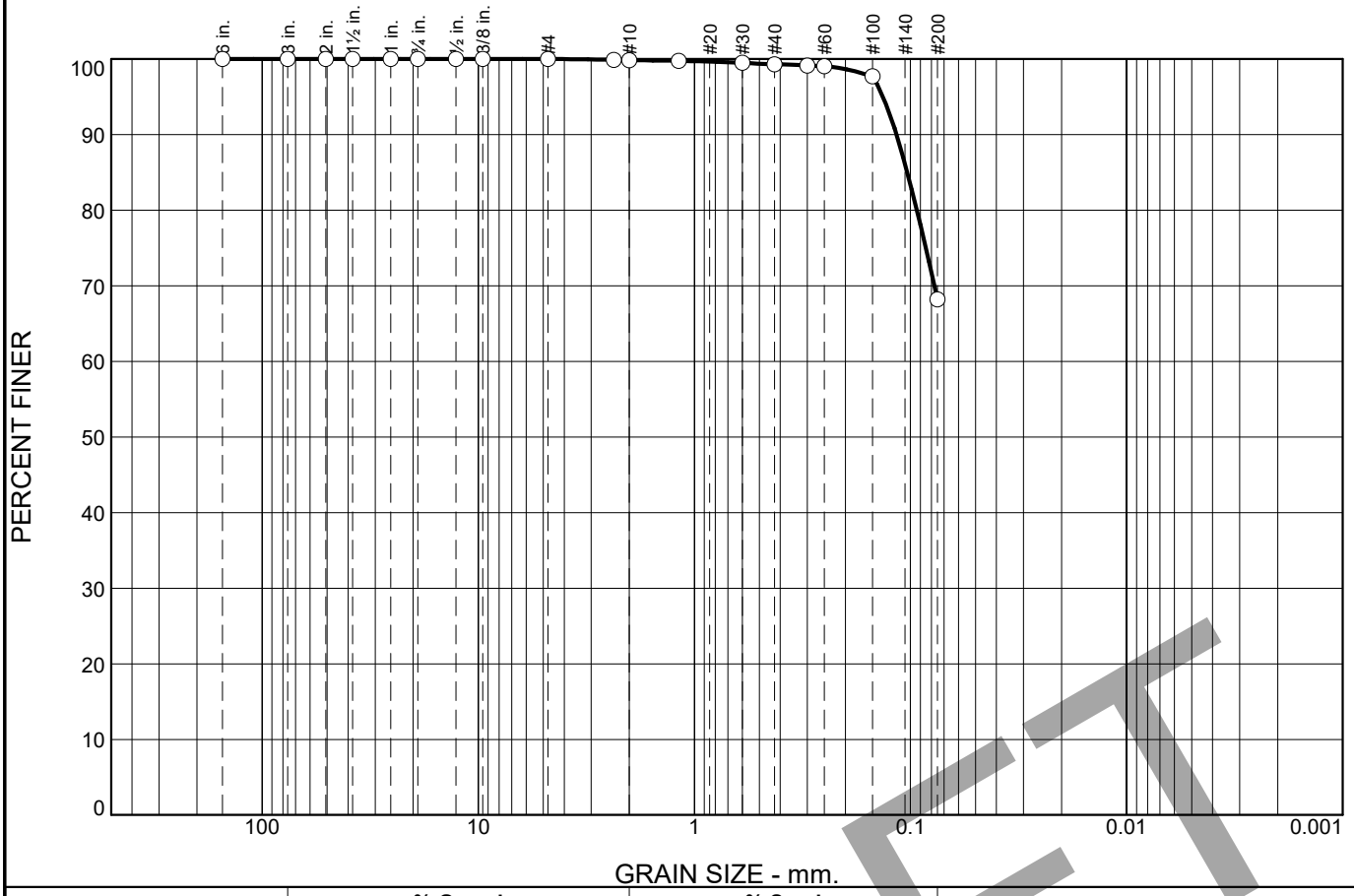
COPIES	DATE	LAB NUMBER	DESCRIPTION
			Concrete Report - Cylinders
			Concrete Inspection Report
			Reinforcing Steel Inspection Report
			Field Density Report
1		L-264-22	Particle Size Distribution Report
			Organic Content Letter
1		L-265-22	Atterberg Limit Report w/ Moisture Content

CC: Nobis Group - Serena Pape

Reviewed By: Donald Walden

18 Cote Ave. Unit 11 Goffstown, NH 03045
p (603) 626-4422 • *f* (603) 782-0064
www.contestconsultantsinc.com

Particle Size Distribution Report



% +3"	% Gravel			% Sand			% Fines
	Coarse	Medium	Fine	Coarse	Medium	Fine	
0.0	0.0	0.0	0.2	0.3	0.5	30.8	68.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
6"	100.0		
3"	100.0		
2"	100.0		
1.5"	100.0		
1"	100.0		
3/4"	100.0		
1/2"	100.0		
3/8"	100.0		
#4	100.0		
#8	99.9		
#10	99.8		
#16	99.8		
#30	99.5		
#40	99.3		
#50	99.1		
#60	99.0		
#100	97.7		
#200	68.2		

* (no specification provided)

Soil Description

SILT, some fine Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.1161 D_{85}= 0.1035 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

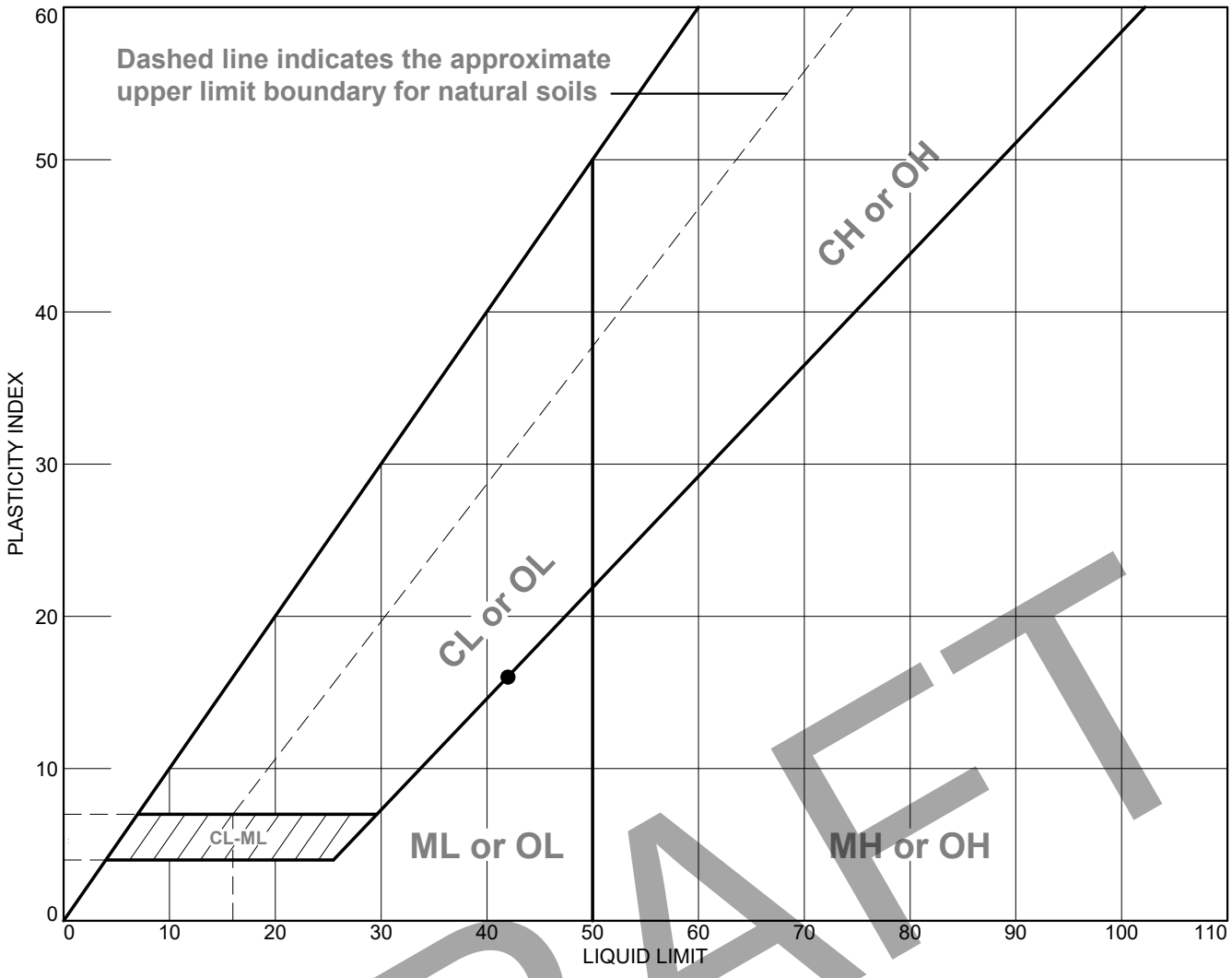
Location: B-101 / S-7
Sample Number: L-264-22 **Depth:** 15.0' - 17.0' **Date:** 7/18/2022

ConTest Consultants, Inc.

Goffstown, New Hampshire

Client: Nobis Group
Project: Hamilton-Wenham HS Fields (100451.000)
Hamilton, MA
Project No: 222165 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean Clay	42	26	16			

Project No. 222165 **Client:** Nobis Group

Project: Hamilton-Wenham HS Fields (100451.000)
Hamilton, MA

● **Location:** B-105 / S-7 **Depth:** 20.0' - 22.0' **Sample Number:** L-265-22

Remarks:

● Received Moisture Content: 26.2%

ConTest Consultants, Inc.

Goffstown, New Hampshire

Figure

CELEBRATING 50 YEARS GALE

SOIL EVALUATOR FORM

Hamilton-Wenham Regional High School

ON-SITE REVIEW

Deep Hole Number: TP-1 Date: 8/12/16 Time: 8:30 AM Weather: Sunny, 85° F
Location (Identify on Site Plan): behind the goal post on the school building side
Land Use: athletic field Slope (%) ≈ 0 % Surface Stones: none
Vegetation: grass
Landform: -
Position on Landscape: (see plan)

Distances from:

Open Water Body:	feet	Drainage Way:	feet
Possible Wet Area:	feet	Property Line:	feet
Drinking Water Well:	feet	Other:	feet

DEEP OBSERVATION HOLE LOG

Depth from Surface (Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Redox / Mottles	Other (Structure, Stone, Boulders, Consistency, % Gravel)
0 – 8”	A_1	Loam	10 YR 3/2	-	granular, friable
8 – 16”	B_1	Fine Sandy Loam	2.5 Y 6/4	-	friable
16 – 29”	A_2	Sandy Loam	10 YR 3/1	-	friable
29 – 39”	Fill	-	-	-	buried chunks of asphalt found
39 – 46”	A_3	Sandy Loam	10 YR 3/1	-	friable
46 – 58” +	B_2	Loamy Sand	7.5 YR 5/6	-	loose, SG

Notes:

- chunks of asphalt observed at 29 – 39” below the surface

Parent Material (Geologic): - Depth to Bedrock: -
Depth to Groundwater: - Weeping from Pit Face: -
Estimated Seasonal High Ground Water: -

Photo 1: Location of TP-1.

Photo 2: Observed profile of TP-1.

Photo 3: Observed profile of TP-1.

Photo 4: Observed asphalt pavement fill layer.

CELEBRATING 50 YEARS GALE

SOIL EVALUATOR FORM

Hamilton-Wenham Regional High School

ON-SITE REVIEW

Deep Hole Number: TP-2 Date: 8/12/16 Time: 9:00 AM Weather: Sunny, 90° F

Location (Identify on Site Plan): behind the goal post on the far side of the field

Land Use: athletic field Slope (%) ≈ 0 % Surface Stones: none

Vegetation: grass

Landform: -

Position on Landscape: (see plan)

Distances from:

Open Water Body:		feet	Drainage Way:		feet
Possible Wet Area:		feet	Property Line:		feet
Drinking Water Well:		feet	Other:		feet

DEEP OBSERVATION HOLE LOG

Depth from Surface (Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Redox / Mottles	Other (Structure, Stone, Boulders, Consistency, % Gravel)
0 – 9”	A_1	Loam	10 YR 3/2	-	granular, friable
9 – 18”	B_1	Fine Sandy Loam	2.5 Y 6/4	-	friable
18 – 43”	A_2	Sandy Loam	10 YR 3/2	-	friable
43 – 73” +	C	Medium Sand	10 YR 5/6	-	5% gravel, loose, SG

Notes:

-

Parent Material (Geologic): - Depth to Bedrock: -

Depth to Groundwater: - Weeping from Pit Face: -

Estimated Seasonal High Ground Water: -

Photo 1: Location of TP-2.

Photo 2: Observed profile of TP-2.

Photo 3: Observed profile of TP-2.

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CELEBRATING 50 YEARS GALE

SOIL EVALUATOR FORM

Hamilton-Wenham Regional High School

ON-SITE REVIEW

Deep Hole Number: TP-3 Date: 8/12/16 Time: 9:30 AM Weather: Sunny, 90° F
Location (Identify on Site Plan): behind the pitcher's mound at the baseball field
Land Use: baseball field Slope (%) ≈ 0 % Surface Stones: none
Vegetation: grass
Landform: -
Position on Landscape: (see plan)

Distances from:

Open Water Body:	feet	Drainage Way:	feet
Possible Wet Area:	feet	Property Line:	feet
Drinking Water Well:	feet	Other:	feet

DEEP OBSERVATION HOLE LOG

Depth from Surface (Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Redox / Mottles	Other (Structure, Stone, Boulders, Consistency, % Gravel)
0 – 15"	A	Loam	10 YR 3/3	-	granular, friable
15 – 32"	B	Very Fine Sand	10 YR 6/8	-	loose, SG
32 – 78" +	C	Medium Sand	10 YR 5/6	-	2% gravel, loose, SG

Notes:

-

Parent Material (Geologic): - Depth to Bedrock: -
Depth to Groundwater: - Weeping from Pit Face: -
Estimated Seasonal High Ground Water: -

	**Intentionally Left Blank**
Photo 1: Location of TP-3.	
Intentionally Left Blank	**Intentionally Left Blank**

CELEBRATING 50 YEARS GALE

SOIL EVALUATOR FORM

Hamilton-Wenham Regional High School

ON-SITE REVIEW

Deep Hole Number: TP-4 Date: 8/12/16 Time: 10:00 AM Weather: Sunny, 90° F
Location (Identify on Site Plan): right field of the baseball
Land Use: baseball field Slope (%) ≈ 0 - 2 % Surface Stones: none
Vegetation: grass
Landform: -
Position on Landscape: (see plan)

Distances from:

Open Water Body:	feet	Drainage Way:	feet
Possible Wet Area:	feet	Property Line:	feet
Drinking Water Well:	feet	Other:	feet

DEEP OBSERVATION HOLE LOG

Depth from Surface (Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Redox / Mottles	Other (Structure, Stone, Boulders, Consistency, % Gravel)
0 – 12”	A_1	Loam	10 YR 3/3	-	granular, friable
12 – 20”	B_1 (sand layer)	Very Fine Sand	2.5 Y 7/6	-	loose, SG
20 – 56”	Fill	-	10 YR 3/4	-	15% cobbles / stones
56 – 64”	C_1	Coarse Sand	2.5 Y 5/3	-	loose, SG

Notes:

- bricks, stones, roots, leaves and sticks observed in fill layer
- large cobbles (some stones) observed beneath the B_1 (sand layer)

Parent Material (Geologic): - Depth to Bedrock: -
Depth to Groundwater: - Weeping from Pit Face: -
Estimated Seasonal High Ground Water: -

Photo 1: Location of TP-4

Photo 2: Observed profile of TP-4

Photo 3: Observed profile of TP-4

Photo 4: Observed sticks, roots and bricks.

CELEBRATING 50 YEARS GALE

SOIL EVALUATOR FORM

Hamilton-Wenham Regional High School

ON-SITE REVIEW

Deep Hole Number: TP-5 Date: 8/12/16 Time: 10:30 AM Weather: Sunny, 90° F
Location (Identify on Site Plan): left field of the baseball field
Land Use: baseball field Slope (%) ≈ 0 - 2 % Surface Stones: none
Vegetation: grass
Landform: -
Position on Landscape: (see plan)

Distances from:

Open Water Body:	feet	Drainage Way:	feet
Possible Wet Area:	feet	Property Line:	feet
Drinking Water Well:	feet	Other:	feet

DEEP OBSERVATION HOLE LOG

Depth from Surface (Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Redox / Mottles	Other (Structure, Stone, Boulders, Consistency, % Gravel)
0 – 16”	A	Sandy Loam	10 YR 3/3	-	granular, friable
16 – 18”	B (sand layer)	Fine Sand	10 YR 5/6	-	loose, SG
18 – 35”	Fill	-	10 YR 4/3	-	10% cobbles
35 – 82” +	C	Loamy Sand	10 YR 5/6	-	WM, friable

Notes:

- cobbles and trash bag pieces observed in the fill layer

Parent Material (Geologic): - Depth to Bedrock: -
Depth to Groundwater: - Weeping from Pit Face: -
Estimated Seasonal High Ground Water: -

Photo 1: Location of TP-5.

Photo 2: Observed profile of TP-5.

Photo 3: Observed profile of TP-5.

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CELEBRATING 50 YEARS GALE

SOIL EVALUATOR FORM

Hamilton-Wenham Regional High School

ON-SITE REVIEW

Deep Hole Number: TP-6 Date: 8/12/16 Time: 11:00 AM Weather: Sunny, 90° F

Location (Identify on Site Plan): inside the track at the 50-yard line on the visitor bleacher side

Land Use: athletic field Slope (%) ≈ 0 % Surface Stones: none

Vegetation: grass

Landform: -

Position on Landscape: (see plan)

Distances from:

Open Water Body:		feet	Drainage Way:		feet
Possible Wet Area:		feet	Property Line:		feet
Drinking Water Well:		feet	Other:		feet

DEEP OBSERVATION HOLE LOG

Depth from Surface (Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Redox / Mottles	Other (Structure, Stone, Boulders, Consistency, % Gravel)
0 – 14”	A_1	Loam	10 YR 3/2	-	granular, friable
14 – 22”	B (sand layer)	Fine Sand	2.5 Y 3/2	-	loose, SG
22 – 30”	A_2	Loamy Sand	10 YR 3/3	-	buried topsoil (granular)
30 – 64” +	C	Medium Sand	10 YR 5/6	-	loose, SG

Notes:

- buried topsoil layer observed

Parent Material (Geologic): - Depth to Bedrock: -

Depth to Groundwater: - Weeping from Pit Face: -

Estimated Seasonal High Ground Water: -

Photo 1: Location of TP-6.

Photo 2: Location of TP-6.

Photo 3: Observed profile of TP-6.

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CELEBRATING 50 YEARS GALE

SOIL EVALUATOR FORM

Hamilton-Wenham Regional High School

ON-SITE REVIEW

Deep Hole Number: TP-7 Date: 8/12/16 Time: 11:30 AM Weather: Sunny, 90° F
Location (Identify on Site Plan): inside the track at the 50-yard line on the home bleacher side
Land Use: athletic field Slope (%) ≈ 0 % Surface Stones: none
Vegetation: grass
Landform: -
Position on Landscape: (see plan)

Distances from:

Open Water Body:		feet	Drainage Way:		feet
Possible Wet Area:		feet	Property Line:		feet
Drinking Water Well:		feet	Other:		feet

DEEP OBSERVATION HOLE LOG

Depth from Surface (Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Redox / Mottles	Other (Structure, Stone, Boulders, Consistency, % Gravel)
0 – 9”	A_1	Loam	10 YR 3/2	-	granular, friable
9 – 18”	B (sand layer)	Fine Sand	2.5 Y 6/6	-	loose, SG
18 – 48”	A_2	Loamy Sand	10 YR 3/3	-	cobbles / gravel 5%
48 – 68”	C	Very Coarse Sand	2.5 Y 5/4	-	loose, SG

Notes:

- A_2 layer contained roots, cobbles and sticks

Parent Material (Geologic): Depth to Bedrock:
Depth to Groundwater: Weeping from Pit Face:
Estimated Seasonal High Ground Water:

Photo 1: Location of TP-7.

Photo 2: Location of TP-7.

Photo 3: Observed profile of TP-7.

Photo 4: Observed stockpile of material from TP-7.

Soil Map—Essex County, Massachusetts, Southern Part
(Hamilton-Wenham Regional High School)

Map Scale: 1:2,580 if printed on B landscape (17" x 11") sheet.

N

Meters: 0 35 70 140 210

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N 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: Essex County, Massachusetts, Southern Part
Survey Area Data: Version 20, Sep 10, 2023

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

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

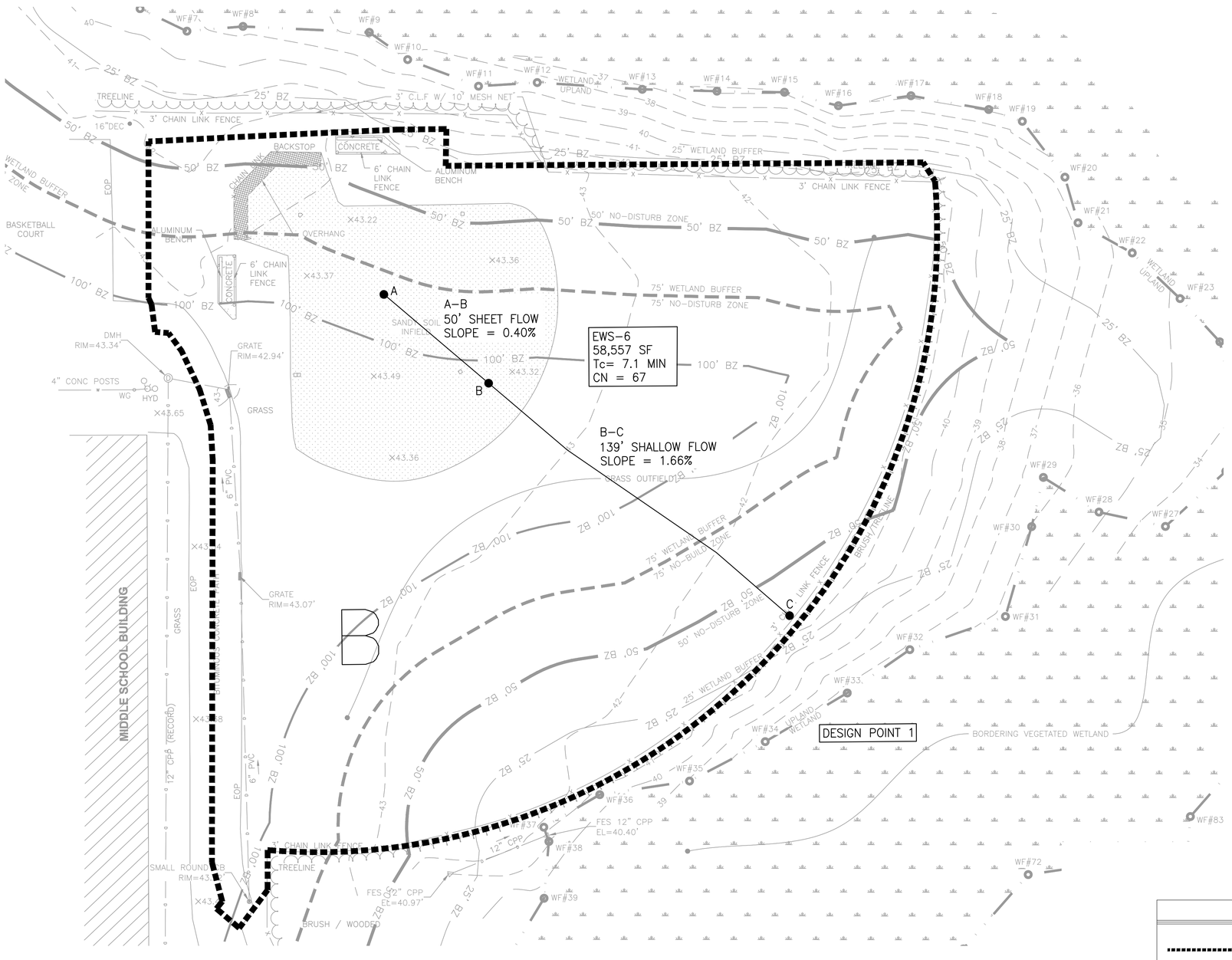
The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
43A	Scarboro mucky fine sandy loam, 0 to 3 percent slopes	6.5	13.0%
225B	Belgrade very fine sandy loam, 0 to 8 percent slopes	0.0	0.0%
242A	Hinckley loamy sand, 0 to 3 percent slopes	5.6	11.1%
254A	Merrimac fine sandy loam, 0 to 3 percent slopes	9.6	19.2%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	12.0	24.0%
260A	Sudbury fine sandy loam, 0 to 3 percent slopes	7.2	14.4%
260B	Sudbury fine sandy loam, 3 to 8 percent slopes	0.6	1.2%
602	Urban land	5.6	11.3%
651	Udorthents, smoothed	2.9	5.8%
Totals for Area of Interest		**49.9**	**100.0%**

ATTACHMENT 4

Pre & Post Development Conditions Maps



NORTH

LEGEND

- WATERSHED BOUNDARY
- TIME OF CONC. / FLOW PATH
- SOIL MAP BOUNDARY
- A — HYDRAULIC SOIL GROUP

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775 BAY ROAD
SOUTH HAMILTON, MA 01982

OWNER
HAMILTON-WENHAM REGIONAL SCHOOL DISTRICT
5 SCHOOL STREET
WENHAM, MA 01984

NO.	DATE	DESCRIPTION	BY

PROJECT NO.	718600
CADD FILE	718600_wsPRE
DESIGNED BY	RDT
DRAWN BY	RDT
CHECKED BY	KDH
DATE	11/16/2023
DRAWING SCALE	1" = 20'

GRAPHIC SCALE

0 10' 20' 40'

SHEET TITLE

EXISTING
WATERSHED PLAN
SHEET 1 OF 3

DRAWING NO.

PRE-1

1 OF 6

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SOUTH HAMILTON, MA 01982

OWNER
HAMILTON-WENHAM REGIONAL SCHOOL DISTRICT
5 SCHOOL STREET
WENHAM, MA 01984

NO.	DATE	DESCRIPTION	BY

PROJECT NO.	718600
CADD FILE	718600_wsPRE
DESIGNED BY	RDT
DRAWN BY	RDT
CHECKED BY	KDH
DATE	11/16/2023
DRAWING SCALE	1" = 30'

GRAPHIC SCALE
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SHEET TITLE

EXISTING
WATERSHED PLAN
SHEET 2 OF 3

DRAWING NO.
PRE-2

2 OF 6

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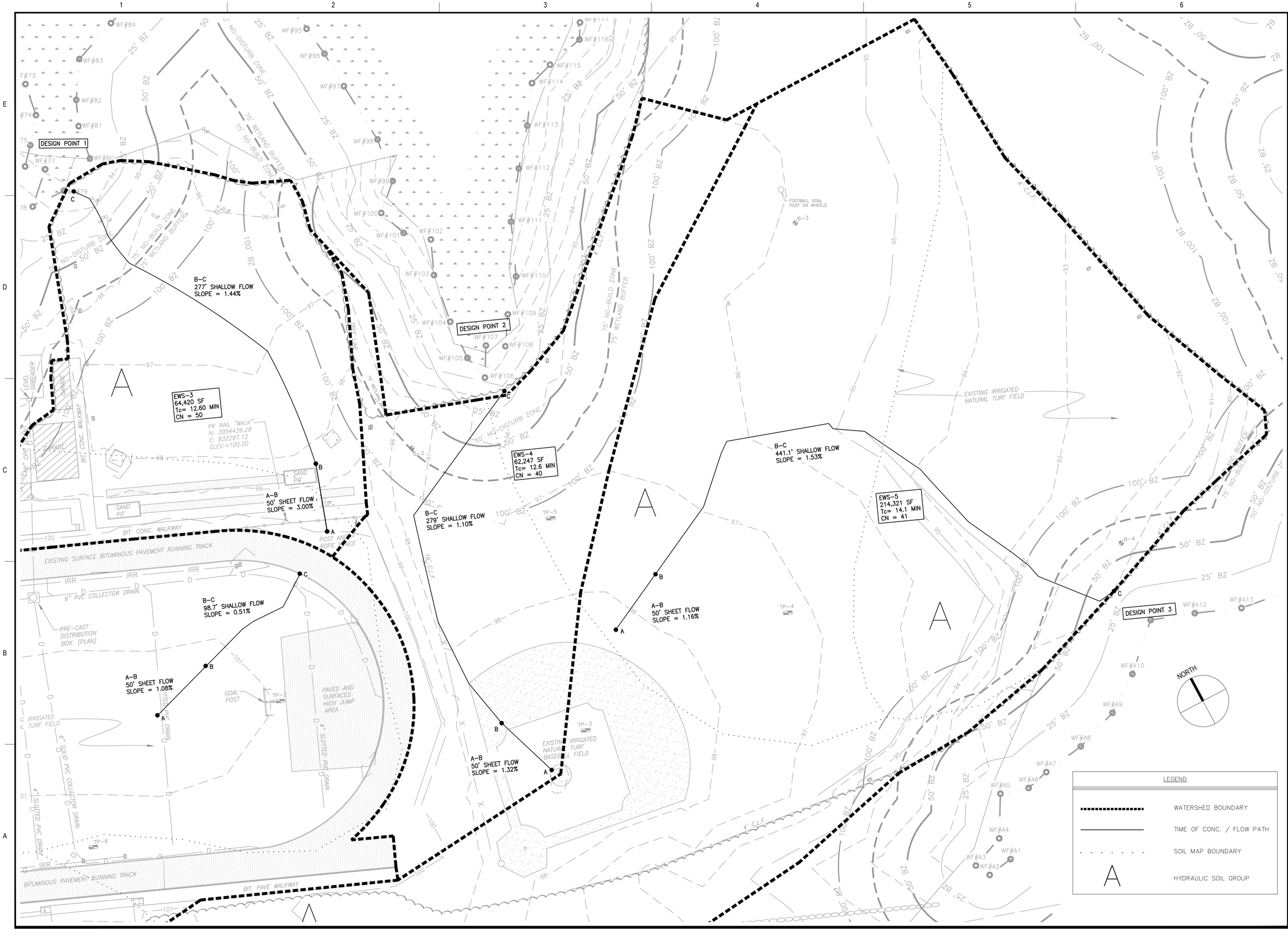

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SOUTH HAMILTON, MA 01982

OWNER

HAMILTON-WENHAM REGIONAL SCHOOL DISTRICT
5 SCHOOL STREET
WENHAM, MA 01984

NO.	DATE	DESCRIPTION	BY

PROJECT NO.	718600
CADD FILE	718600_wsPRE
DESIGNED BY	RDT
DRAWN BY	RDT
CHECKED BY	KDH
DATE	11/16/2023
DRAWING SCALE	1" = 30'

GRAPHIC SCALE

0 30' 60'

SHEET TITLE

EXISTING
WATERSHED PLAN
SHEET 3 OF 3

LEGEND

- WATERSHED BOUNDARY
- TIME OF CONC. / FLOW PATH
- SOIL MAP BOUNDARY
- A — HYDRAULIC SOIL GROUP

DRAWING NO.

PRE-3

3 OF 6

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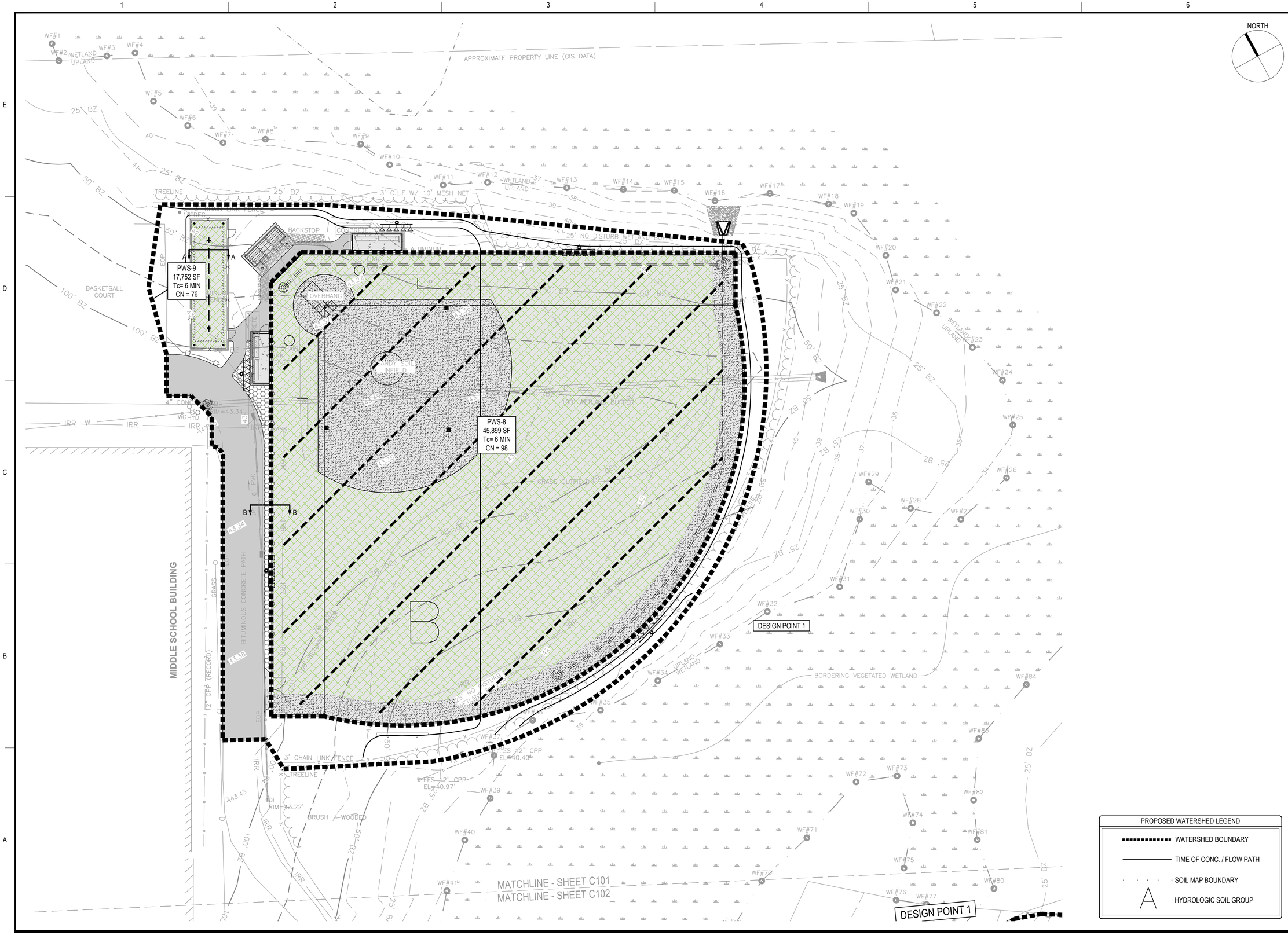

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OWNER
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5 SCHOOL STREET
WENHAM, MA 01984

NO.	DATE	DESCRIPTION	BY
1	2/13/2024	PEER REVIEW COMM.	KFR

PROJECT NO.	718601
CADD FILE	718601_wsPOST
DESIGNED BY	CRR / KFR
DRAWN BY	CRR / KFR
CHECKED BY	KDH / PS
DATE	11/16/2023
DRAWING SCALE	1" = 20'

GRAPHIC SCALE
0 10' 20' 40'

SHEET TITLE

PROPOSED
WATERSHED PLAN
SHEET 1 OF 3

DRAWING NO.
POST-1

4 OF 40

PROPOSED WATERSHED LEGEND

- WATERSHED BOUNDARY
- TIME OF CONC. / FLOW PATH
- SOIL MAP BOUNDARY
- A — HYDROLOGIC SOIL GROUP

NORTH

MATCHLINE - SHEET C101
MATCHLINE - SHEET C102

DESIGN POINT 1

DESIGN POINT 2

PWS-3
64,336 SF
Tc= 6 MIN
CN = 69

PWS-2
167,451 SF
Tc= 6 MIN
CN = 94

PWS-1
34,493 SF
Tc= 10.1 MIN
CN = 73

C-D
66.4' SHALLOW FLOW
SLOPE = 1.85%

B-C
21' SHALLOW FLOW
SLOPE = 2.40%

A-B
50' SHEET FLOW
SLOPE = 1.40%

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5 SCHOOL STREET
WENHAM, MA 01984

NO.	DATE	DESCRIPTION	BY
2	2/13/2024	PEER REVIEW COMM.	KFR

PROJECT NO.	718601
CADD FILE	718601_wsPOST
DESIGNED BY	CRR / KFR
DRAWN BY	CRR / KFR
CHECKED BY	KDH / PS
DATE	11/16/2023
DRAWING SCALE	1" = 30'

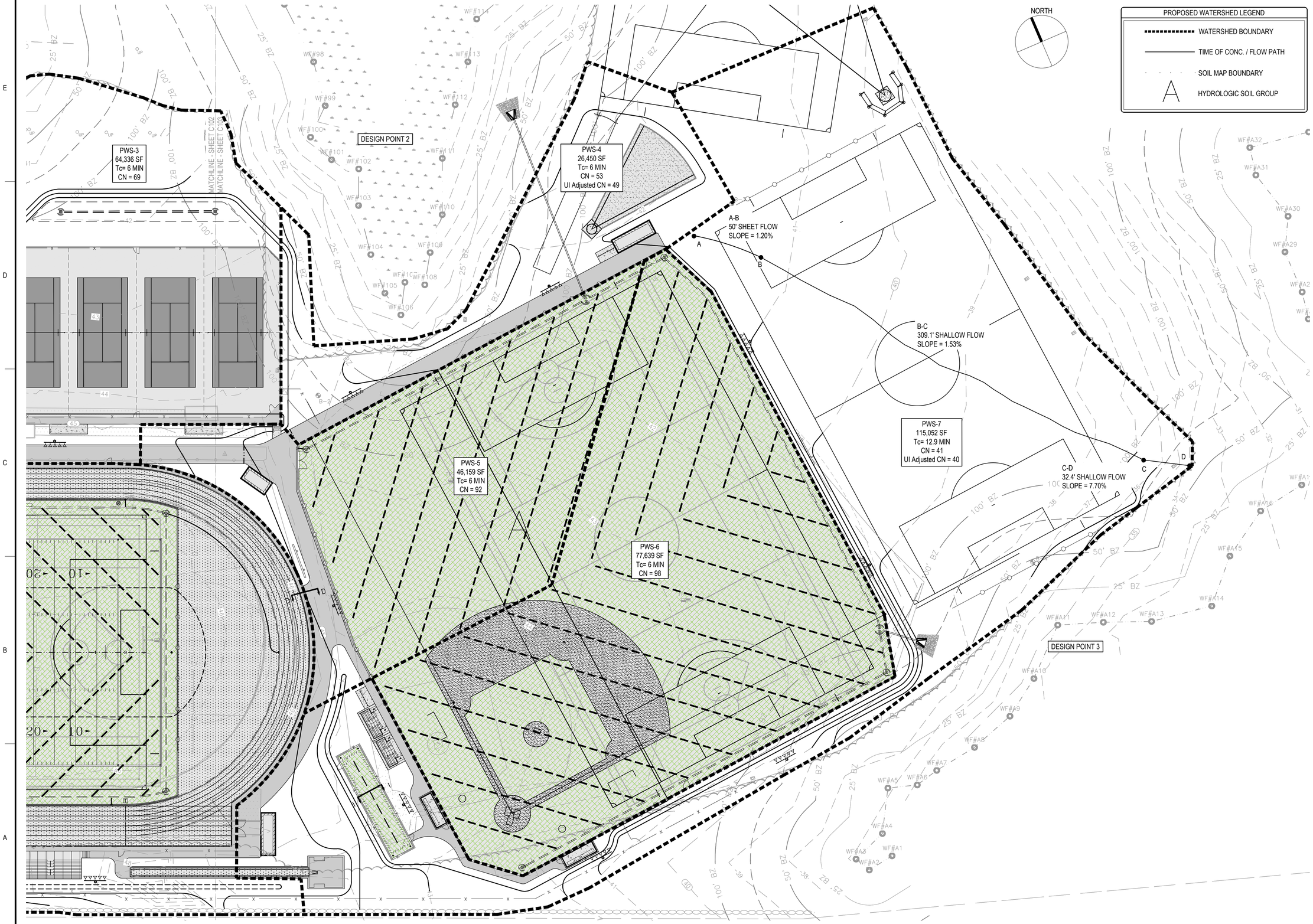
GRAPHIC SCALE
0 30' 60'

SHEET TITLE

PROPOSED
WATERSHED PLAN
SHEET 2 OF 3

DRAWING NO.
POST-2

5 OF 40



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WENHAM, MA 01984

NO.	DATE	DESCRIPTION	BY
2	2/13/2024	PEER REVIEW COMM.	KFR

PROJECT NO.	718601
CADD FILE	718601_wsPOST
DESIGNED BY	CRR / KFR
DRAWN BY	CRR / KFR
CHECKED BY	KDH / PS
DATE	11/16/2023
DRAWING SCALE	1" = 30'

GRAPHIC SCALE
0 30' 60'

SHEET TITLE

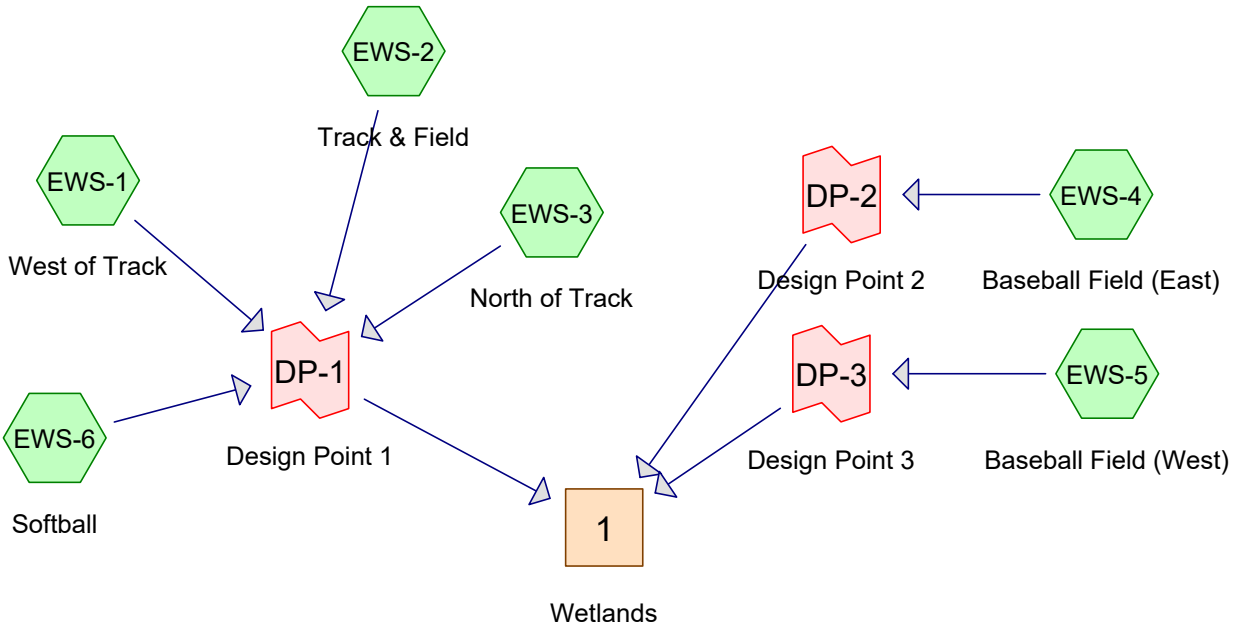
PROPOSED
WATERSHED PLAN
SHEET 3 OF 3

DRAWING NO.
POST-3

6 OF 40

ATTACHMENT 5

Pre & Post Development Hydrology Reports



Subcat Reach Pond Link

Routing Diagram for 718600_PRE 1114 23

Prepared by Bree D. Sullivan, P.E. - Gale Associates, Inc., Printed 2/12/2024

HydroCAD® 10.10-6a s/n 00742 © 2020 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.10	2
2	10-Year	Type III 24-hr		Default	24.00	1	4.50	2
3	100-Year	Type III 24-hr		Default	24.00	1	6.50	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
409,071	39	>75% Grass cover, Good, HSG A (EWS-1, EWS-2, EWS-3, EWS-4, EWS-5)
57,665	61	>75% Grass cover, Good, HSG B (EWS-1, EWS-2, EWS-6)
9,539	85	Gravel roads, HSG B (EWS-6)
2,302	96	Gravel surface, HSG B (EWS-6)
57,921	98	Unconnected pavement, HSG A (EWS-1, EWS-2, EWS-3)
14,695	98	Unconnected pavement, HSG B (EWS-1, EWS-2, EWS-3, EWS-6)
3,887	98	Unconnected roofs, HSG A (EWS-1, EWS-2, EWS-3)
33,859	36	Woods, Fair, HSG A (EWS-2, EWS-4, EWS-5)
588,939	50	TOTAL AREA

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
504,738	HSG A	EWS-1, EWS-2, EWS-3, EWS-4, EWS-5
84,201	HSG B	EWS-1, EWS-2, EWS-3, EWS-6
0	HSG C	
0	HSG D	
0	Other	
588,939		TOTAL AREA

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subcatchment Numbers
409,071	57,665	0	0	0	466,736	>75% Grass cover, Good	EWS-1, EWS-2, EWS-3, EWS-4, EWS-5, EWS-6
0	9,539	0	0	0	9,539	Gravel roads	EWS-6
0	2,302	0	0	0	2,302	Gravel surface	EWS-6
57,921	14,695	0	0	0	72,616	Unconnected pavement	EWS-1, EWS-2, EWS-3, EWS-6
3,887	0	0	0	0	3,887	Unconnected roofs	EWS-1, EWS-2, EWS-3
33,859	0	0	0	0	33,859	Woods, Fair	EWS-2, EWS-4, EWS-5
504,738	84,201	0	0	0	588,939	TOTAL AREA	

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EWS-1: West of Track
Runoff Area=21,230 sf 61.93% Impervious Runoff Depth>1.26"
Flow Length=141' Tc=6.9 min CN=79 Runoff=0.68 cfs 2,230 cf

Subcatchment EWS-2: Track & Field
Runoff Area=168,164 sf 30.17% Impervious Runoff Depth>0.31"
Flow Length=149' Tc=12.1 min CN=58 Runoff=0.54 cfs 4,279 cf

Subcatchment EWS-3: North of Track
Runoff Area=64,420 sf 19.15% Impervious Runoff Depth>0.03"
Flow Length=327' Tc=12.6 min UI Adjusted CN=45 Runoff=0.01 cfs 177 cf

Subcatchment EWS-4: Baseball Field (East)
Runoff Area=62,247 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=329' Tc=12.6 min CN=39 Runoff=0.00 cfs 0 cf

Subcatchment EWS-5: Baseball Field (West)
Runoff Area=214,321 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=491' Tc=14.1 min CN=39 Runoff=0.00 cfs 0 cf

Subcatchment EWS-6: Softball
Runoff Area=58,557 sf 0.48% Impervious Runoff Depth>0.59"
Flow Length=189' Tc=7.1 min CN=66 Runoff=0.69 cfs 2,889 cf

Reach 1: Wetlands
Inflow=1.54 cfs 9,575 cf
Outflow=1.54 cfs 9,575 cf

Link DP-1: Design Point 1
Inflow=1.54 cfs 9,575 cf
Primary=1.54 cfs 9,575 cf

Link DP-2: Design Point 2
Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Link DP-3: Design Point 3
Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Total Runoff Area = 588,939 sf Runoff Volume = 9,575 cf Average Runoff Depth = 0.20"
87.01% Pervious = 512,436 sf 12.99% Impervious = 76,503 sf

Summary for Subcatchment EWS-1: West of Track

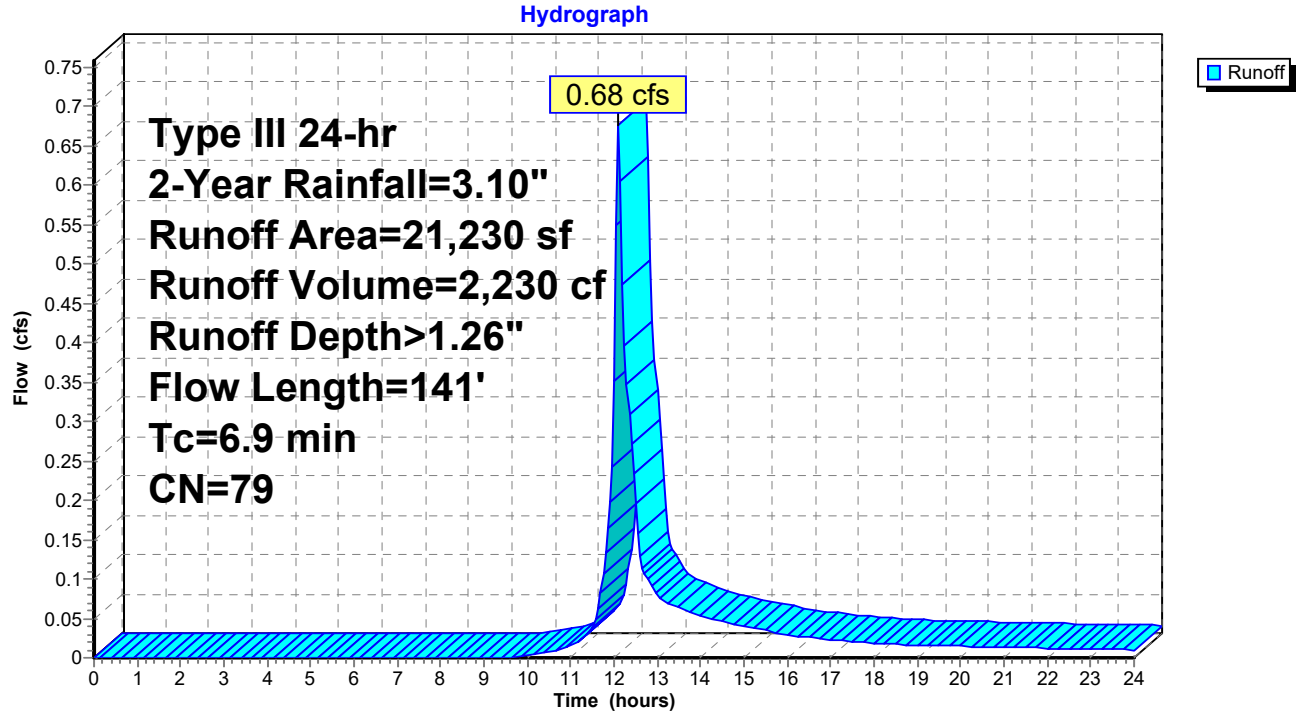
Runoff = 0.68 cfs @ 12.11 hrs, Volume= 2,230 cf, Depth> 1.26"
Routed to Link DP-1 : Design Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

	Area (sf)	CN	Description
	7,149	98	Unconnected pavement, HSG B
	3,634	61	>75% Grass cover, Good, HSG B
*	82	98	Unconnected roofs, HSG A
	4,449	39	>75% Grass cover, Good, HSG A
*	5,916	98	Unconnected pavement, HSG A
	21,230	79	Weighted Average
	8,083		38.07% Pervious Area
	13,147		61.93% Impervious Area
	13,147		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	37	0.0220	0.10		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 3.10"
0.6	104	0.0176	2.69		Shallow Concentrated Flow, B-C Paved Kv= 20.3 fps
6.9	141	Total			

Subcatchment EWS-1: West of Track



Summary for Subcatchment EWS-2: Track & Field

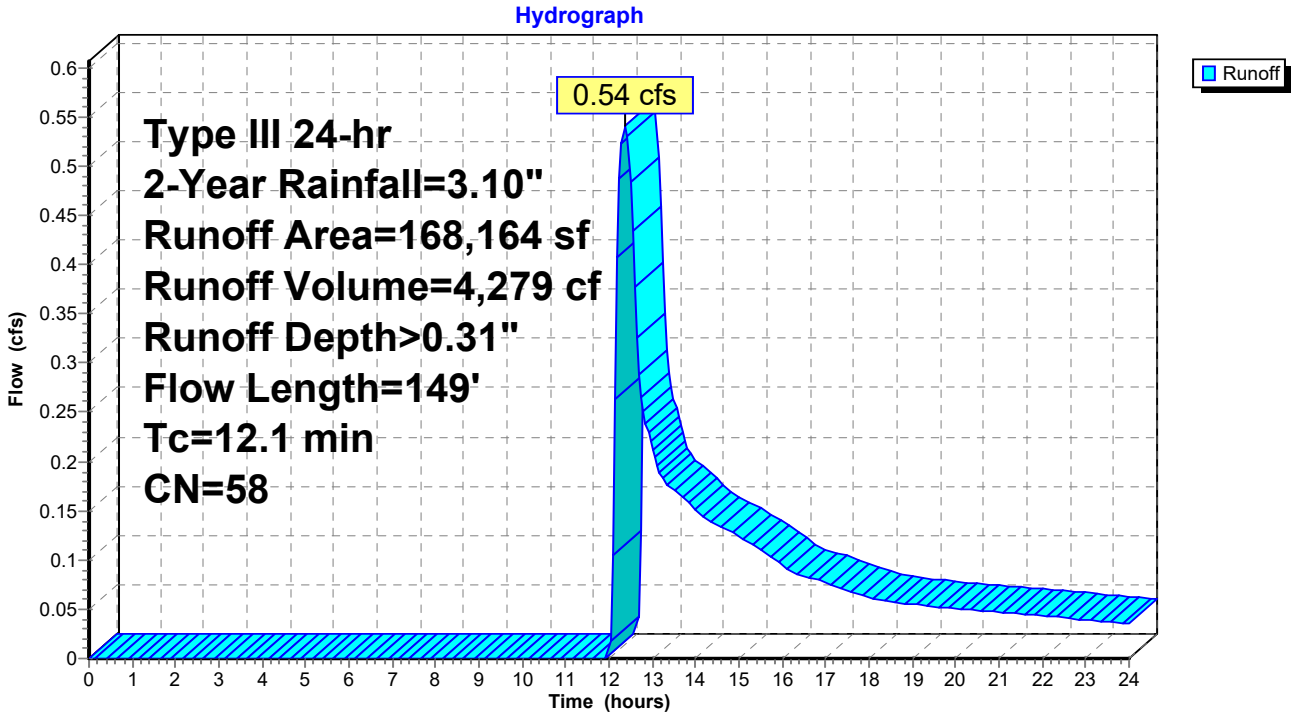
Runoff = 0.54 cfs @ 12.37 hrs, Volume= 4,279 cf, Depth> 0.31"
Routed to Link DP-1 : Design Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

	Area (sf)	CN	Description
	7,597	61	>75% Grass cover, Good, HSG B
*	258	98	Unconnected roofs, HSG A
	6,042	98	Unconnected pavement, HSG B
	9,872	36	Woods, Fair, HSG A
*	44,435	98	Unconnected pavement, HSG A
	99,960	39	>75% Grass cover, Good, HSG A
	168,164	58	Weighted Average
	117,429		69.83% Pervious Area
	50,735		30.17% Impervious Area
	50,735		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0108	0.08		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 3.10"
1.4	99	0.0051	1.15		Shallow Concentrated Flow, B-C Unpaved Kv= 16.1 fps
12.1	149	Total			

Subcatchment EWS-2: Track & Field



Summary for Subcatchment EWS-3: North of Track

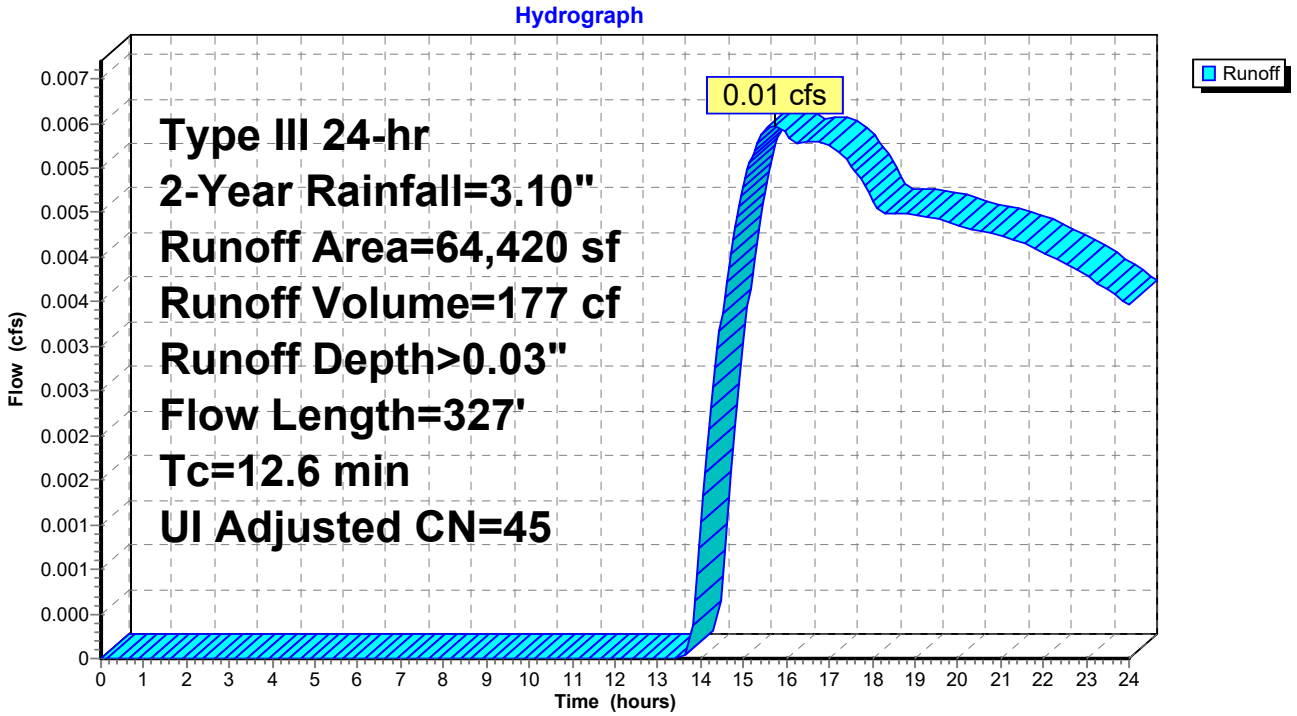
Runoff = 0.01 cfs @ 15.71 hrs, Volume= 177 cf, Depth> 0.03"
Routed to Link DP-1 : Design Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Adj	Description
52,081	39		>75% Grass cover, Good, HSG A
3,547	98		Unconnected roofs, HSG A
7,570	98		Unconnected pavement, HSG A
1,222	98		Unconnected pavement, HSG B
64,420	50	45	Weighted Average, UI Adjusted
52,081			80.85% Pervious Area
12,339			19.15% Impervious Area
12,339			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0300	0.12		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 3.10"
5.5	277	0.0144	0.84		Shallow Concentrated Flow, B-C Short Grass Pasture Kv= 7.0 fps
12.6	327	Total			

Subcatchment EWS-3: North of Track



Summary for Subcatchment EWS-4: Baseball Field (East)

[45] Hint: Runoff=Zero

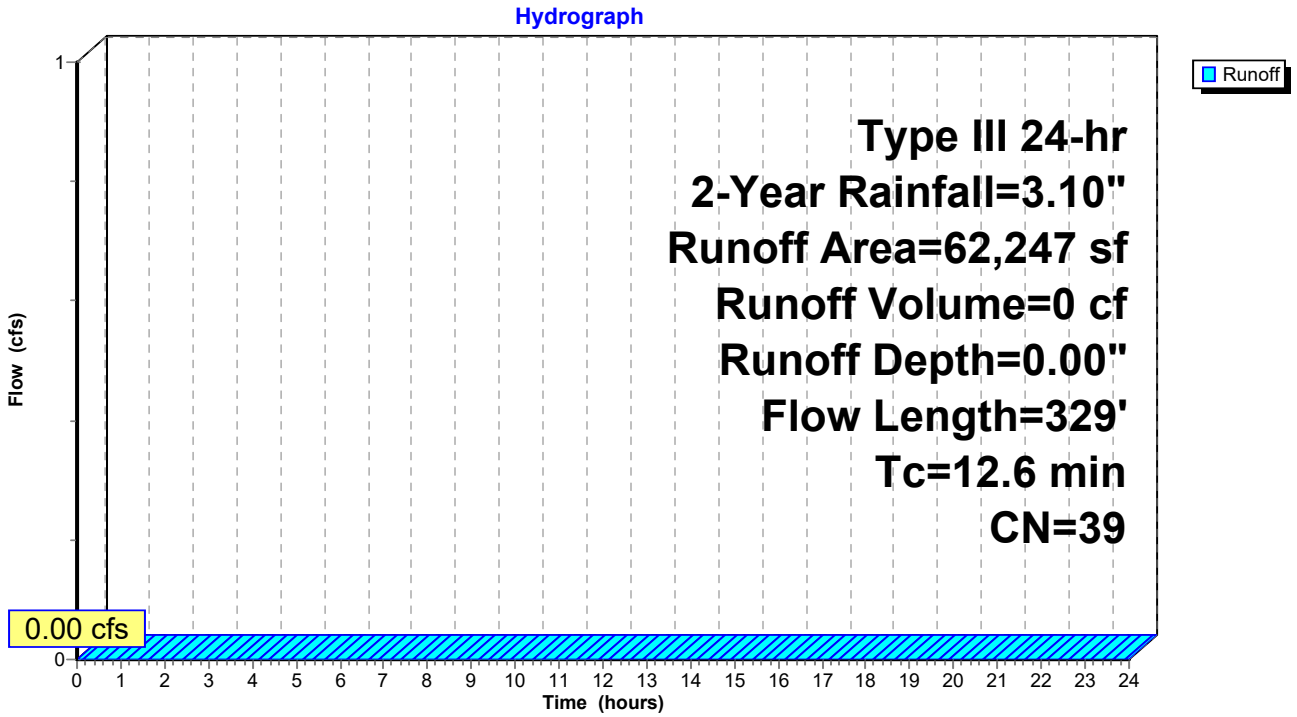
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Link DP-2 : Design Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
60,403	39	>75% Grass cover, Good, HSG A
1,844	36	Woods, Fair, HSG A
62,247	39	Weighted Average
62,247		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0132	0.08		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 3.10"
2.8	279	0.0110	1.69		Shallow Concentrated Flow, B-C Unpaved Kv= 16.1 fps
12.6	329	Total			

Subcatchment EWS-4: Baseball Field (East)



Summary for Subcatchment EWS-5: Baseball Field (West)

[45] Hint: Runoff=Zero

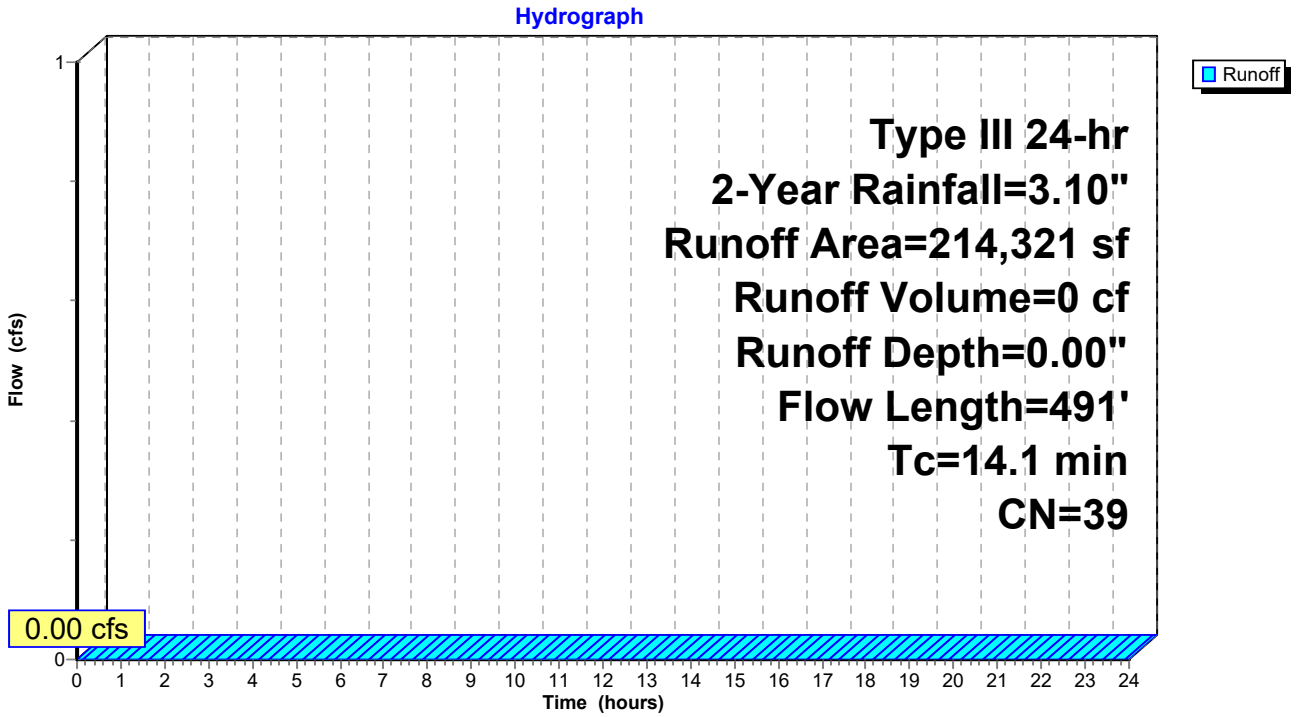
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Link DP-3 : Design Point 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
192,178	39	>75% Grass cover, Good, HSG A
22,143	36	Woods, Fair, HSG A
214,321	39	Weighted Average
214,321		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	50	0.0116	0.08		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 3.10"
3.7	441	0.0153	1.99		Shallow Concentrated Flow, B-C Unpaved Kv= 16.1 fps
14.1	491	Total			

Subcatchment EWS-5: Baseball Field (West)



Summary for Subcatchment EWS-6: Softball

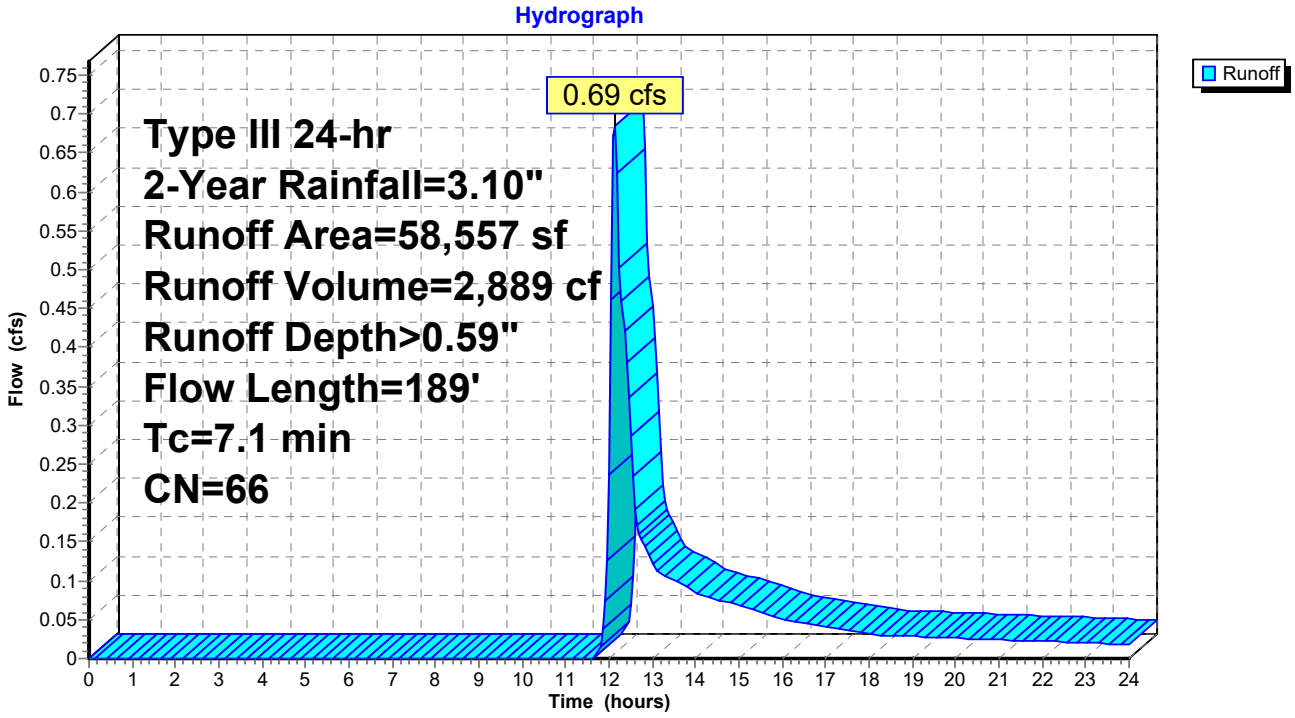
Runoff = 0.69 cfs @ 12.13 hrs, Volume= 2,889 cf, Depth> 0.59"
Routed to Link DP-1 : Design Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
9,539	85	Gravel roads, HSG B
2,302	96	Gravel surface, HSG B
282	98	Unconnected pavement, HSG B
46,434	61	>75% Grass cover, Good, HSG B
58,557	66	Weighted Average
58,275		99.52% Pervious Area
282		0.48% Impervious Area
282		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	50	0.0040	0.18		Sheet Flow, A-B Fallow n= 0.050 P2= 3.10"
2.6	139	0.0166	0.90		Shallow Concentrated Flow, B-C Short Grass Pasture Kv= 7.0 fps
7.1	189	Total			

Subcatchment EWS-6: Softball



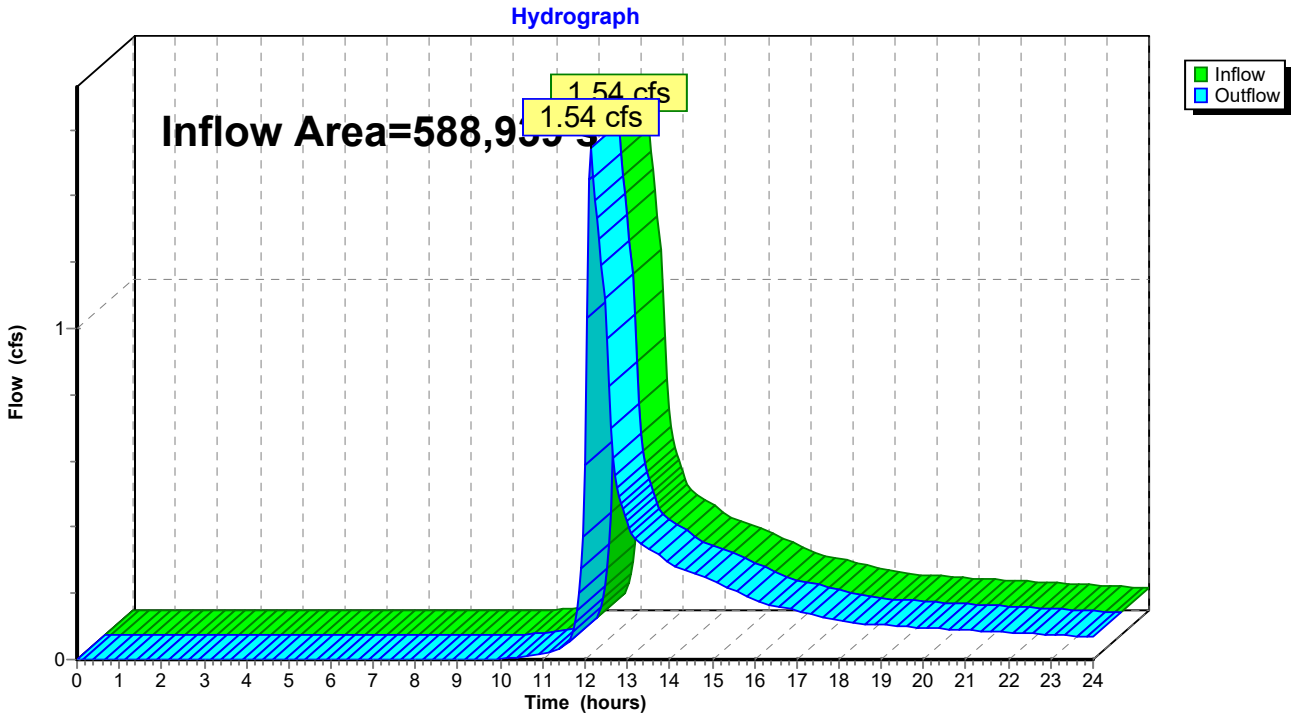
Summary for Reach 1: Wetlands

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

Inflow Area = 588,939 sf, 12.99% Impervious, Inflow Depth > 0.20" for 2-Year event
Inflow = 1.54 cfs @ 12.15 hrs, Volume= 9,575 cf
Outflow = 1.54 cfs @ 12.15 hrs, Volume= 9,575 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach 1: Wetlands

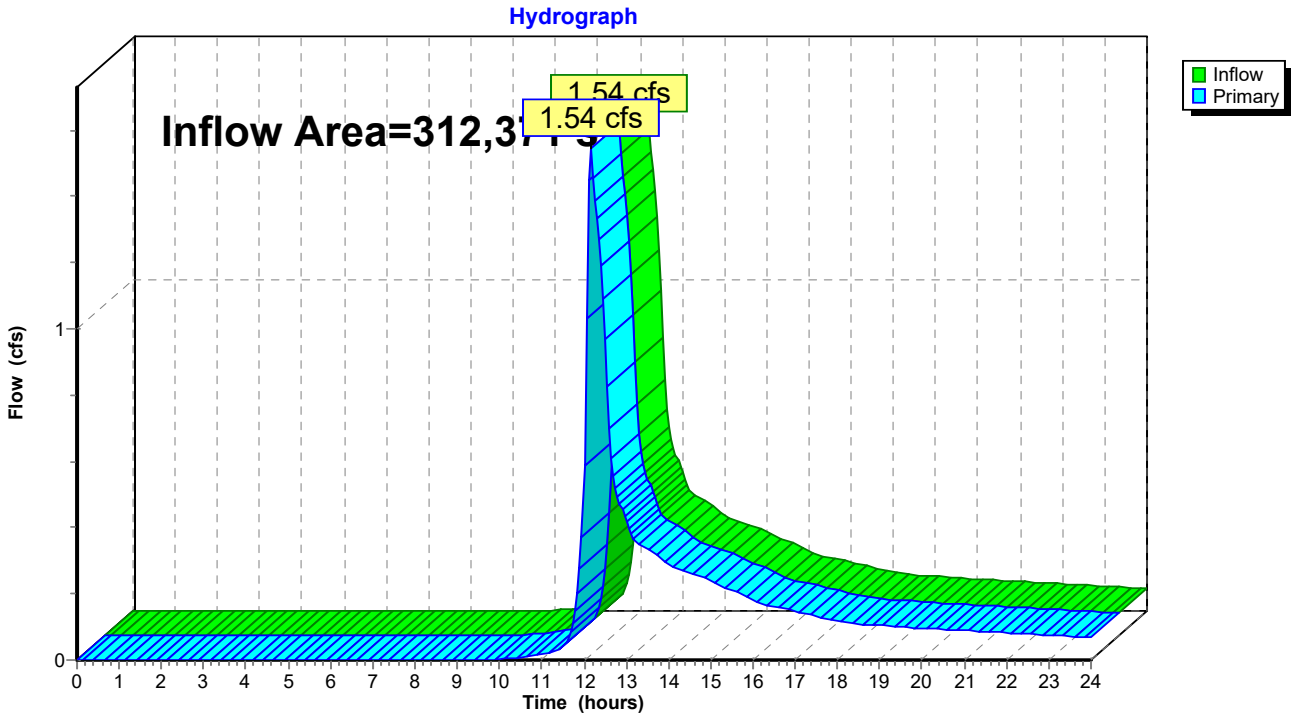


Summary for Link DP-1: Design Point 1

Inflow Area = 312,371 sf, 24.49% Impervious, Inflow Depth > 0.37" for 2-Year event
Inflow = 1.54 cfs @ 12.15 hrs, Volume= 9,575 cf
Primary = 1.54 cfs @ 12.15 hrs, Volume= 9,575 cf, Atten= 0%, Lag= 0.0 min
Routed to Reach 1 : Wetlands

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP-1: Design Point 1

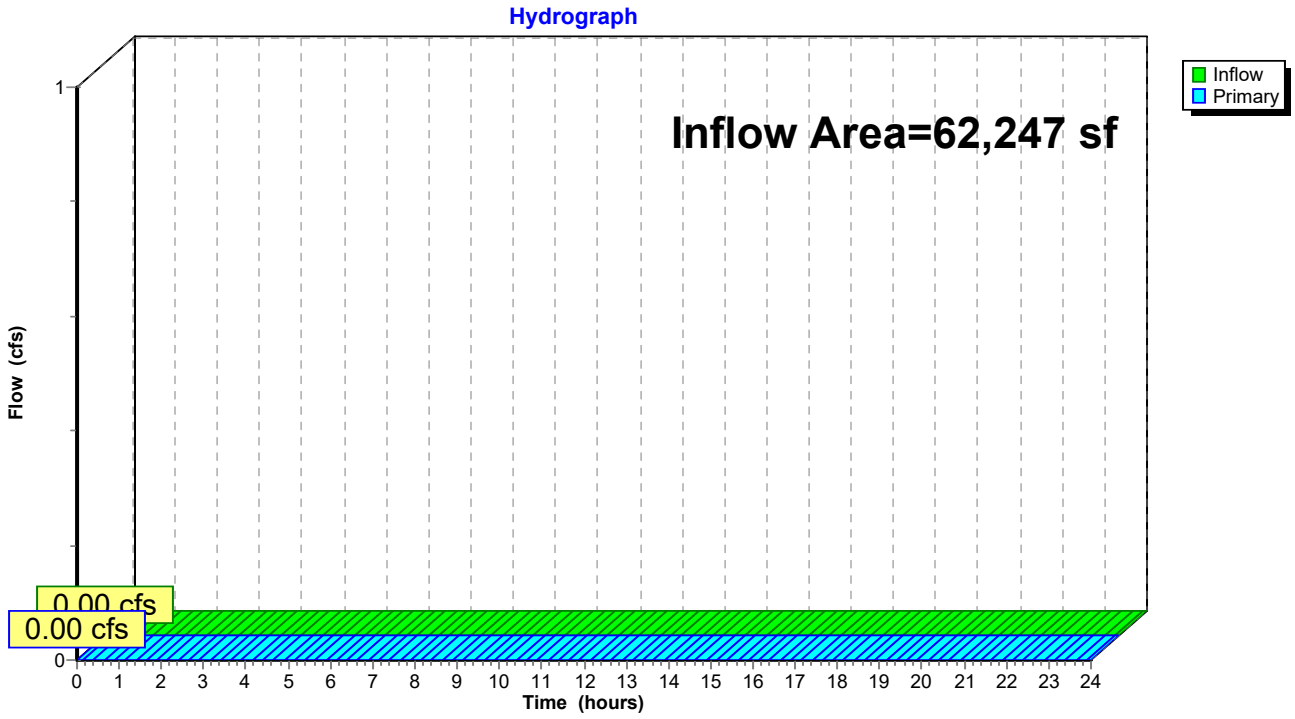


Summary for Link DP-2: Design Point 2

Inflow Area = 62,247 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min
Routed to Reach 1 : Wetlands

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP-2: Design Point 2

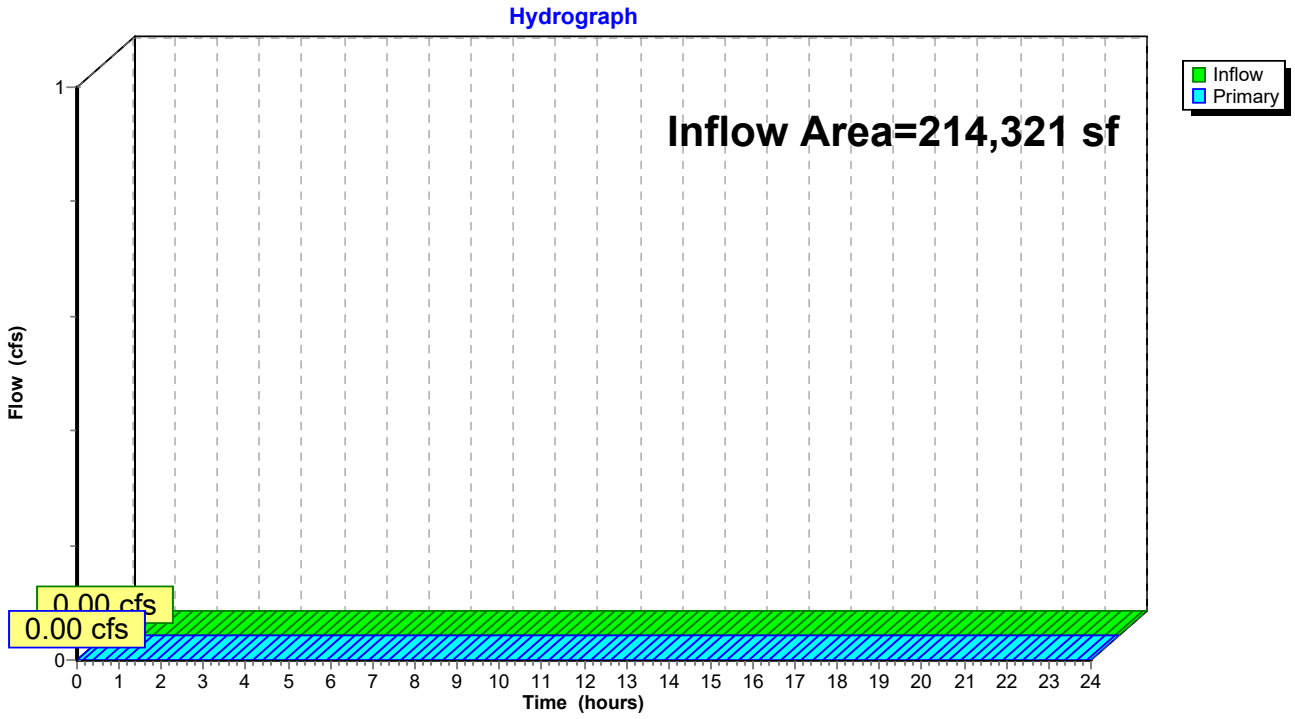


Summary for Link DP-3: Design Point 3

Inflow Area = 214,321 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min
Routed to Reach 1 : Wetlands

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP-3: Design Point 3



Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EWS-1: West of Track
Runoff Area=21,230 sf 61.93% Impervious Runoff Depth>2.37"
Flow Length=141' Tc=6.9 min CN=79 Runoff=1.30 cfs 4,200 cf

Subcatchment EWS-2: Track & Field
Runoff Area=168,164 sf 30.17% Impervious Runoff Depth>0.90"
Flow Length=149' Tc=12.1 min CN=58 Runoff=2.66 cfs 12,635 cf

Subcatchment EWS-3: North of Track
Runoff Area=64,420 sf 19.15% Impervious Runoff Depth>0.29"
Flow Length=327' Tc=12.6 min UI Adjusted CN=45 Runoff=0.15 cfs 1,579 cf

Subcatchment EWS-4: Baseball Field (East)
Runoff Area=62,247 sf 0.00% Impervious Runoff Depth>0.11"
Flow Length=329' Tc=12.6 min CN=39 Runoff=0.02 cfs 568 cf

Subcatchment EWS-5: Baseball Field (West)
Runoff Area=214,321 sf 0.00% Impervious Runoff Depth>0.11"
Flow Length=491' Tc=14.1 min CN=39 Runoff=0.07 cfs 1,955 cf

Subcatchment EWS-6: Softball
Runoff Area=58,557 sf 0.48% Impervious Runoff Depth>1.39"
Flow Length=189' Tc=7.1 min CN=66 Runoff=1.96 cfs 6,804 cf

Reach 1: Wetlands
Inflow=5.41 cfs 27,741 cf
Outflow=5.41 cfs 27,741 cf

Link DP-1: Design Point 1
Inflow=5.41 cfs 25,218 cf
Primary=5.41 cfs 25,218 cf

Link DP-2: Design Point 2
Inflow=0.02 cfs 568 cf
Primary=0.02 cfs 568 cf

Link DP-3: Design Point 3
Inflow=0.07 cfs 1,955 cf
Primary=0.07 cfs 1,955 cf

Total Runoff Area = 588,939 sf Runoff Volume = 27,741 cf Average Runoff Depth = 0.57"
87.01% Pervious = 512,436 sf 12.99% Impervious = 76,503 sf

Summary for Subcatchment EWS-1: West of Track

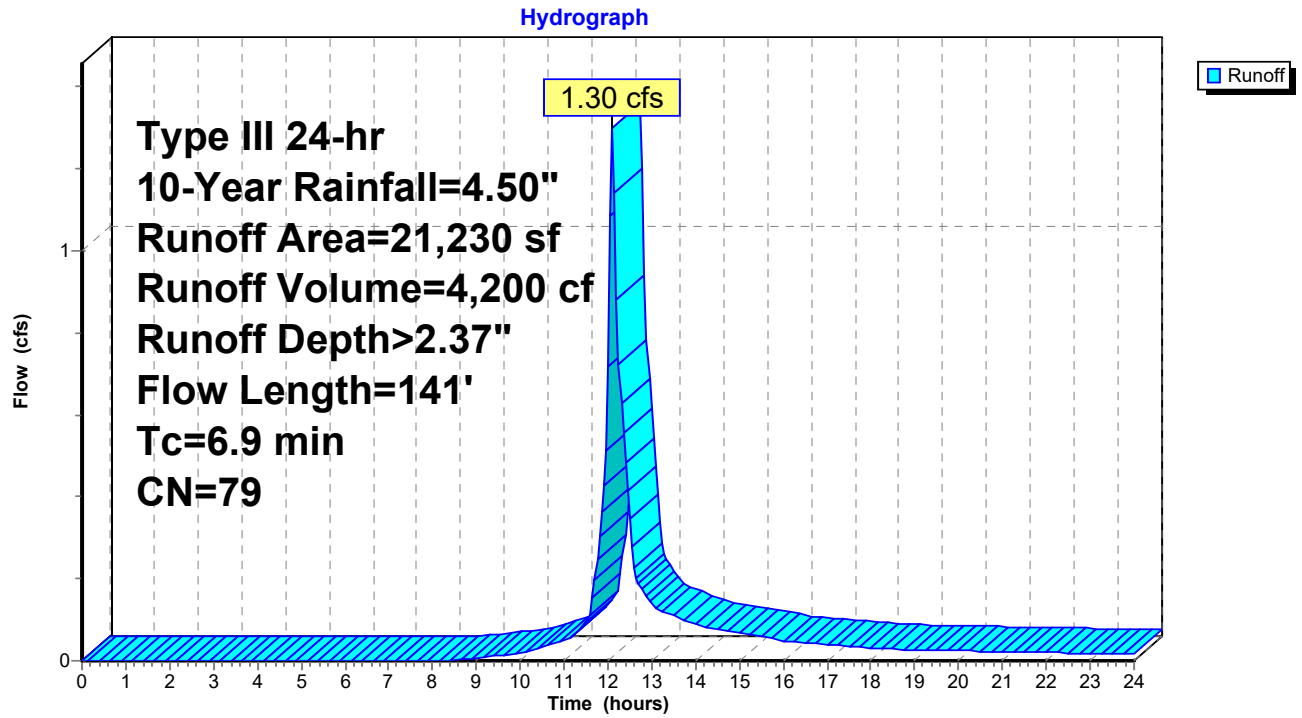
Runoff = 1.30 cfs @ 12.10 hrs, Volume= 4,200 cf, Depth> 2.37"
Routed to Link DP-1 : Design Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

	Area (sf)	CN	Description
	7,149	98	Unconnected pavement, HSG B
	3,634	61	>75% Grass cover, Good, HSG B
*	82	98	Unconnected roofs, HSG A
	4,449	39	>75% Grass cover, Good, HSG A
*	5,916	98	Unconnected pavement, HSG A
	21,230	79	Weighted Average
	8,083		38.07% Pervious Area
	13,147		61.93% Impervious Area
	13,147		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	37	0.0220	0.10		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 3.10"
0.6	104	0.0176	2.69		Shallow Concentrated Flow, B-C Paved Kv= 20.3 fps
6.9	141	Total			

Subcatchment EWS-1: West of Track



Summary for Subcatchment EWS-2: Track & Field

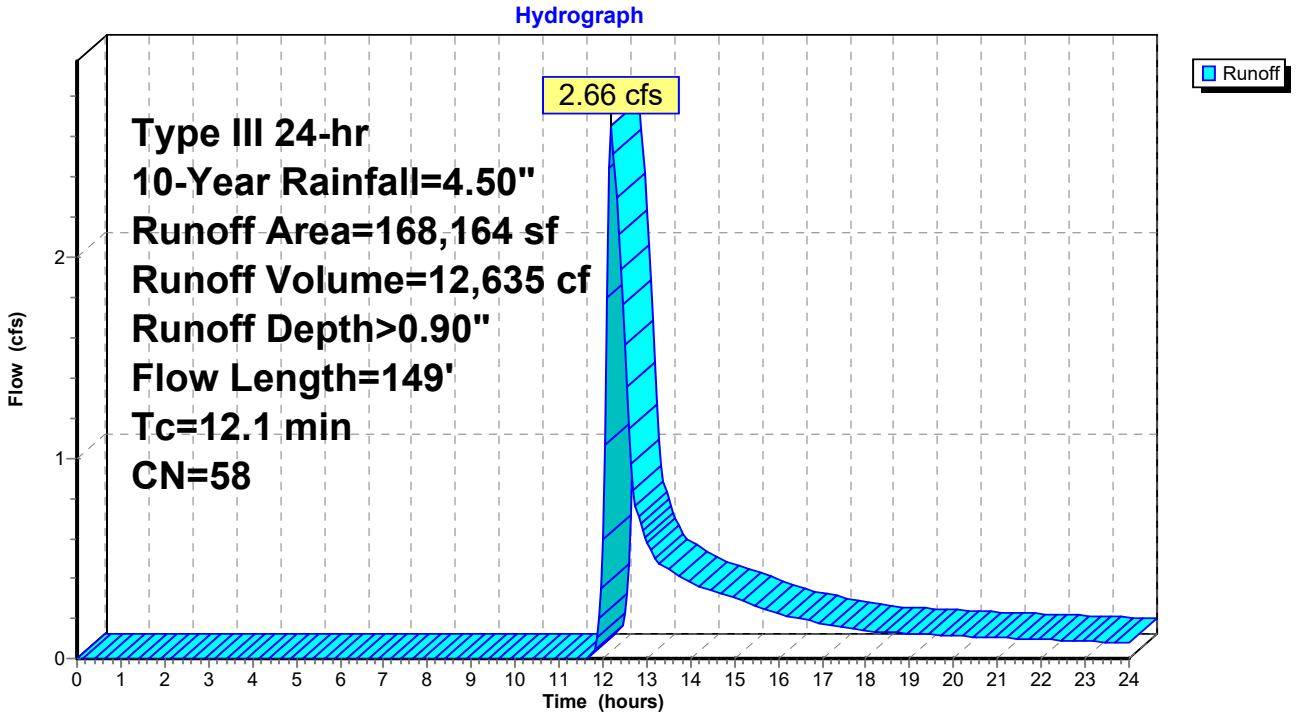
Runoff = 2.66 cfs @ 12.21 hrs, Volume= 12,635 cf, Depth> 0.90"
Routed to Link DP-1 : Design Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

	Area (sf)	CN	Description
	7,597	61	>75% Grass cover, Good, HSG B
*	258	98	Unconnected roofs, HSG A
	6,042	98	Unconnected pavement, HSG B
	9,872	36	Woods, Fair, HSG A
*	44,435	98	Unconnected pavement, HSG A
	99,960	39	>75% Grass cover, Good, HSG A
	168,164	58	Weighted Average
	117,429		69.83% Pervious Area
	50,735		30.17% Impervious Area
	50,735		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0108	0.08		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 3.10"
1.4	99	0.0051	1.15		Shallow Concentrated Flow, B-C Unpaved Kv= 16.1 fps
12.1	149	Total			

Subcatchment EWS-2: Track & Field



Summary for Subcatchment EWS-3: North of Track

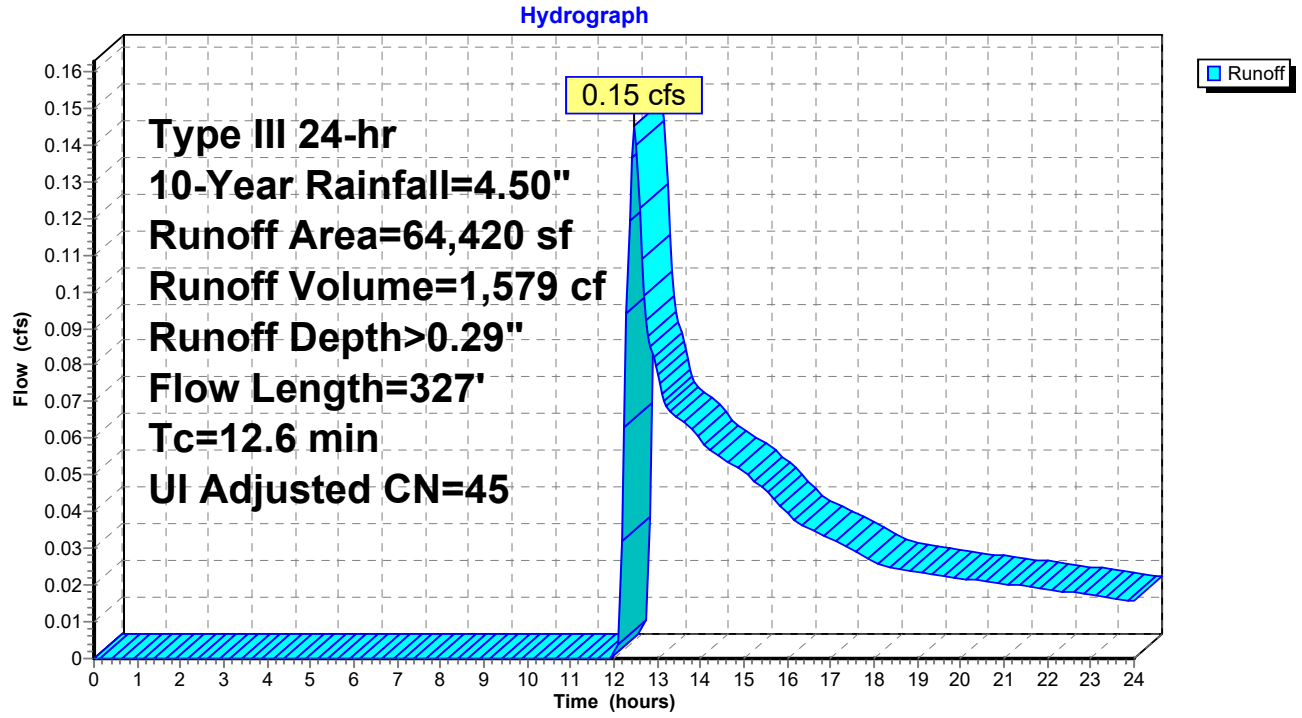
Runoff = 0.15 cfs @ 12.47 hrs, Volume= 1,579 cf, Depth> 0.29"
Routed to Link DP-1 : Design Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Adj	Description
52,081	39		>75% Grass cover, Good, HSG A
3,547	98		Unconnected roofs, HSG A
7,570	98		Unconnected pavement, HSG A
1,222	98		Unconnected pavement, HSG B
64,420	50	45	Weighted Average, UI Adjusted
52,081			80.85% Pervious Area
12,339			19.15% Impervious Area
12,339			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0300	0.12		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 3.10"
5.5	277	0.0144	0.84		Shallow Concentrated Flow, B-C Short Grass Pasture Kv= 7.0 fps
12.6	327	Total			

Subcatchment EWS-3: North of Track



Summary for Subcatchment EWS-4: Baseball Field (East)

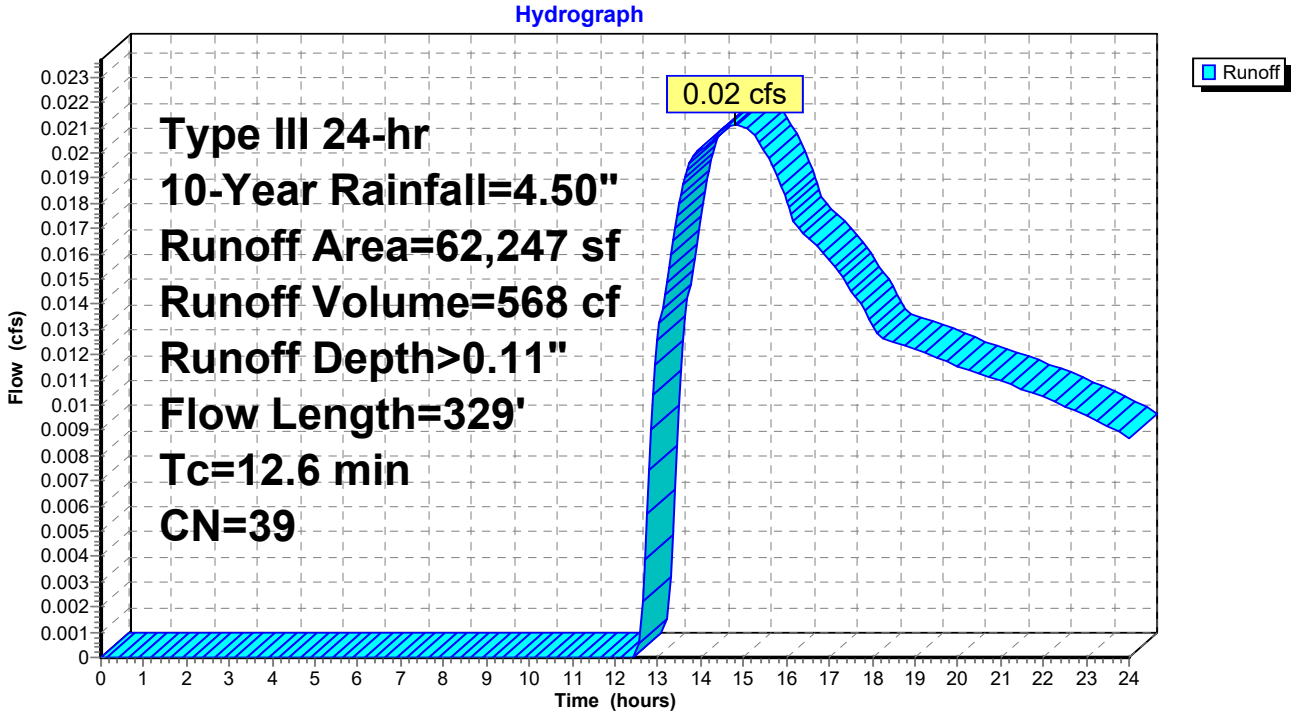
Runoff = 0.02 cfs @ 14.81 hrs, Volume= 568 cf, Depth> 0.11"
Routed to Link DP-2 : Design Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
60,403	39	>75% Grass cover, Good, HSG A
1,844	36	Woods, Fair, HSG A
62,247	39	Weighted Average
62,247		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0132	0.08		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 3.10"
2.8	279	0.0110	1.69		Shallow Concentrated Flow, B-C Unpaved Kv= 16.1 fps
12.6	329	Total			

Subcatchment EWS-4: Baseball Field (East)



Summary for Subcatchment EWS-5: Baseball Field (West)

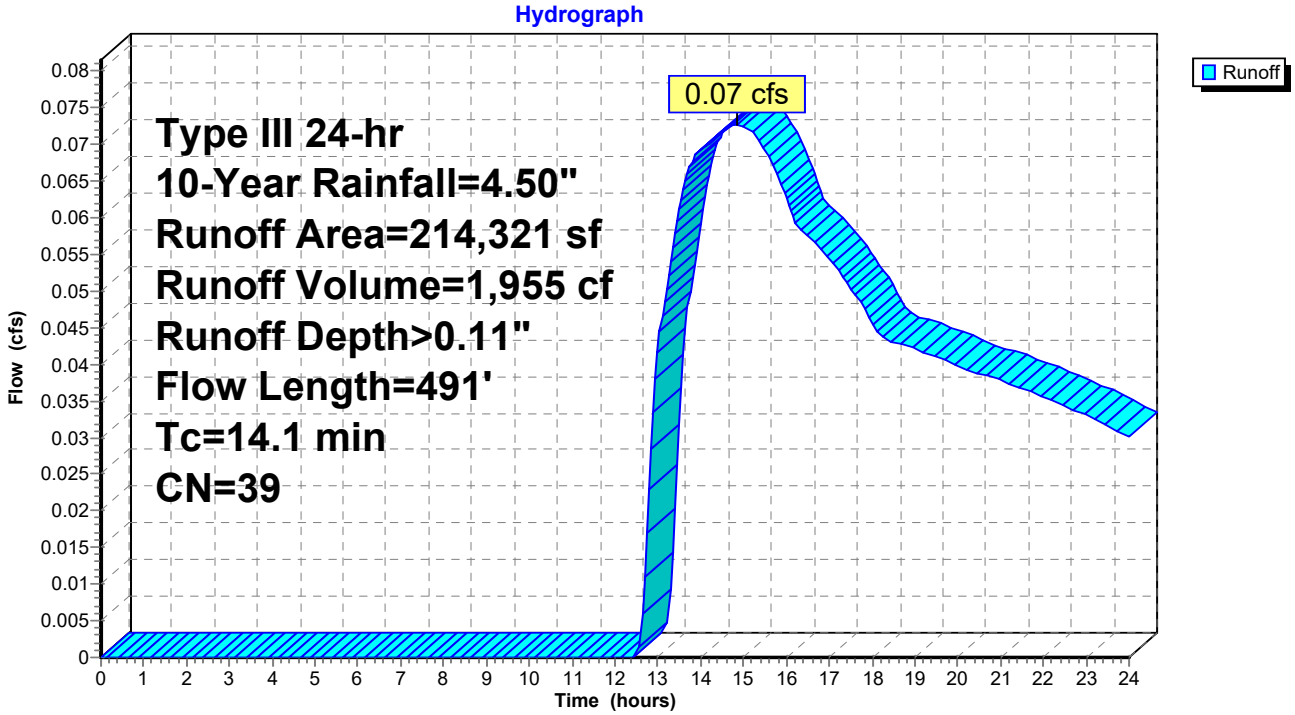
Runoff = 0.07 cfs @ 14.84 hrs, Volume= 1,955 cf, Depth> 0.11"
Routed to Link DP-3 : Design Point 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
192,178	39	>75% Grass cover, Good, HSG A
22,143	36	Woods, Fair, HSG A
214,321	39	Weighted Average
214,321		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	50	0.0116	0.08		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 3.10"
3.7	441	0.0153	1.99		Shallow Concentrated Flow, B-C Unpaved Kv= 16.1 fps
14.1	491	Total			

Subcatchment EWS-5: Baseball Field (West)



Summary for Subcatchment EWS-6: Softball

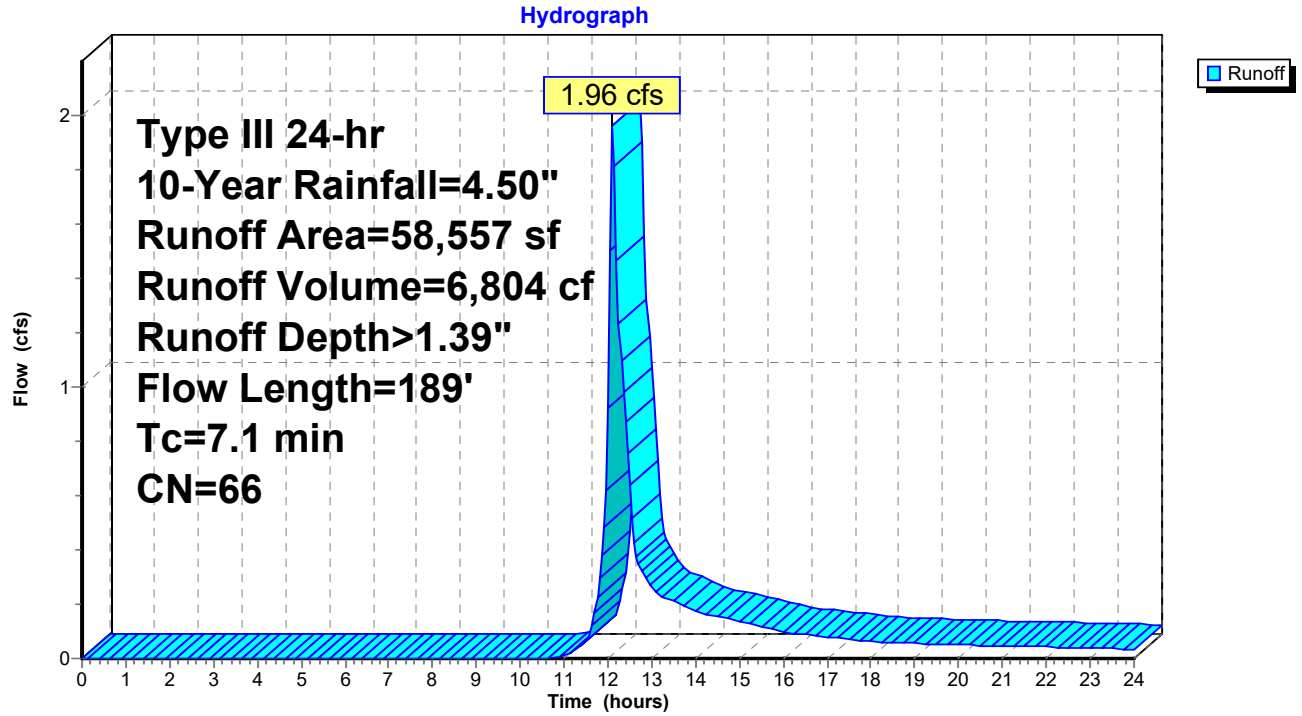
Runoff = 1.96 cfs @ 12.11 hrs, Volume= 6,804 cf, Depth> 1.39"
Routed to Link DP-1 : Design Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
9,539	85	Gravel roads, HSG B
2,302	96	Gravel surface, HSG B
282	98	Unconnected pavement, HSG B
46,434	61	>75% Grass cover, Good, HSG B
58,557	66	Weighted Average
58,275		99.52% Pervious Area
282		0.48% Impervious Area
282		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	50	0.0040	0.18		Sheet Flow, A-B Fallow n= 0.050 P2= 3.10"
2.6	139	0.0166	0.90		Shallow Concentrated Flow, B-C Short Grass Pasture Kv= 7.0 fps
7.1	189	Total			

Subcatchment EWS-6: Softball



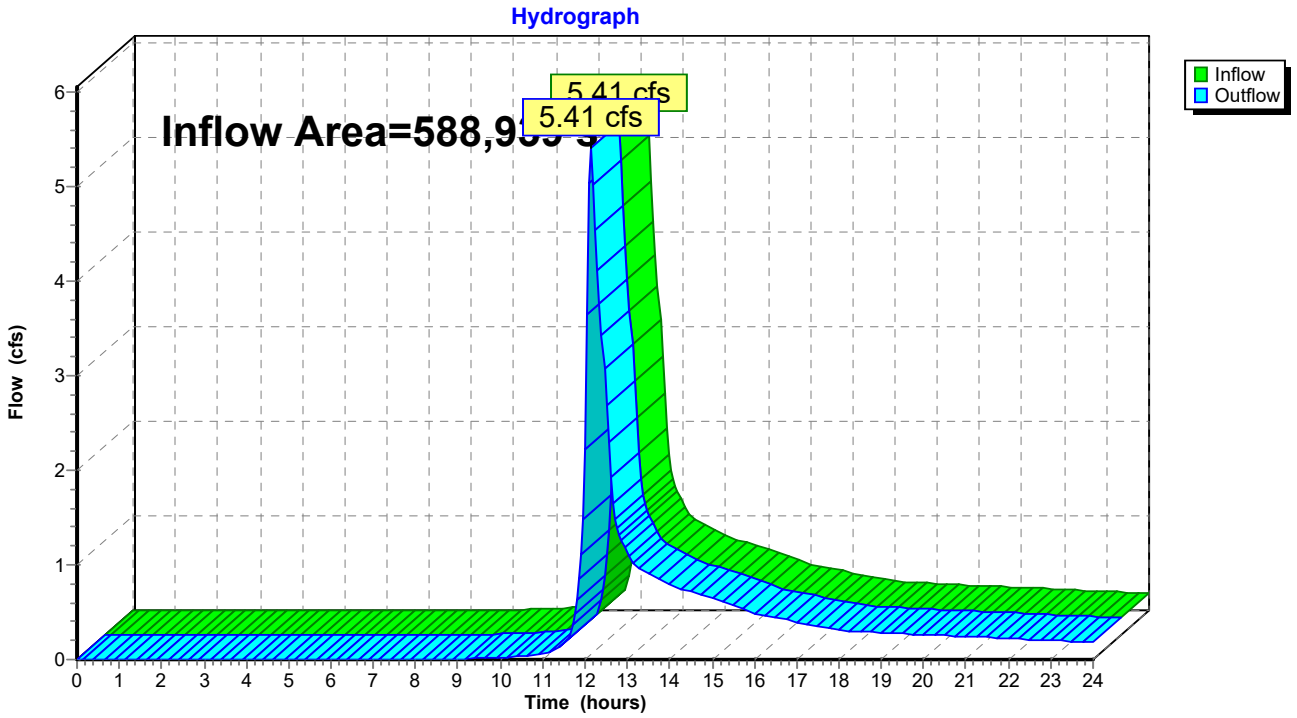
Summary for Reach 1: Wetlands

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

Inflow Area = 588,939 sf, 12.99% Impervious, Inflow Depth > 0.57" for 10-Year event
Inflow = 5.41 cfs @ 12.15 hrs, Volume= 27,741 cf
Outflow = 5.41 cfs @ 12.15 hrs, Volume= 27,741 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach 1: Wetlands

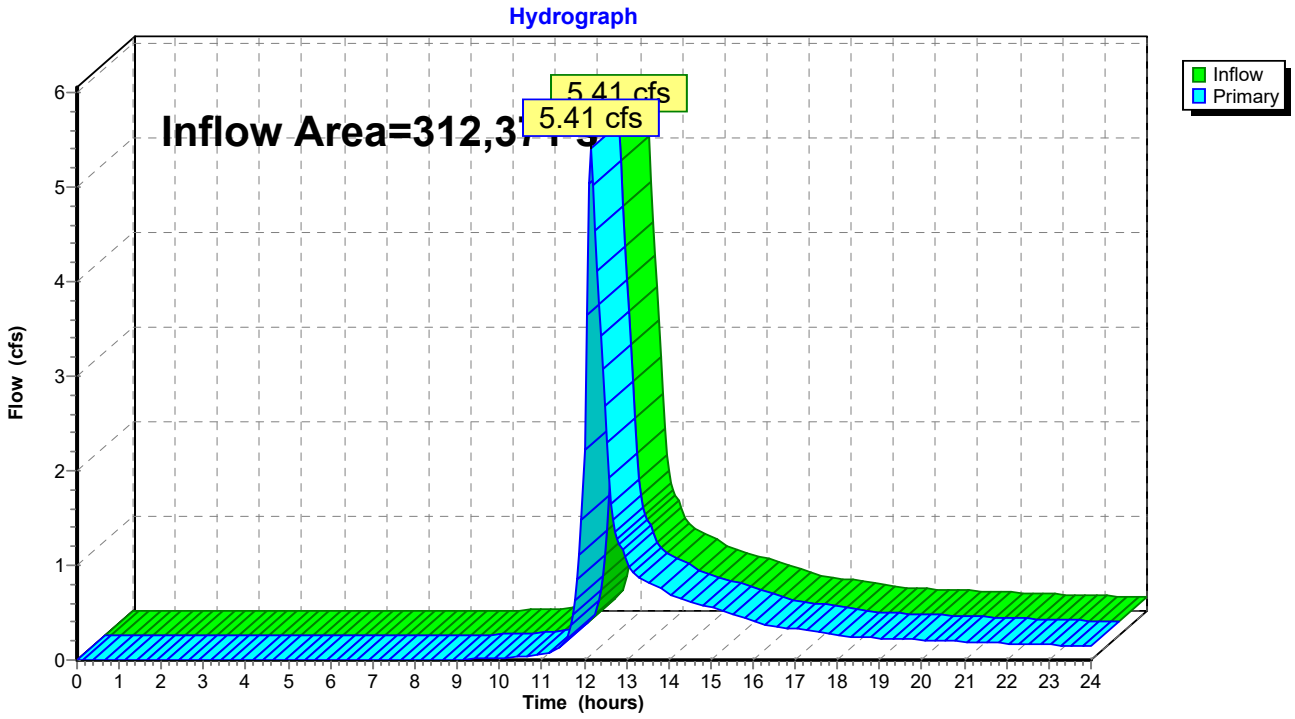


Summary for Link DP-1: Design Point 1

Inflow Area = 312,371 sf, 24.49% Impervious, Inflow Depth > 0.97" for 10-Year event
Inflow = 5.41 cfs @ 12.15 hrs, Volume= 25,218 cf
Primary = 5.41 cfs @ 12.15 hrs, Volume= 25,218 cf, Atten= 0%, Lag= 0.0 min
Routed to Reach 1 : Wetlands

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP-1: Design Point 1

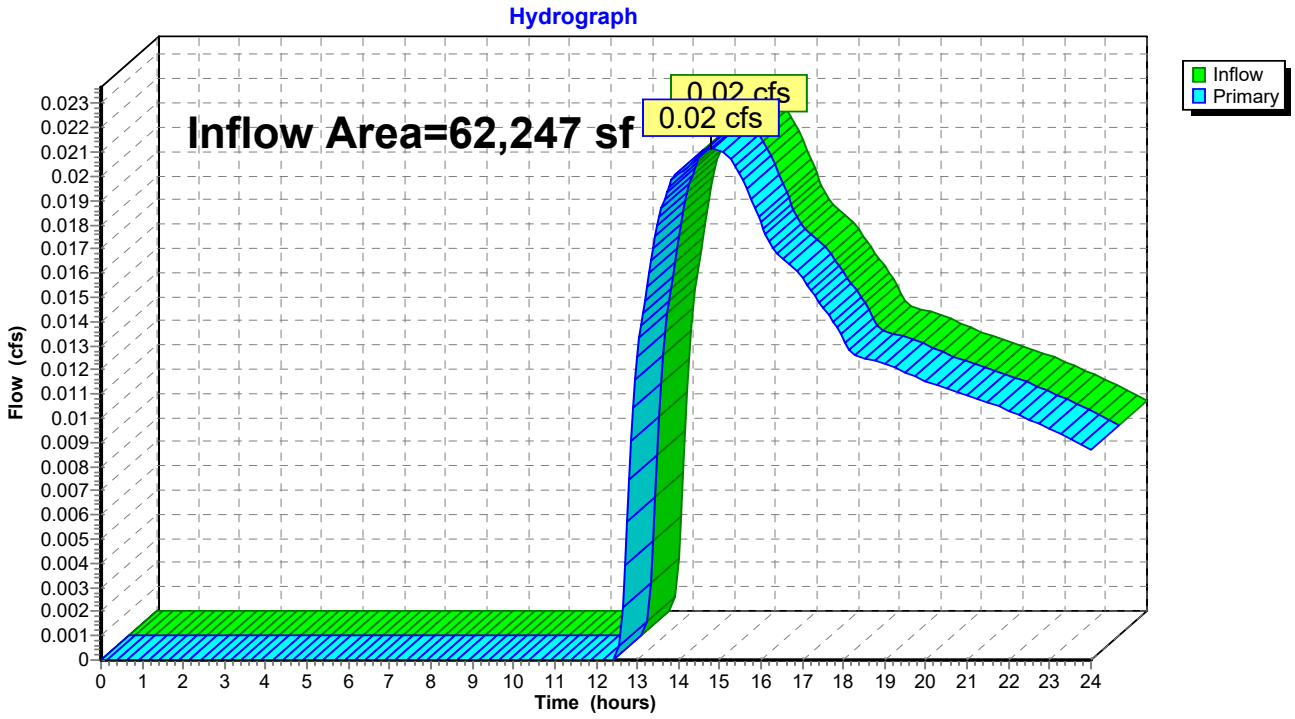


Summary for Link DP-2: Design Point 2

Inflow Area = 62,247 sf, 0.00% Impervious, Inflow Depth > 0.11" for 10-Year event
Inflow = 0.02 cfs @ 14.81 hrs, Volume= 568 cf
Primary = 0.02 cfs @ 14.81 hrs, Volume= 568 cf, Atten= 0%, Lag= 0.0 min
Routed to Reach 1 : Wetlands

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP-2: Design Point 2

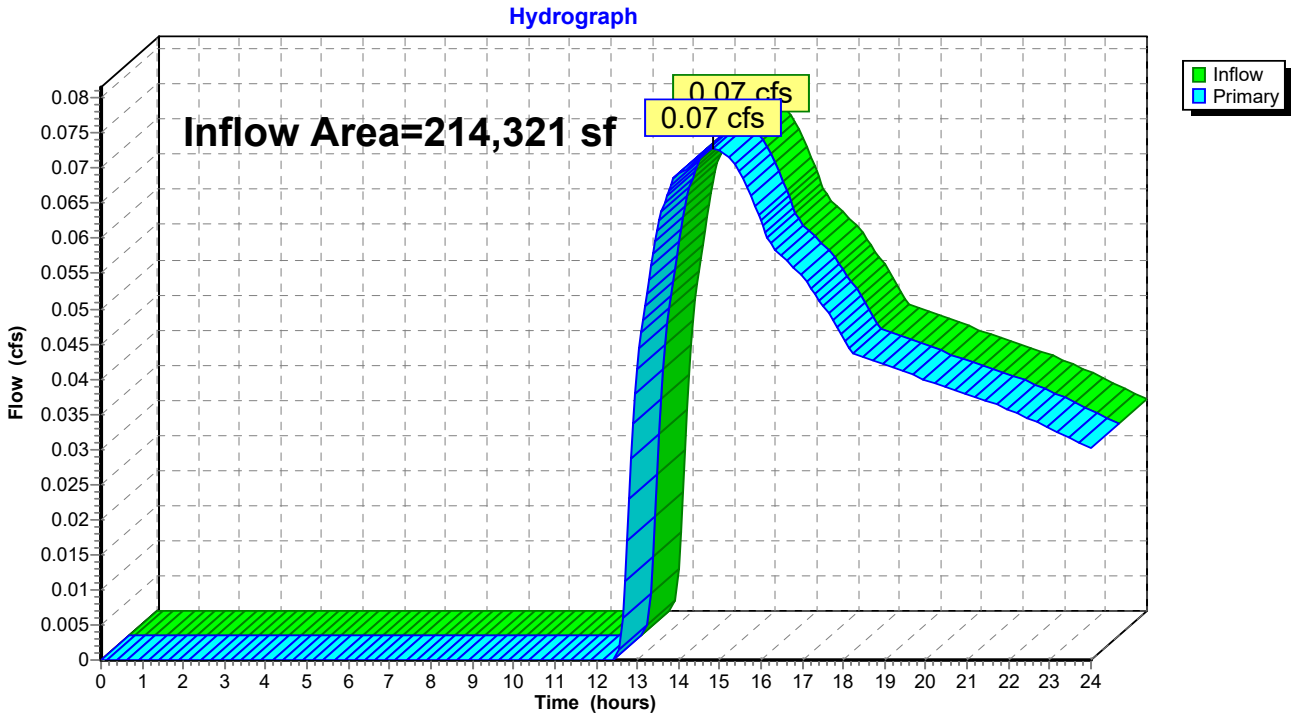


Summary for Link DP-3: Design Point 3

Inflow Area = 214,321 sf, 0.00% Impervious, Inflow Depth > 0.11" for 10-Year event
Inflow = 0.07 cfs @ 14.84 hrs, Volume= 1,955 cf
Primary = 0.07 cfs @ 14.84 hrs, Volume= 1,955 cf, Atten= 0%, Lag= 0.0 min
Routed to Reach 1 : Wetlands

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP-3: Design Point 3



Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EWS-1: West of Track
Runoff Area=21,230 sf 61.93% Impervious Runoff Depth>4.13"
Flow Length=141' Tc=6.9 min CN=79 Runoff=2.25 cfs 7,298 cf

Subcatchment EWS-2: Track & Field
Runoff Area=168,164 sf 30.17% Impervious Runoff Depth>2.07"
Flow Length=149' Tc=12.1 min CN=58 Runoff=7.13 cfs 29,009 cf

Subcatchment EWS-3: North of Track
Runoff Area=64,420 sf 19.15% Impervious Runoff Depth>1.01"
Flow Length=327' Tc=12.6 min UI Adjusted CN=45 Runoff=0.95 cfs 5,402 cf

Subcatchment EWS-4: Baseball Field (East)
Runoff Area=62,247 sf 0.00% Impervious Runoff Depth>0.59"
Flow Length=329' Tc=12.6 min CN=39 Runoff=0.37 cfs 3,086 cf

Subcatchment EWS-5: Baseball Field (West)
Runoff Area=214,321 sf 0.00% Impervious Runoff Depth>0.59"
Flow Length=491' Tc=14.1 min CN=39 Runoff=1.25 cfs 10,617 cf

Subcatchment EWS-6: Softball
Runoff Area=58,557 sf 0.48% Impervious Runoff Depth>2.81"
Flow Length=189' Tc=7.1 min CN=66 Runoff=4.17 cfs 13,728 cf

Reach 1: Wetlands
Inflow=13.97 cfs 69,139 cf
Outflow=13.97 cfs 69,139 cf

Link DP-1: Design Point 1
Inflow=13.44 cfs 55,436 cf
Primary=13.44 cfs 55,436 cf

Link DP-2: Design Point 2
Inflow=0.37 cfs 3,086 cf
Primary=0.37 cfs 3,086 cf

Link DP-3: Design Point 3
Inflow=1.25 cfs 10,617 cf
Primary=1.25 cfs 10,617 cf

Total Runoff Area = 588,939 sf Runoff Volume = 69,139 cf Average Runoff Depth = 1.41"
87.01% Pervious = 512,436 sf 12.99% Impervious = 76,503 sf

Summary for Subcatchment EWS-1: West of Track

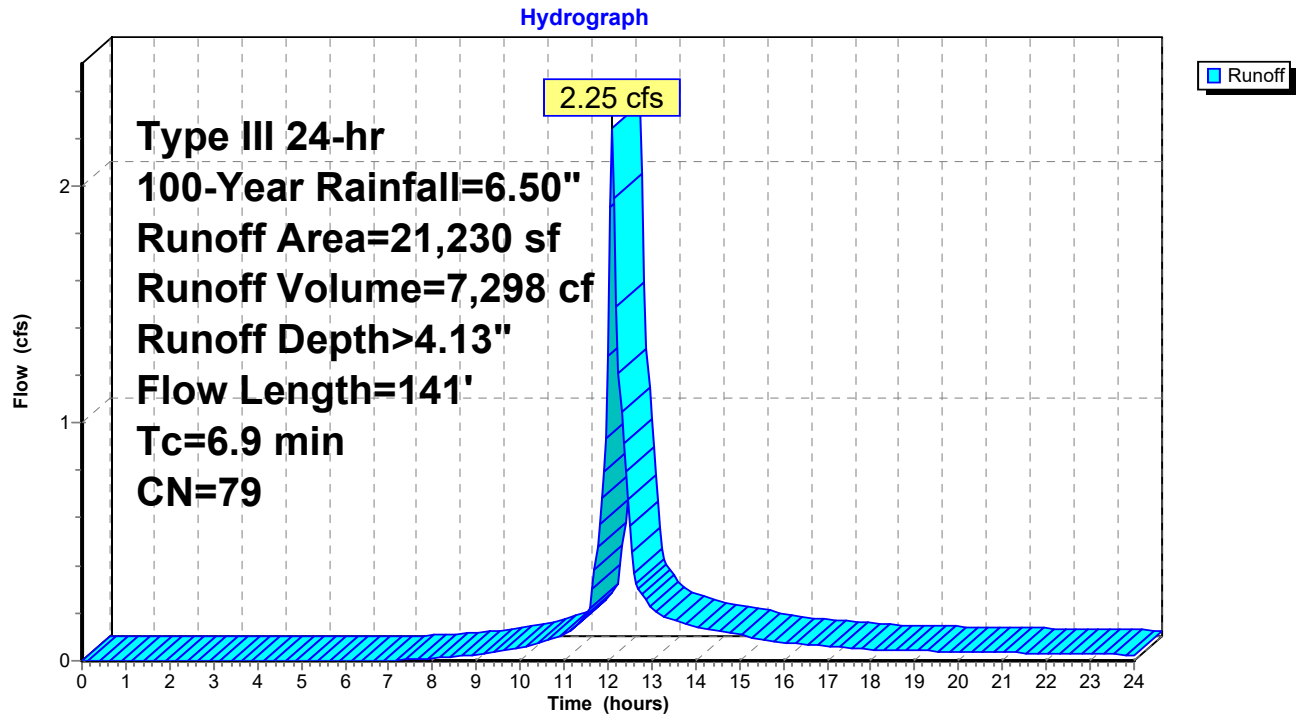
Runoff = 2.25 cfs @ 12.10 hrs, Volume= 7,298 cf, Depth> 4.13"
Routed to Link DP-1 : Design Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

	Area (sf)	CN	Description
	7,149	98	Unconnected pavement, HSG B
	3,634	61	>75% Grass cover, Good, HSG B
*	82	98	Unconnected roofs, HSG A
	4,449	39	>75% Grass cover, Good, HSG A
*	5,916	98	Unconnected pavement, HSG A
	21,230	79	Weighted Average
	8,083		38.07% Pervious Area
	13,147		61.93% Impervious Area
	13,147		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	37	0.0220	0.10		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 3.10"
0.6	104	0.0176	2.69		Shallow Concentrated Flow, B-C Paved Kv= 20.3 fps
6.9	141	Total			

Subcatchment EWS-1: West of Track



Summary for Subcatchment EWS-2: Track & Field

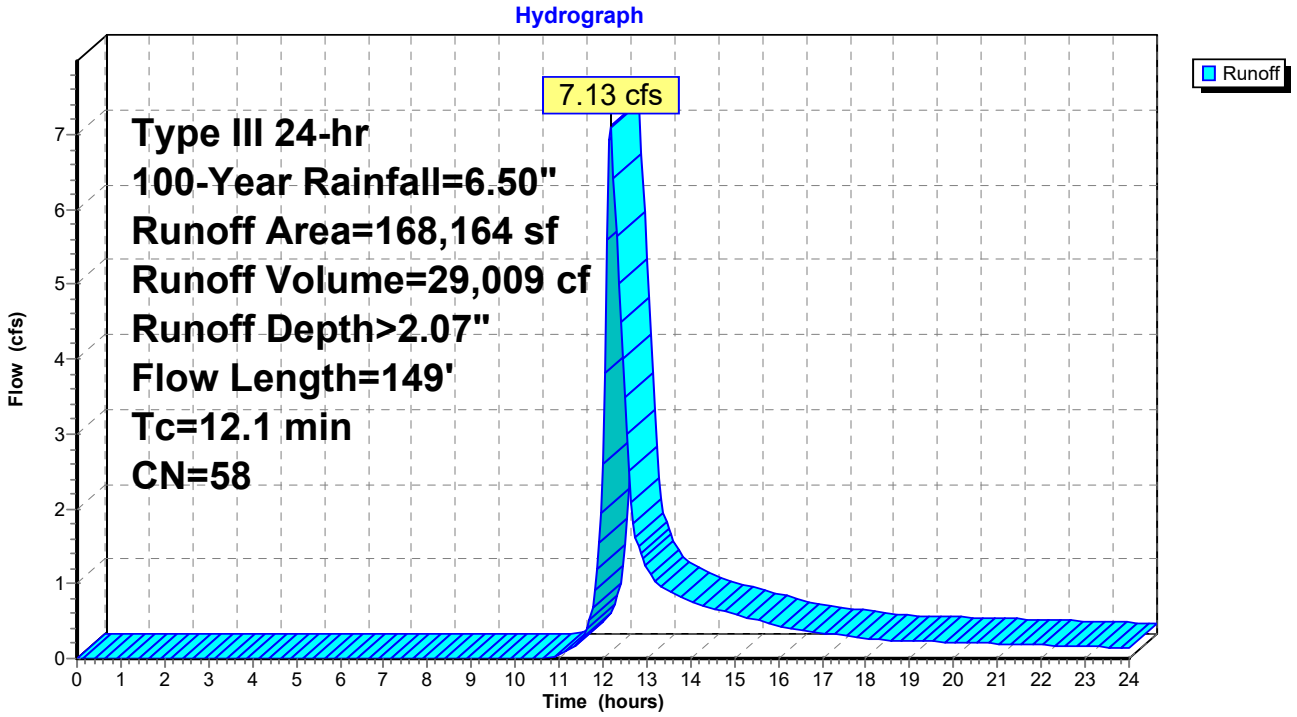
Runoff = 7.13 cfs @ 12.18 hrs, Volume= 29,009 cf, Depth> 2.07"
Routed to Link DP-1 : Design Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

	Area (sf)	CN	Description
	7,597	61	>75% Grass cover, Good, HSG B
*	258	98	Unconnected roofs, HSG A
	6,042	98	Unconnected pavement, HSG B
	9,872	36	Woods, Fair, HSG A
*	44,435	98	Unconnected pavement, HSG A
	99,960	39	>75% Grass cover, Good, HSG A
	168,164	58	Weighted Average
	117,429		69.83% Pervious Area
	50,735		30.17% Impervious Area
	50,735		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0108	0.08		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 3.10"
1.4	99	0.0051	1.15		Shallow Concentrated Flow, B-C Unpaved Kv= 16.1 fps
12.1	149	Total			

Subcatchment EWS-2: Track & Field



Summary for Subcatchment EWS-3: North of Track

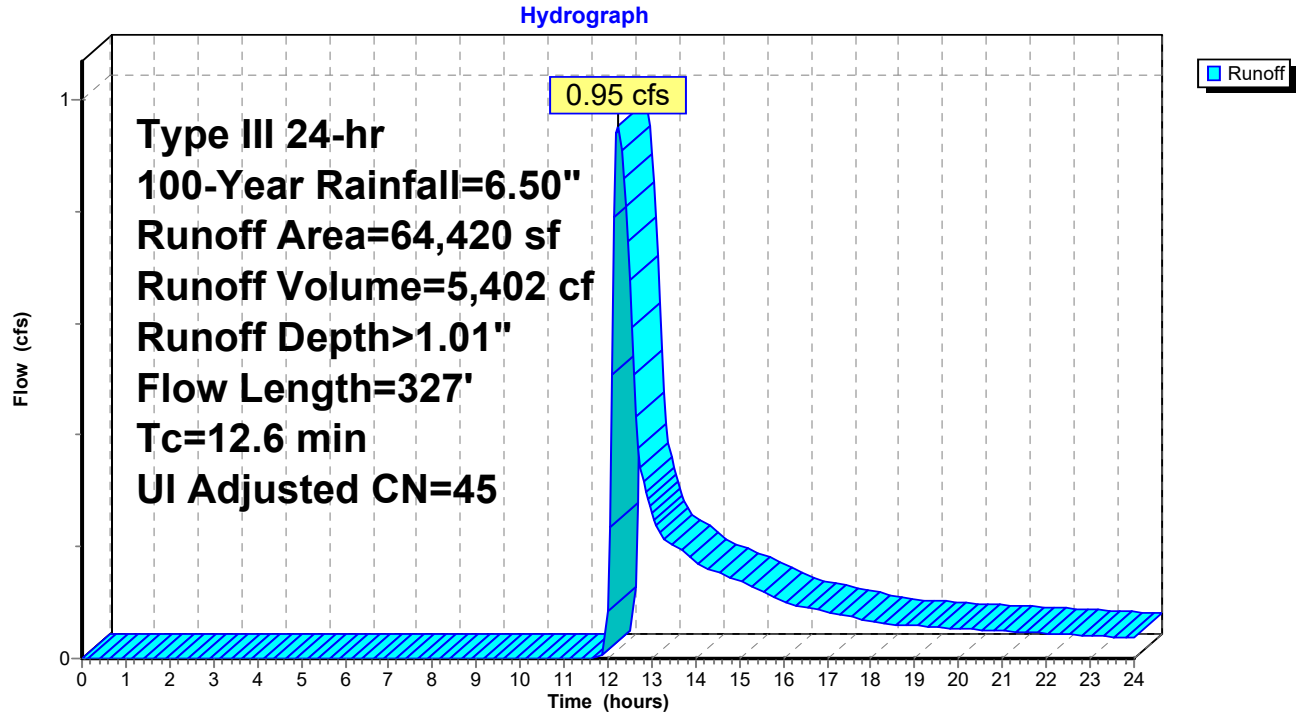
Runoff = 0.95 cfs @ 12.24 hrs, Volume= 5,402 cf, Depth> 1.01"
Routed to Link DP-1 : Design Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Adj	Description
52,081	39		>75% Grass cover, Good, HSG A
3,547	98		Unconnected roofs, HSG A
7,570	98		Unconnected pavement, HSG A
1,222	98		Unconnected pavement, HSG B
64,420	50	45	Weighted Average, UI Adjusted
52,081			80.85% Pervious Area
12,339			19.15% Impervious Area
12,339			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0300	0.12		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 3.10"
5.5	277	0.0144	0.84		Shallow Concentrated Flow, B-C Short Grass Pasture Kv= 7.0 fps
12.6	327	Total			

Subcatchment EWS-3: North of Track



Summary for Subcatchment EWS-4: Baseball Field (East)

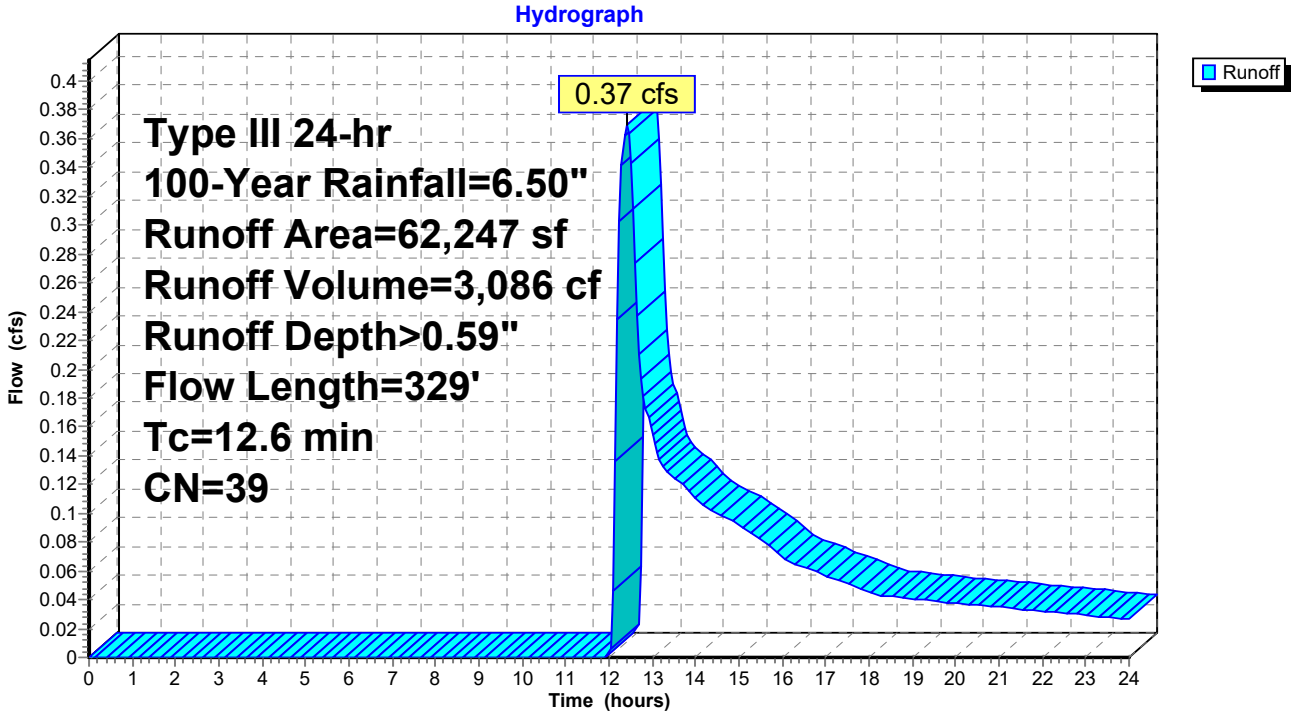
Runoff = 0.37 cfs @ 12.40 hrs, Volume= 3,086 cf, Depth> 0.59"
Routed to Link DP-2 : Design Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
60,403	39	>75% Grass cover, Good, HSG A
1,844	36	Woods, Fair, HSG A
62,247	39	Weighted Average
62,247		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0132	0.08		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 3.10"
2.8	279	0.0110	1.69		Shallow Concentrated Flow, B-C Unpaved Kv= 16.1 fps
12.6	329	Total			

Subcatchment EWS-4: Baseball Field (East)



Summary for Subcatchment EWS-5: Baseball Field (West)

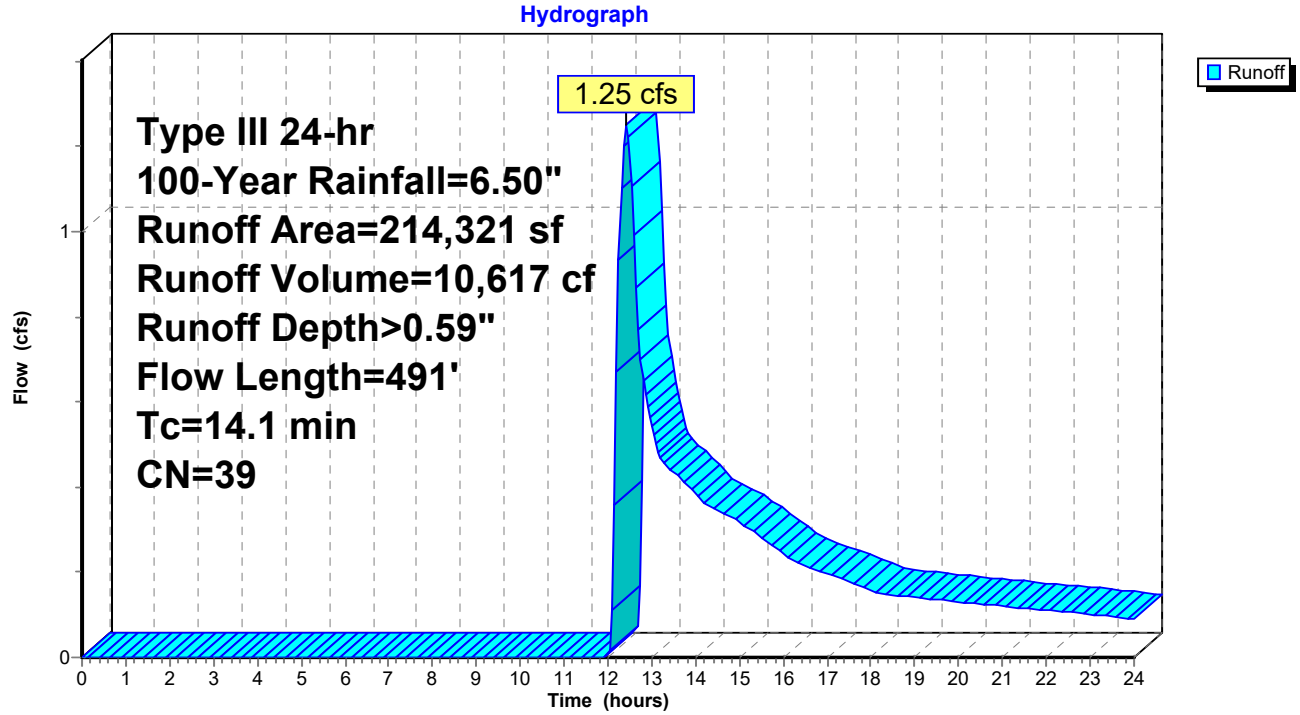
Runoff = 1.25 cfs @ 12.42 hrs, Volume= 10,617 cf, Depth> 0.59"
Routed to Link DP-3 : Design Point 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
192,178	39	>75% Grass cover, Good, HSG A
22,143	36	Woods, Fair, HSG A
214,321	39	Weighted Average
214,321		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	50	0.0116	0.08		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 3.10"
3.7	441	0.0153	1.99		Shallow Concentrated Flow, B-C Unpaved Kv= 16.1 fps
14.1	491	Total			

Subcatchment EWS-5: Baseball Field (West)



Summary for Subcatchment EWS-6: Softball

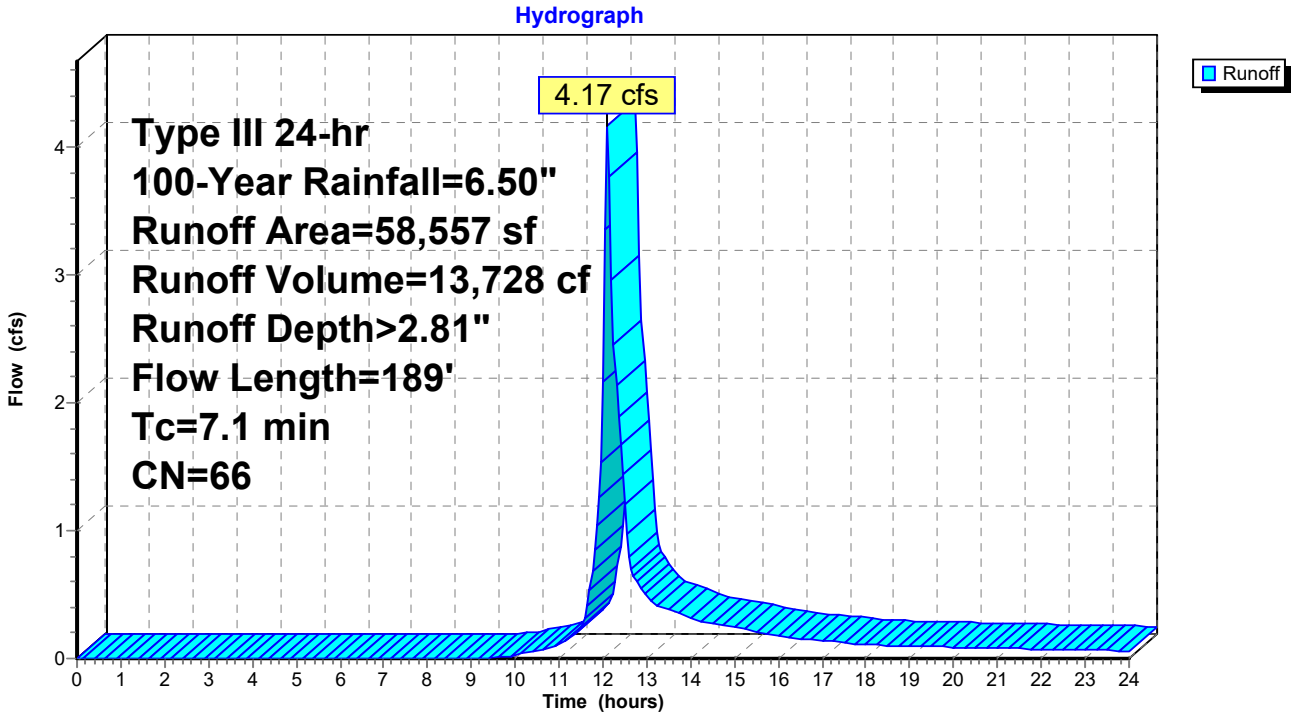
Runoff = 4.17 cfs @ 12.11 hrs, Volume= 13,728 cf, Depth> 2.81"
Routed to Link DP-1 : Design Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
9,539	85	Gravel roads, HSG B
2,302	96	Gravel surface, HSG B
282	98	Unconnected pavement, HSG B
46,434	61	>75% Grass cover, Good, HSG B
58,557	66	Weighted Average
58,275		99.52% Pervious Area
282		0.48% Impervious Area
282		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	50	0.0040	0.18		Sheet Flow, A-B Fallow n= 0.050 P2= 3.10"
2.6	139	0.0166	0.90		Shallow Concentrated Flow, B-C Short Grass Pasture Kv= 7.0 fps
7.1	189	Total			

Subcatchment EWS-6: Softball



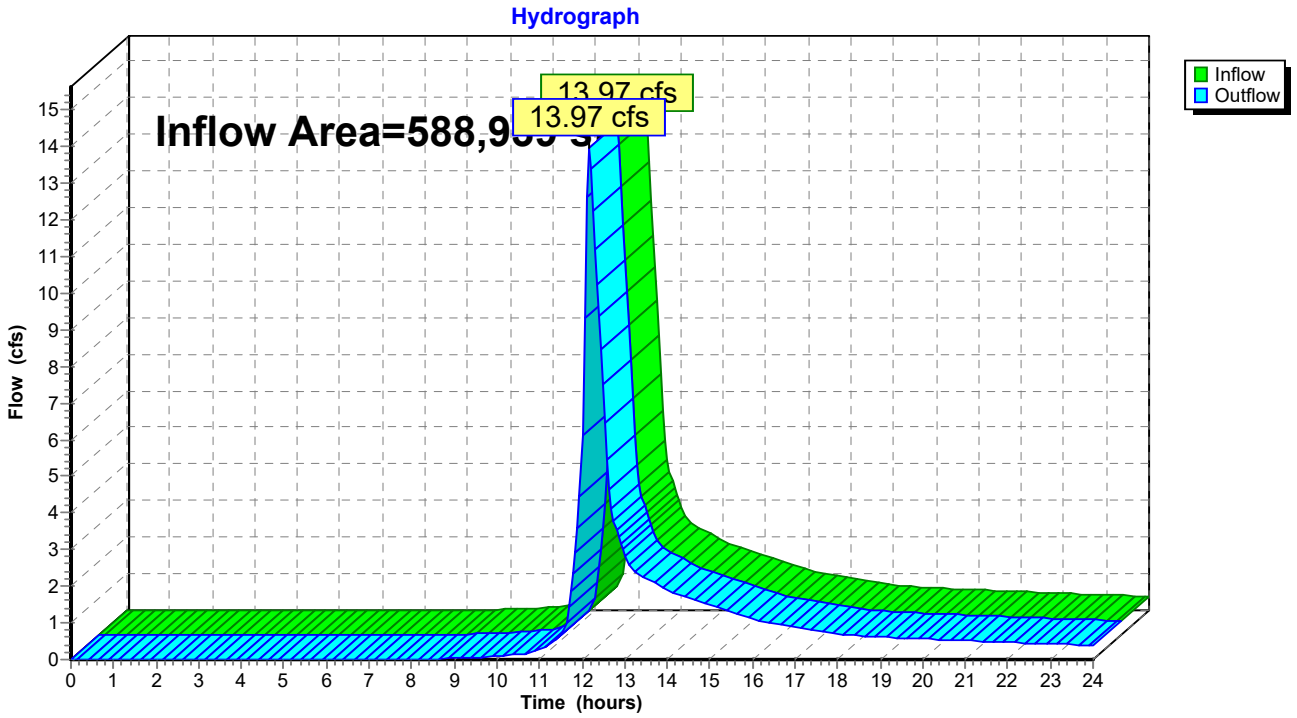
Summary for Reach 1: Wetlands

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

Inflow Area = 588,939 sf, 12.99% Impervious, Inflow Depth > 1.41" for 100-Year event
Inflow = 13.97 cfs @ 12.16 hrs, Volume= 69,139 cf
Outflow = 13.97 cfs @ 12.16 hrs, Volume= 69,139 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach 1: Wetlands

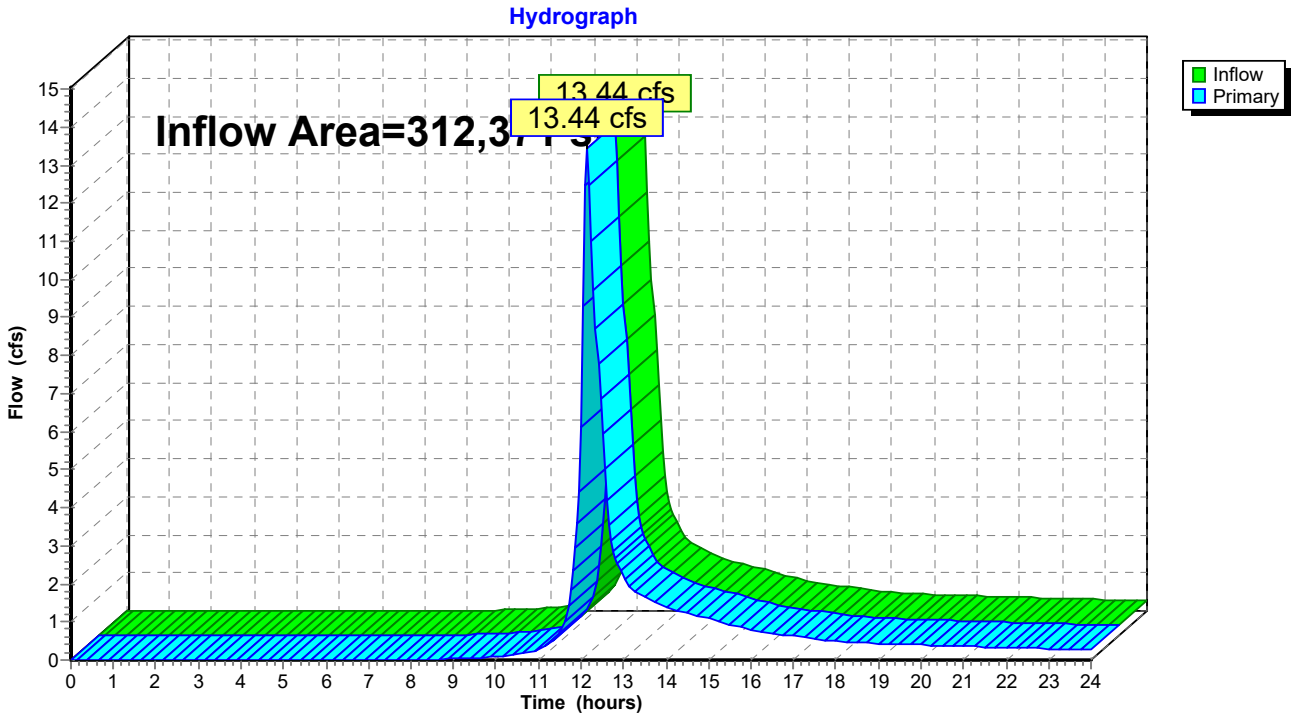


Summary for Link DP-1: Design Point 1

Inflow Area = 312,371 sf, 24.49% Impervious, Inflow Depth > 2.13" for 100-Year event
Inflow = 13.44 cfs @ 12.15 hrs, Volume= 55,436 cf
Primary = 13.44 cfs @ 12.15 hrs, Volume= 55,436 cf, Atten= 0%, Lag= 0.0 min
Routed to Reach 1 : Wetlands

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP-1: Design Point 1

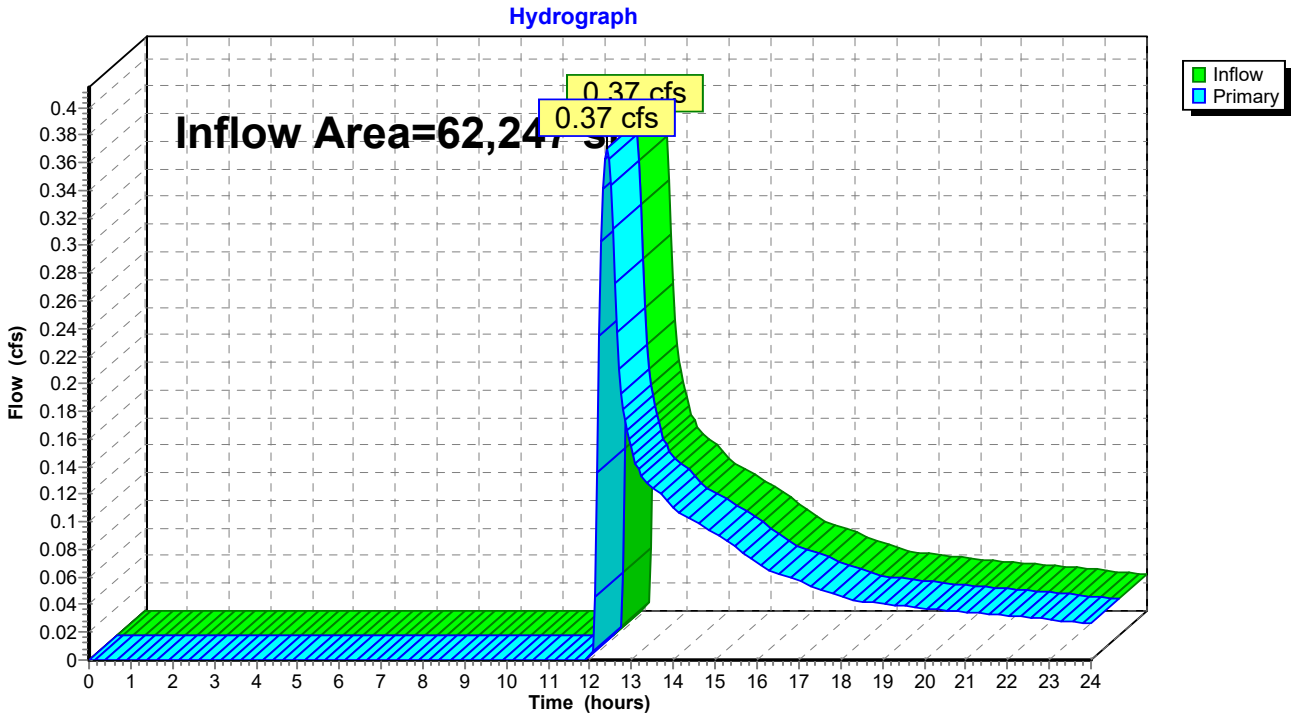


Summary for Link DP-2: Design Point 2

Inflow Area = 62,247 sf, 0.00% Impervious, Inflow Depth > 0.59" for 100-Year event
Inflow = 0.37 cfs @ 12.40 hrs, Volume= 3,086 cf
Primary = 0.37 cfs @ 12.40 hrs, Volume= 3,086 cf, Atten= 0%, Lag= 0.0 min
Routed to Reach 1 : Wetlands

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP-2: Design Point 2

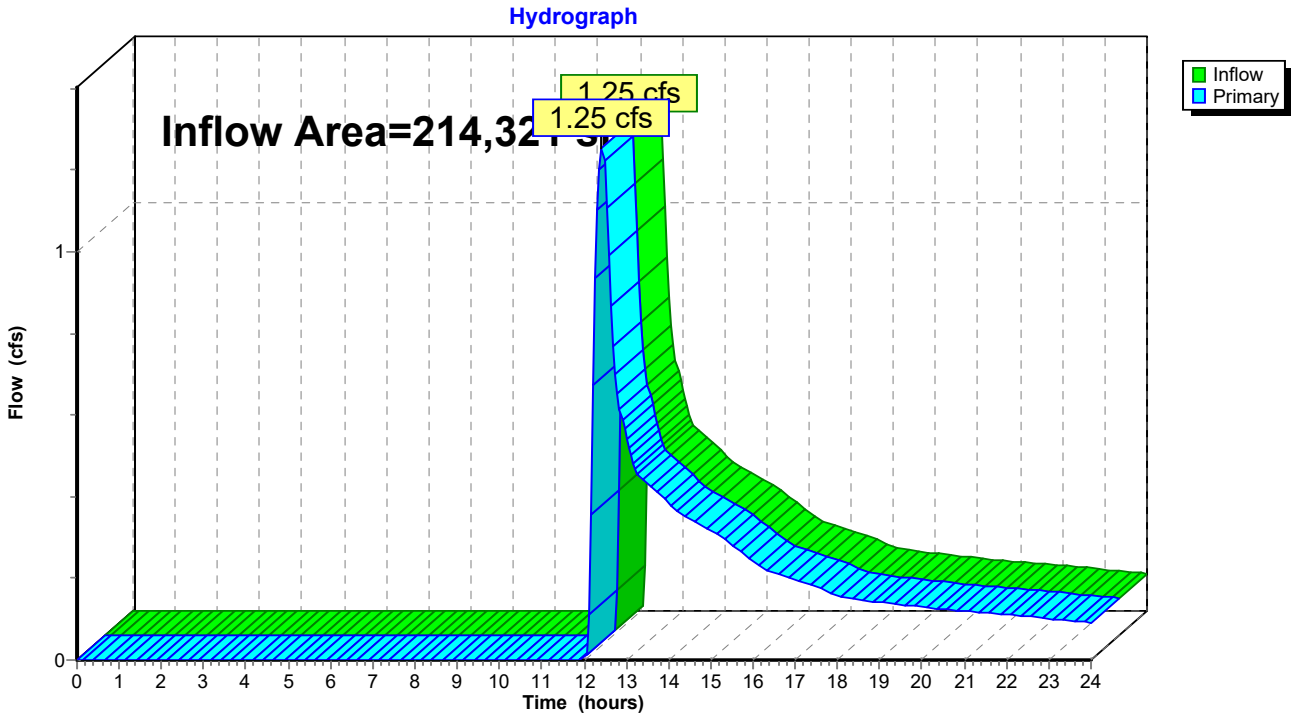


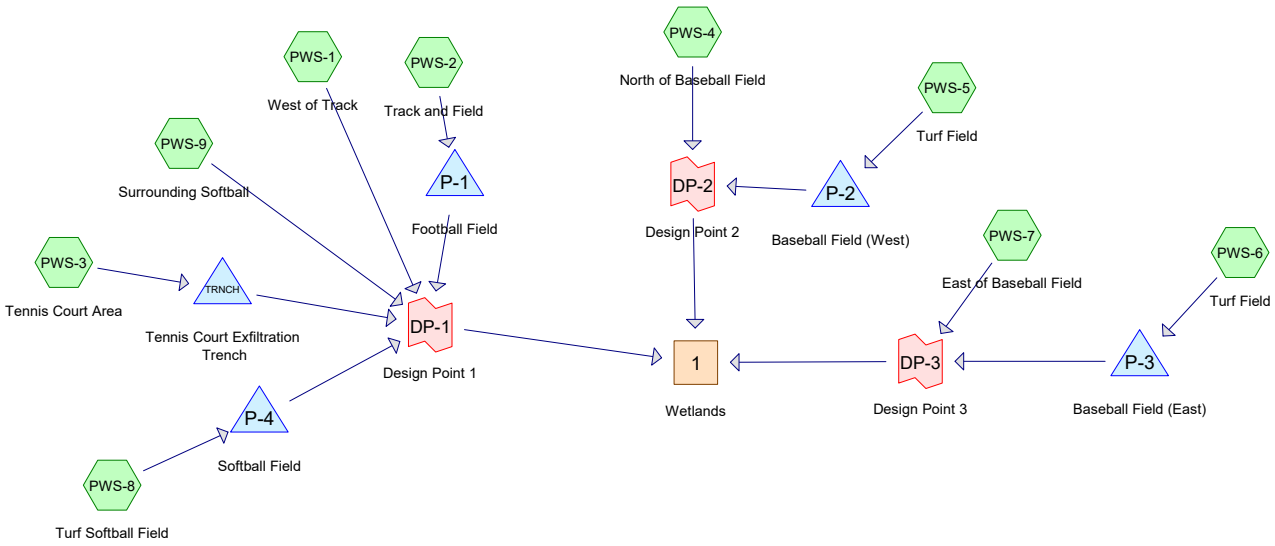
Summary for Link DP-3: Design Point 3

Inflow Area = 214,321 sf, 0.00% Impervious, Inflow Depth > 0.59" for 100-Year event
Inflow = 1.25 cfs @ 12.42 hrs, Volume= 10,617 cf
Primary = 1.25 cfs @ 12.42 hrs, Volume= 10,617 cf, Atten= 0%, Lag= 0.0 min
Routed to Reach 1 : Wetlands

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP-3: Design Point 3





Subcat Reach Pond Link

Routing Diagram for 718601_POST 2024 0206
Prepared by Gale Associates, Inc., Printed 2/13/2024

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-year	Type III 24-hr		Default	24.00	1	3.10	2
2	10-year	Type III 24-hr		Default	24.00	1	4.50	2
3	100-year	Type III 24-hr		Default	24.00	1	6.50	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
186,333	39	>75% Grass cover, Good, HSG A (PWS-1, PWS-2, PWS-3, PWS-4, PWS-5, PWS-6, PWS-7)
22,045	61	>75% Grass cover, Good, HSG B (PWS-1, PWS-2, PWS-3, PWS-9)
2,569	96	Gravel surface, HSG A (PWS-4)
632	96	Gravel surface, HSG B (PWS-9)
117,858	98	Unconnected pavement, HSG A (PWS-1, PWS-2, PWS-3, PWS-4, PWS-5, PWS-7)
18,966	98	Unconnected pavement, HSG B (PWS-1, PWS-2, PWS-3, PWS-9)
1,935	98	Unconnected roofs, HSG A (PWS-1)
901	98	Unconnected roofs, HSG B (PWS-1)
196,879	98	Water Surface, 0% imp, HSG A (PWS-2, PWS-5, PWS-6)
47,112	98	Water Surface, 0% imp, HSG B (PWS-2, PWS-8, PWS-9)
595,231	**78**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
505,574	HSG A	PWS-1, PWS-2, PWS-3, PWS-4, PWS-5, PWS-6, PWS-7
89,657	HSG B	PWS-1, PWS-2, PWS-3, PWS-8, PWS-9
0	HSG C	
0	HSG D	
0	Other	
595,231		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subcatchment Numbers
186,333	22,045	0	0	0	208,378	>75% Grass cover, Good	PWS-1, PWS-2, PWS-3, PWS-4, PWS-5, PWS-6, PWS-7, PWS-9
2,569	632	0	0	0	3,201	Gravel surface	PWS-4, PWS-9
117,858	18,966	0	0	0	136,824	Unconnected pavement	PWS-1, PWS-2, PWS-3, PWS-4, PWS-5, PWS-7, PWS-9
1,935	901	0	0	0	2,837	Unconnected roofs	PWS-1
196,879	47,112	0	0	0	243,991	Water Surface, 0% imp	PWS-2, PWS-5, PWS-6, PWS-8, PWS-9
505,574	**89,657**	**0**	**0**	**0**	**595,231**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	P-1	42.19	41.44	150.0	0.0050	0.013	0.0	10.0	0.0
2	P-2	39.17	38.50	135.0	0.0050	0.013	0.0	10.0	0.0
3	P-3	38.76	38.50	25.0	0.0104	0.013	0.0	10.0	0.0
4	P-4	39.07	39.00	15.0	0.0047	0.013	0.0	10.0	0.0

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PWS-1: West of Track Runoff Area=34,493 sf 44.98% Impervious Runoff Depth=0.92"
Flow Length=137' Tc=10.1 min CN=73 Runoff=0.69 cfs 2,643 cf

Subcatchment PWS-2: Track and Field Runoff Area=167,451 sf 43.24% Impervious Runoff Depth=2.45"
Tc=6.0 min CN=94 Runoff=10.59 cfs 34,144 cf

Subcatchment PWS-3: Tennis Court Area Runoff Area=64,336 sf 50.56% Impervious Runoff Depth=0.72"
Tc=6.0 min CN=69 Runoff=1.08 cfs 3,881 cf

Subcatchment PWS-4: North of Baseball Field Runoff Area=26,450 sf 15.13% Impervious Runoff Depth=0.09"
Tc=6.0 min UI Adjusted CN=49 Runoff=0.01 cfs 200 cf

Subcatchment PWS-5: Turf Field Runoff Area=46,159 sf 10.66% Impervious Runoff Depth=2.26"
Tc=6.0 min CN=92 Runoff=2.74 cfs 8,677 cf

Subcatchment PWS-6: Turf Field Runoff Area=77,639 sf 0.00% Impervious Runoff Depth=2.87"
Tc=6.0 min CN=98 Runoff=5.36 cfs 18,555 cf

Subcatchment PWS-7: East of Baseball Field Runoff Area=115,052 sf 4.21% Impervious Runoff Depth=0.00"
Flow Length=391' Tc=12.9 min UI Adjusted CN=40 Runoff=0.00 cfs 6 cf

Subcatchment PWS-8: Turf Softball Field Runoff Area=45,899 sf 0.00% Impervious Runoff Depth=2.87"
Tc=6.0 min CN=98 Runoff=3.17 cfs 10,969 cf

Subcatchment PWS-9: Surrounding Softball Runoff Area=17,752 sf 30.67% Impervious Runoff Depth=1.08"
Tc=6.0 min CN=76 Runoff=0.50 cfs 1,602 cf

Reach 1: Wetlands Inflow=1.13 cfs 4,451 cf
Outflow=1.13 cfs 4,451 cf

Pond P-1: Football Field Peak Elev=44.66' Storage=8,951 cf Inflow=10.59 cfs 34,144 cf
Discarded=1.96 cfs 34,144 cf Primary=0.00 cfs 0 cf Outflow=1.96 cfs 34,144 cf

Pond P-2: Baseball Field (West) Peak Elev=41.68' Storage=1,406 cf Inflow=2.74 cfs 8,677 cf
Discarded=0.88 cfs 8,677 cf Primary=0.00 cfs 0 cf Outflow=0.88 cfs 8,677 cf

Pond P-3: Baseball Field (East) Peak Elev=41.26' Storage=2,565 cf Inflow=5.36 cfs 18,555 cf
Discarded=1.83 cfs 18,555 cf Primary=0.00 cfs 0 cf Outflow=1.83 cfs 18,555 cf

Pond P-4: Softball Field Peak Elev=41.66' Storage=1,516 cf Inflow=3.17 cfs 10,969 cf
Discarded=1.08 cfs 10,969 cf Primary=0.00 cfs 0 cf Outflow=1.08 cfs 10,969 cf

Pond TRNCH: Tennis Court Exfiltration Trench Peak Elev=43.68' Storage=2,029 cf Inflow=1.08 cfs 3,881 cf
Discarded=0.07 cfs 3,881 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 3,881 cf

Link DP-1: Design Point 1 Inflow=1.13 cfs 4,245 cf
Primary=1.13 cfs 4,245 cf

Link DP-2: Design Point 2 Inflow=0.01 cfs 200 cf
Primary=0.01 cfs 200 cf

Link DP-3: Design Point 3 Inflow=0.00 cfs 6 cf
Primary=0.00 cfs 6 cf

Total Runoff Area = 595,231 sf Runoff Volume = 80,678 cf Average Runoff Depth = 1.63"
76.54% Pervious = 455,570 sf 23.46% Impervious = 139,661 sf

Summary for Subcatchment PWS-1: West of Track

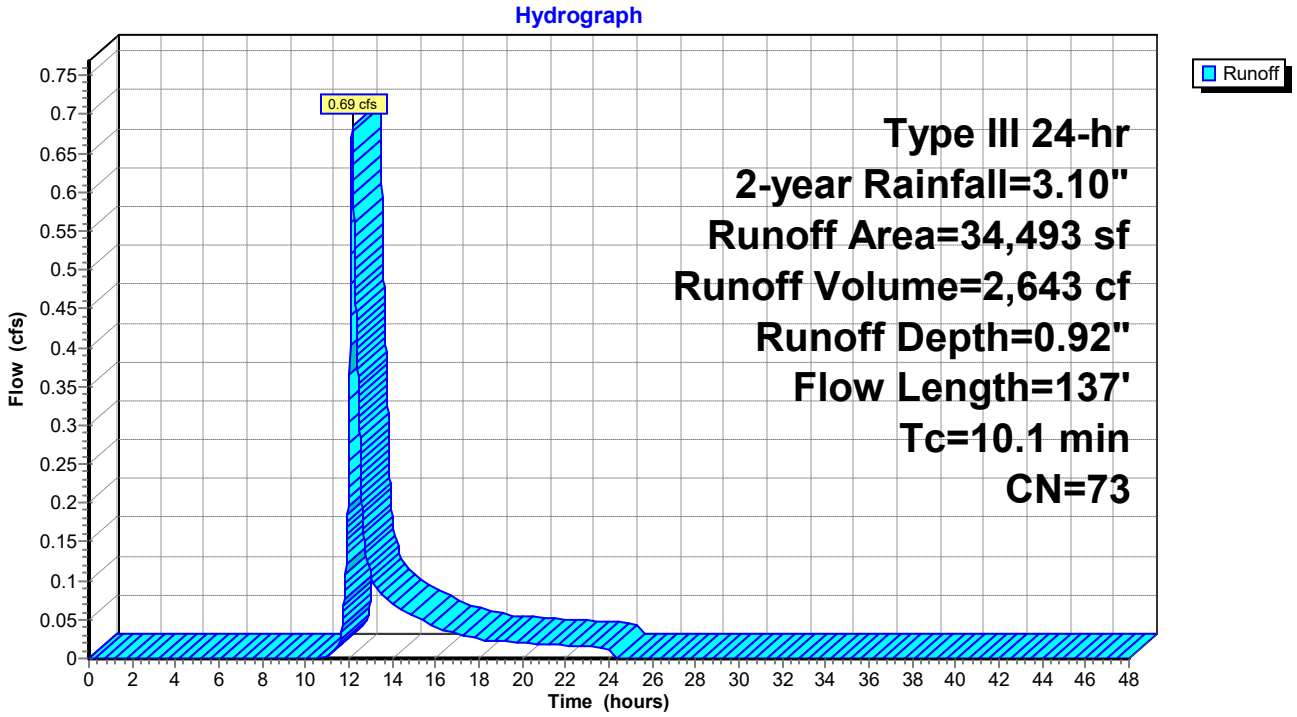
Runoff = 0.69 cfs @ 12.15 hrs, Volume= 2,643 cf, Depth= 0.92"
Routed to Link DP-1 : Design Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.10"

Area (sf)	CN	Description
901	98	Unconnected roofs, HSG B
1,128	98	Unconnected pavement, HSG B
2,984	98	Unconnected pavement, HSG B
42	61	>75% Grass cover, Good, HSG B
7,382	39	>75% Grass cover, Good, HSG A
70	39	>75% Grass cover, Good, HSG A
11,486	61	>75% Grass cover, Good, HSG B
2,766	98	Unconnected pavement, HSG A
1,190	98	Unconnected pavement, HSG A
429	98	Unconnected pavement, HSG A
4,179	98	Unconnected pavement, HSG A
1,935	98	Unconnected roofs, HSG A
34,493	73	Weighted Average
18,980		55.02% Pervious Area
15,513		44.98% Impervious Area
15,513		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	50	0.0140	0.09		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.10"
0.1	21	0.0240	2.49		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.4	66	0.0185	2.76		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
10.1	137	Total			

Subcatchment PWS-1: West of Track



Summary for Subcatchment PWS-2: Track and Field

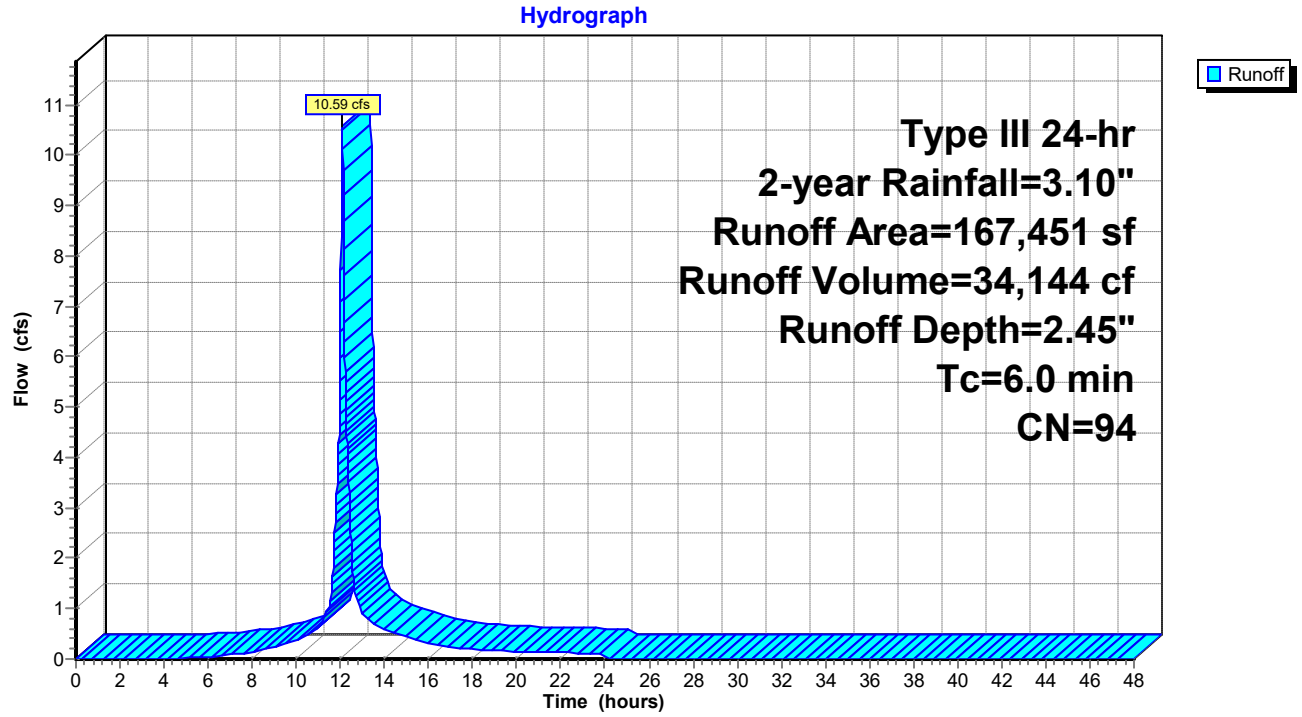
Runoff = 10.59 cfs @ 12.08 hrs, Volume= 34,144 cf, Depth= 2.45"
Routed to Pond P-1 : Football Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.10"

Area (sf)	CN	Description
23,921	98	Unconnected pavement, HSG A
39,732	98	Unconnected pavement, HSG A
8,756	98	Unconnected pavement, HSG B
2	98	Water Surface, 0% imp, HSG B
1	61	>75% Grass cover, Good, HSG B
492	39	>75% Grass cover, Good, HSG A
125	39	>75% Grass cover, Good, HSG A
12,023	39	>75% Grass cover, Good, HSG A
82,400	98	Water Surface, 0% imp, HSG A
167,451	94	Weighted Average
95,043		56.76% Pervious Area
72,408		43.24% Impervious Area
72,408		100.00% Unconnected

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

Subcatchment PWS-2: Track and Field



Summary for Subcatchment PWS-3: Tennis Court Area

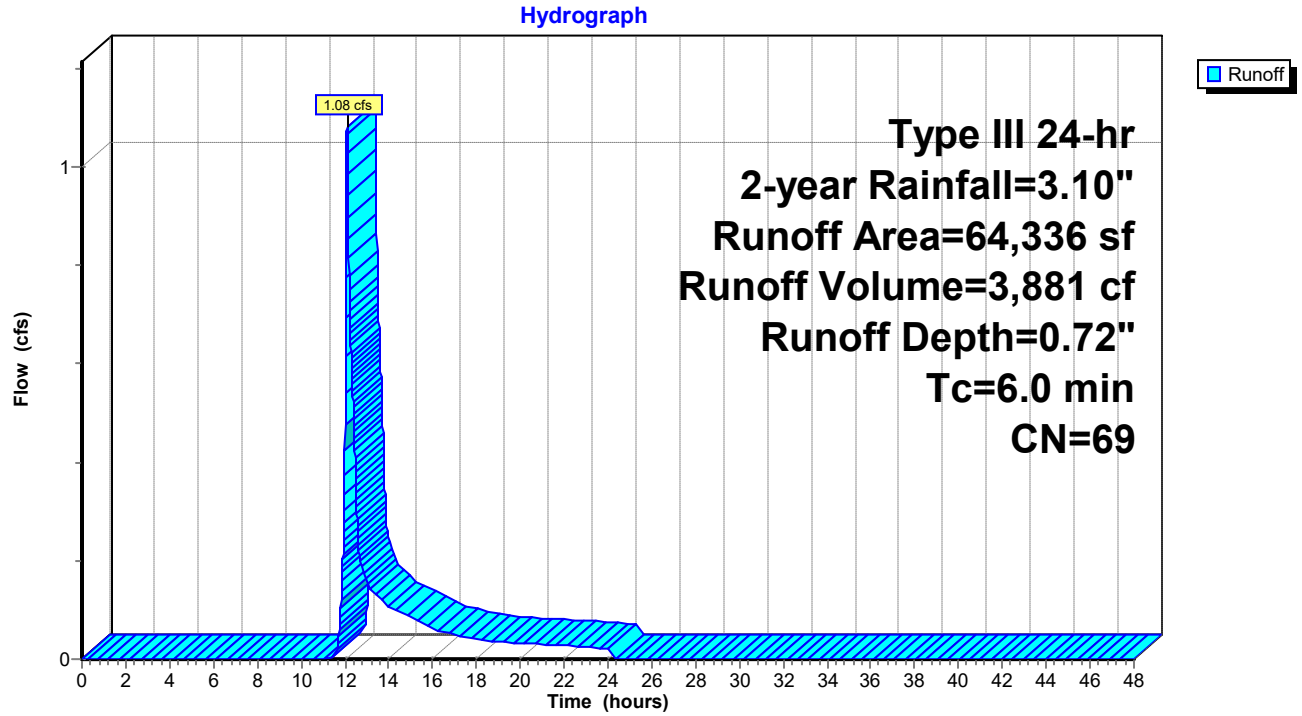
Runoff = 1.08 cfs @ 12.10 hrs, Volume= 3,881 cf, Depth= 0.72"
Routed to Pond TRNCH : Tennis Court Exfiltration Trench

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.10"

Area (sf)	CN	Description
654	98	Unconnected pavement, HSG B
51	61	>75% Grass cover, Good, HSG B
30,220	39	>75% Grass cover, Good, HSG A
1,534	39	>75% Grass cover, Good, HSG A
31,877	98	Unconnected pavement, HSG A
64,336	69	Weighted Average
31,805		49.44% Pervious Area
32,531		50.56% Impervious Area
32,531		100.00% Unconnected

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

Subcatchment PWS-3: Tennis Court Area



Summary for Subcatchment PWS-4: North of Baseball Field

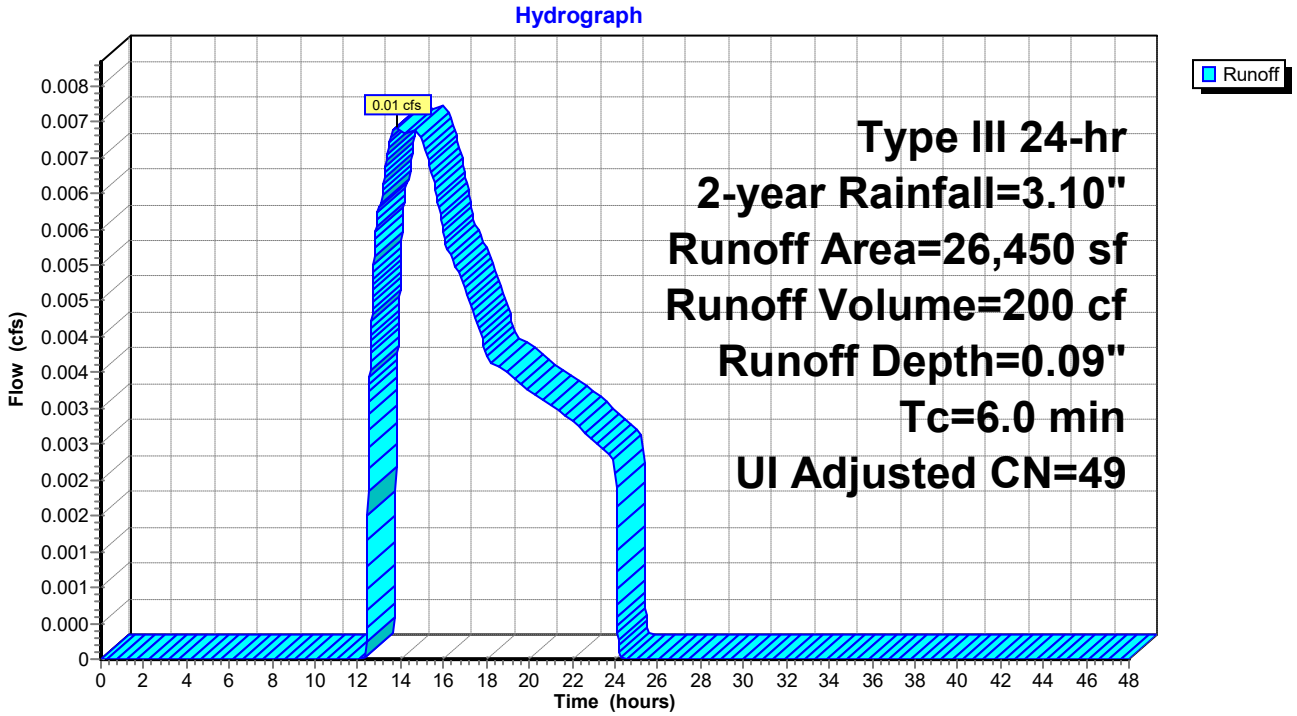
Runoff = 0.01 cfs @ 13.78 hrs, Volume= 200 cf, Depth= 0.09"
Routed to Link DP-2 : Design Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.10"

Area (sf)	CN	Adj	Description
2,569	96		Gravel surface, HSG A
96	98		Unconnected pavement, HSG A
3,902	98		Unconnected pavement, HSG A
5	98		Unconnected pavement, HSG A
19,878	39		>75% Grass cover, Good, HSG A
26,450	53	49	Weighted Average, UI Adjusted
22,447			84.87% Pervious Area
4,003			15.13% Impervious Area
4,003			100.00% Unconnected

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

Subcatchment PWS-4: North of Baseball Field



Summary for Subcatchment PWS-5: Turf Field

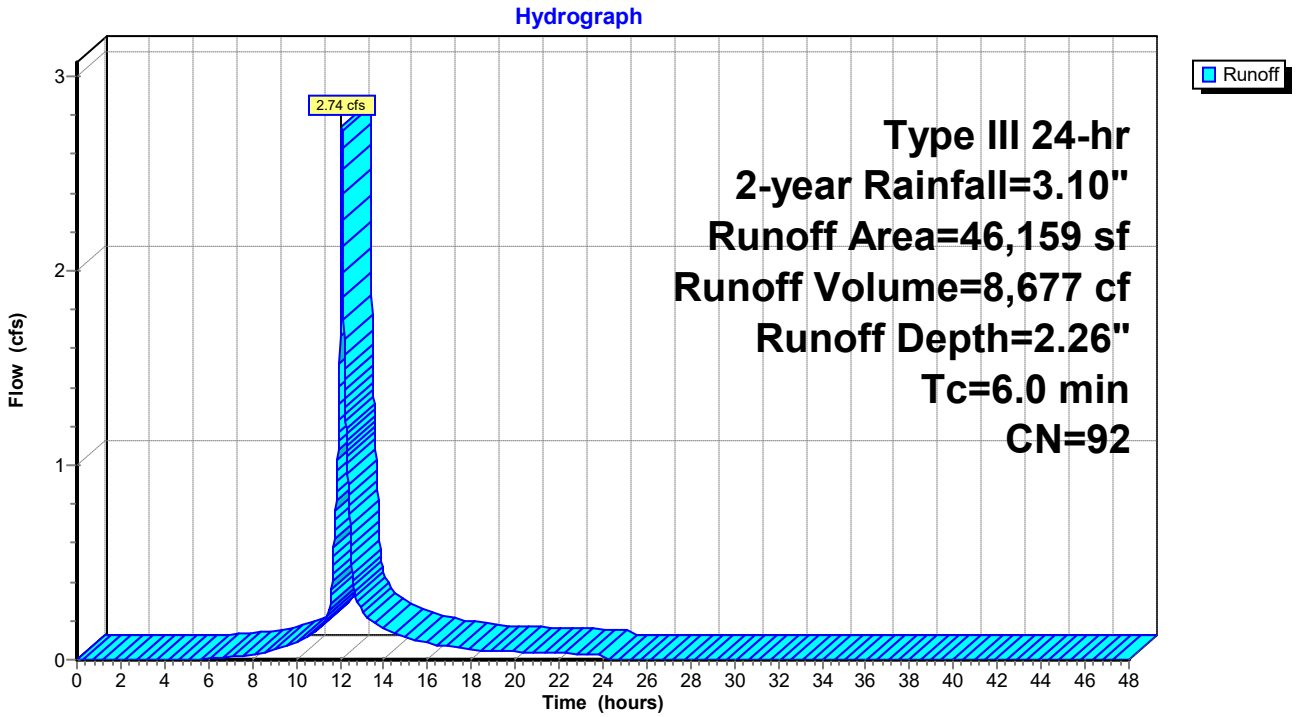
Runoff = 2.74 cfs @ 12.09 hrs, Volume= 8,677 cf, Depth= 2.26"
Routed to Pond P-2 : Baseball Field (West)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.10"

Area (sf)	CN	Description
558	39	>75% Grass cover, Good, HSG A
552	39	>75% Grass cover, Good, HSG A
3,255	39	>75% Grass cover, Good, HSG A
36,873	98	Water Surface, 0% imp, HSG A
4,864	98	Unconnected pavement, HSG A
58	98	Unconnected pavement, HSG A
46,159	92	Weighted Average
41,238		89.34% Pervious Area
4,921		10.66% Impervious Area
4,921		100.00% Unconnected

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

Subcatchment PWS-5: Turf Field



Summary for Subcatchment PWS-6: Turf Field

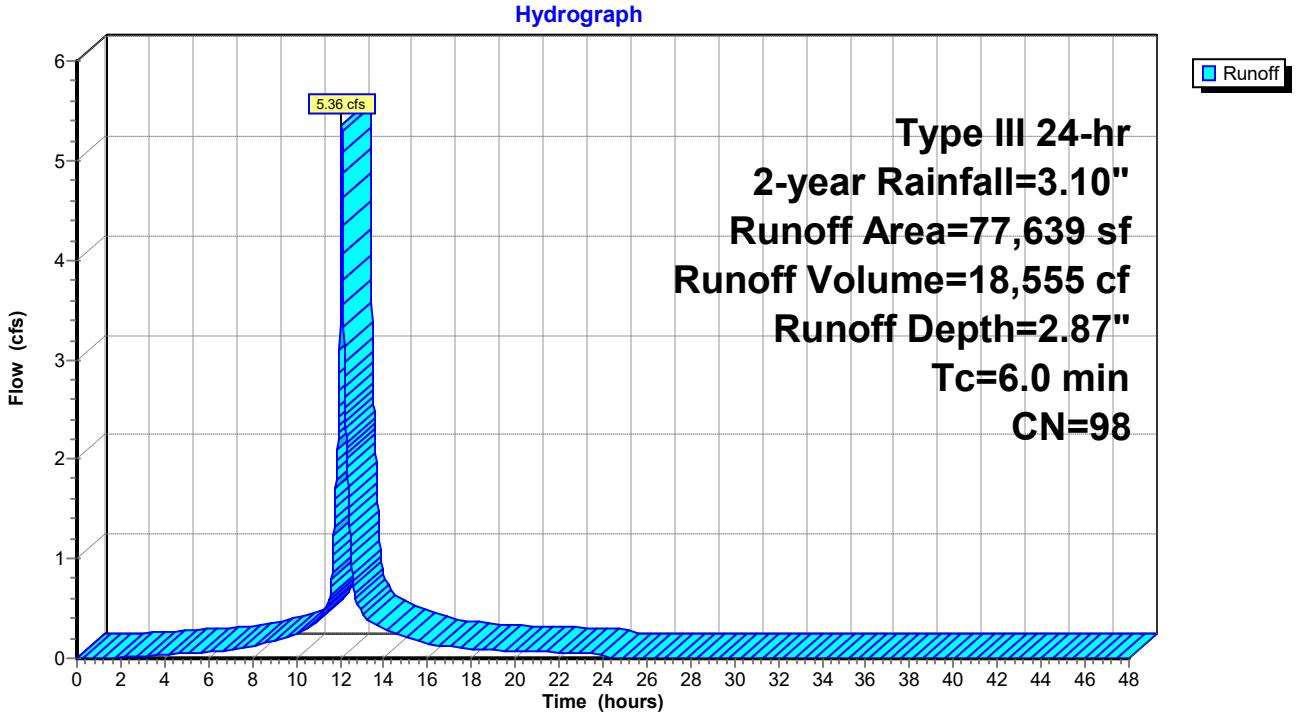
Runoff = 5.36 cfs @ 12.08 hrs, Volume= 18,555 cf, Depth= 2.87"
Routed to Pond P-3 : Baseball Field (East)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.10"

Area (sf)	CN	Description
12	39	>75% Grass cover, Good, HSG A
21	39	>75% Grass cover, Good, HSG A
77,606	98	Water Surface, 0% imp, HSG A
77,639	98	Weighted Average
77,639		100.00% Pervious Area

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

Subcatchment PWS-6: Turf Field



Summary for Subcatchment PWS-7: East of Baseball Field

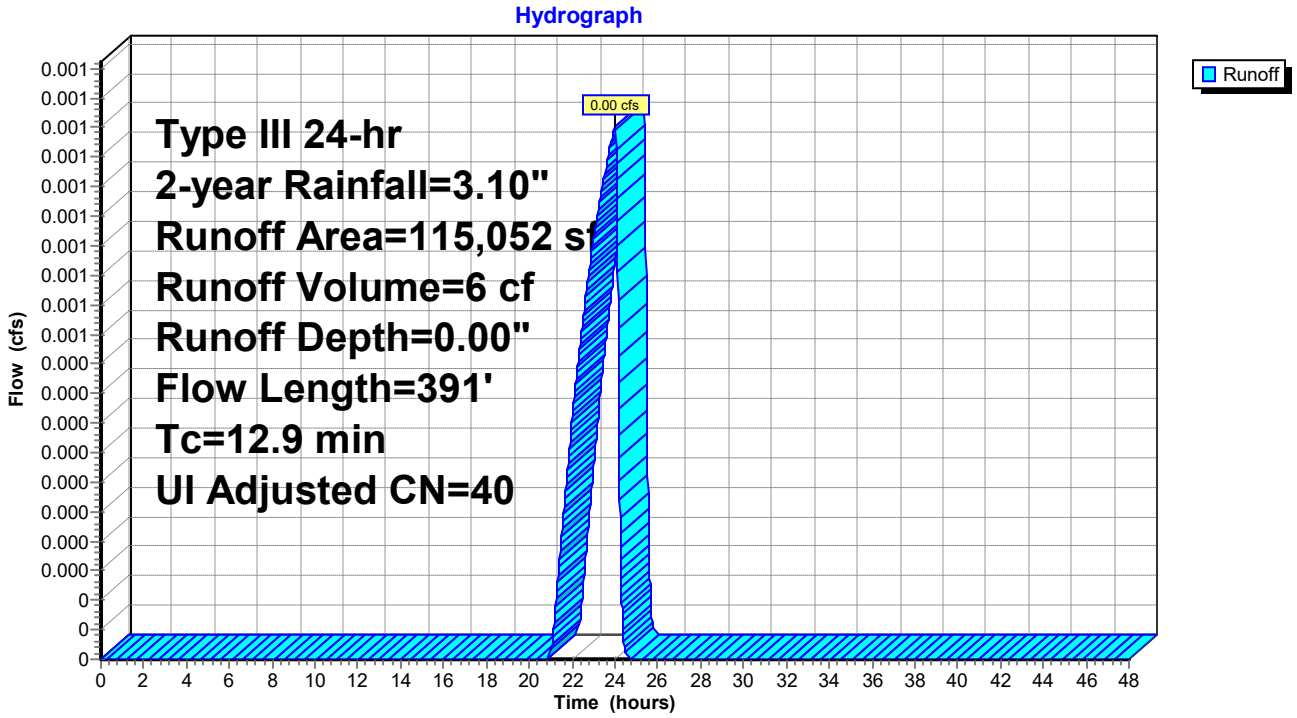
Runoff = 0.00 cfs @ 24.03 hrs, Volume= 6 cf, Depth= 0.00"
Routed to Link DP-3 : Design Point 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.10"

Area (sf)	CN	Adj	Description
99	98		Unconnected pavement, HSG A
4,742	98		Unconnected pavement, HSG A
110,211	39		>75% Grass cover, Good, HSG A
115,052	41	40	Weighted Average, UI Adjusted
110,211			95.79% Pervious Area
4,841			4.21% Impervious Area
4,841			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	50	0.0120	0.08		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.10"
2.6	309	0.0153	1.99		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.1	32	0.0770	4.47		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
12.9	391	Total			

Subcatchment PWS-7: East of Baseball Field



Summary for Subcatchment PWS-8: Turf Softball Field

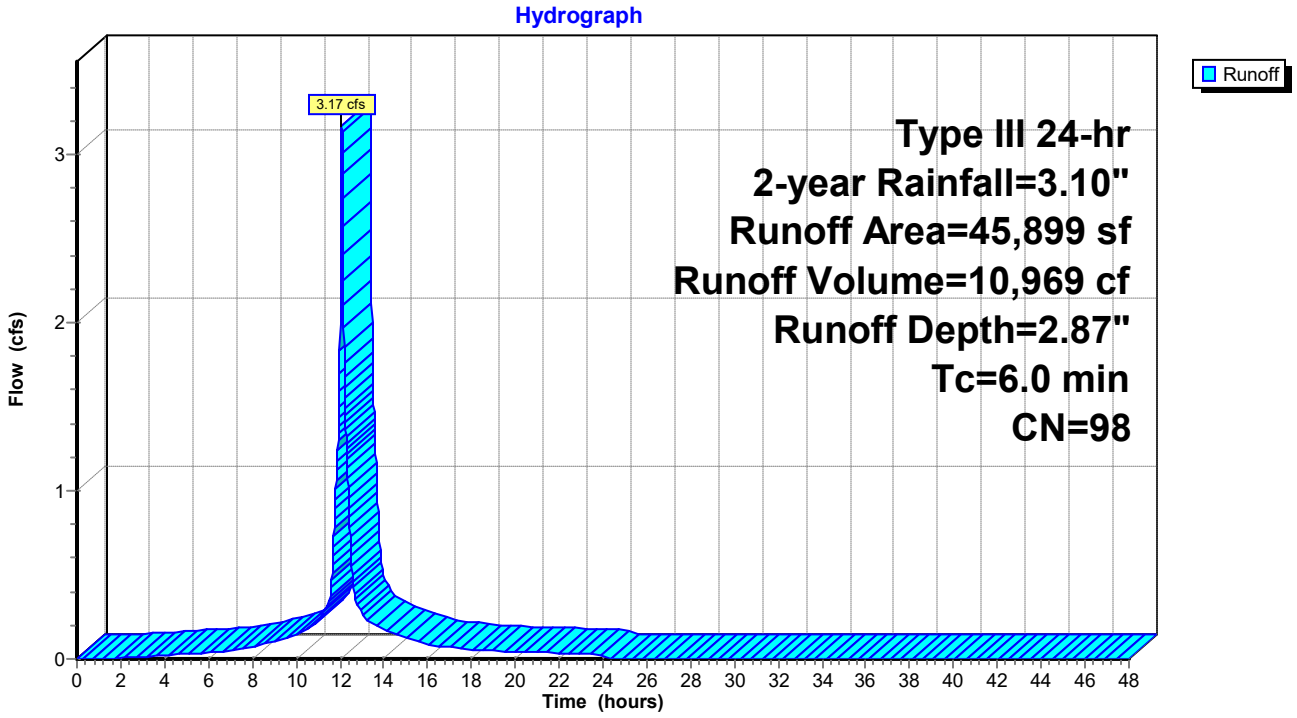
Runoff = 3.17 cfs @ 12.08 hrs, Volume= 10,969 cf, Depth= 2.87"
Routed to Pond P-4 : Softball Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.10"

Area (sf)	CN	Description
45,899	98	Water Surface, 0% imp, HSG B
45,899		100.00% Pervious Area

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

Subcatchment PWS-8: Turf Softball Field



Summary for Subcatchment PWS-9: Surrounding Softball

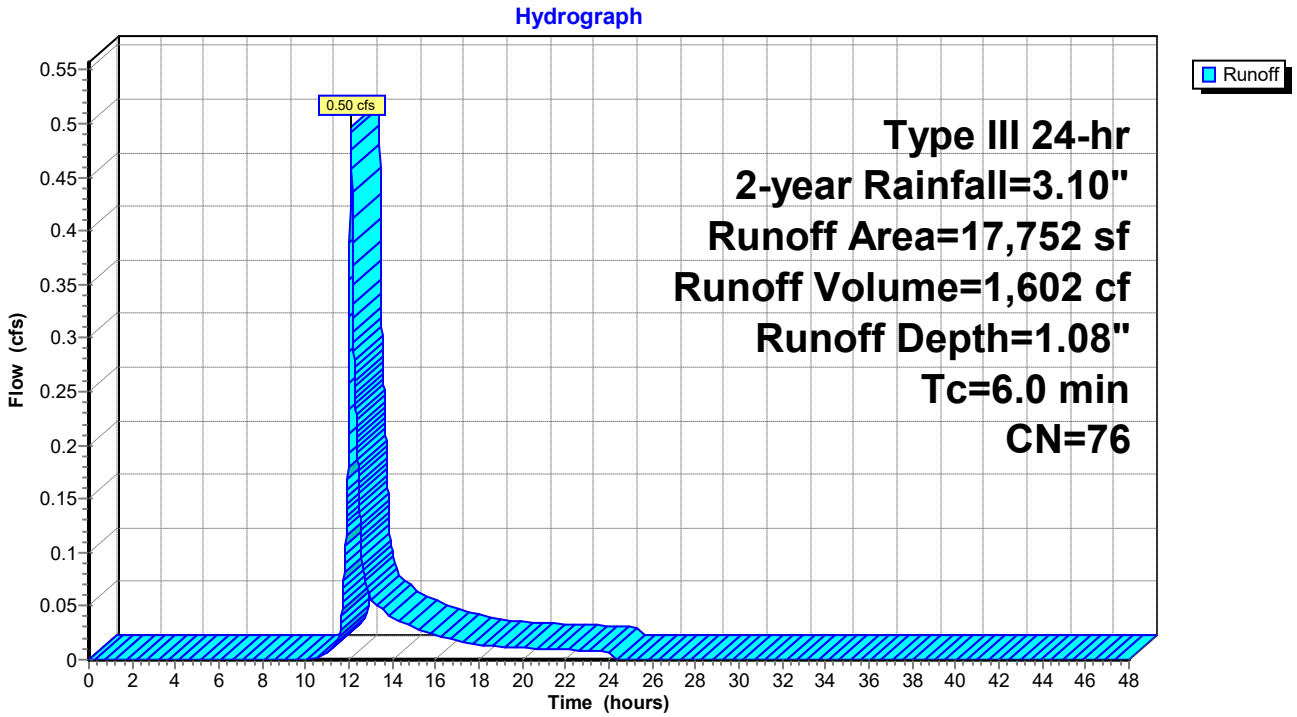
Runoff = 0.50 cfs @ 12.09 hrs, Volume= 1,602 cf, Depth= 1.08"
Routed to Link DP-1 : Design Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.10"

Area (sf)	CN	Description
1,211	98	Water Surface, 0% imp, HSG B
5,444	98	Unconnected pavement, HSG B
632	96	Gravel surface, HSG B
7,095	61	>75% Grass cover, Good, HSG B
3,329	61	>75% Grass cover, Good, HSG B
40	61	>75% Grass cover, Good, HSG B
17,752	76	Weighted Average
12,308		69.33% Pervious Area
5,444		30.67% Impervious Area
5,444		100.00% Unconnected

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

Subcatchment PWS-9: Surrounding Softball

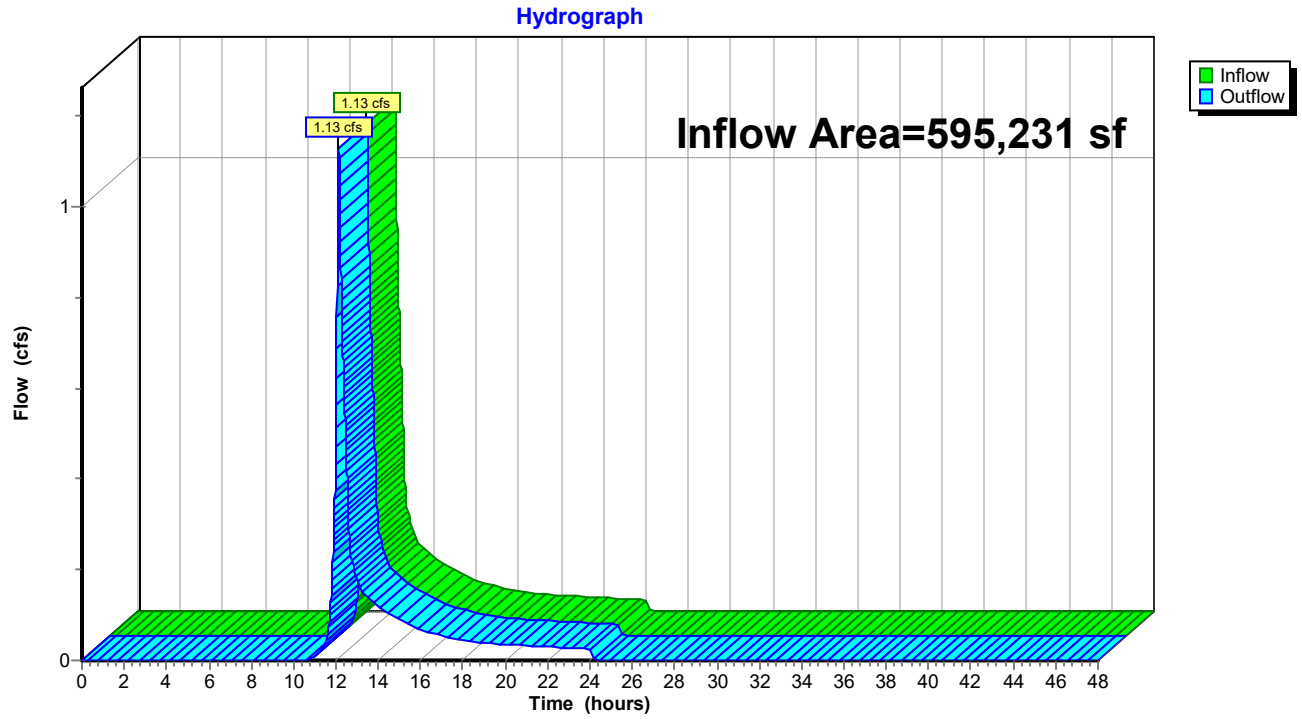


Summary for Reach 1: Wetlands

Inflow Area = 595,231 sf, 23.46% Impervious, Inflow Depth = 0.09" for 2-year event
Inflow = 1.13 cfs @ 12.13 hrs, Volume= 4,451 cf
Outflow = 1.13 cfs @ 12.13 hrs, Volume= 4,451 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 1: Wetlands



Summary for Pond P-1: Football Field

Inflow Area = 167,451 sf, 43.24% Impervious, Inflow Depth = 2.45" for 2-year event
Inflow = 10.59 cfs @ 12.08 hrs, Volume= 34,144 cf
Outflow = 1.96 cfs @ 11.73 hrs, Volume= 34,144 cf, Atten= 81%, Lag= 0.0 min
Discarded = 1.96 cfs @ 11.73 hrs, Volume= 34,144 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link DP-1 : Design Point 1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 44.66' @ 12.53 hrs Surf.Area= 83,155 sf Storage= 8,951 cf

Plug-Flow detention time= 26.4 min calculated for 34,137 cf (100% of inflow)
Center-of-Mass det. time= 26.4 min (814.5 - 788.2)

Volume	Invert	Avail.Storage	Storage Description
#1	44.36'	27,242 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 75,671 cf Overall x 36.0% Voids

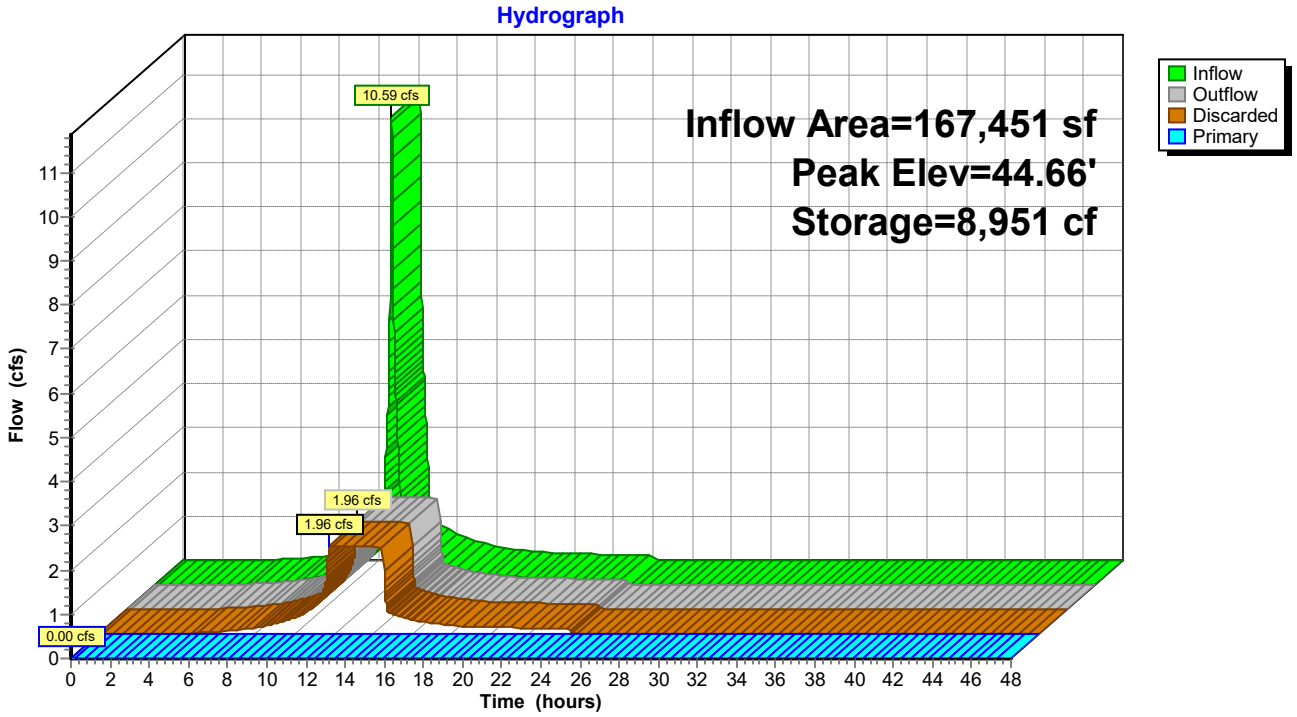
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
44.36	83,155	0	0
45.27	83,155	75,671	75,671

Device	Routing	Invert	Outlet Devices
#1	Discarded	44.36'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	42.19'	**10.0" Round 10" HDPE Pipe** L= 150.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 42.19' / 41.44' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#3	Device 2	44.86'	**12.0" Horiz. Riser Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=1.96 cfs @ 11.73 hrs HW=44.37' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 1.96 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=44.36' (Free Discharge)
↑—**2=10" HDPE Pipe** (Passes 0.00 cfs of 2.31 cfs potential flow)
↑—**3=Riser Orifice/Grate** (Controls 0.00 cfs)

Pond P-1: Football Field



Summary for Pond P-2: Baseball Field (West)

Inflow Area = 46,159 sf, 10.66% Impervious, Inflow Depth = 2.26" for 2-year event
Inflow = 2.74 cfs @ 12.09 hrs, Volume= 8,677 cf
Outflow = 0.88 cfs @ 11.88 hrs, Volume= 8,677 cf, Atten= 68%, Lag= 0.0 min
Discarded = 0.88 cfs @ 11.88 hrs, Volume= 8,677 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link DP-2 : Design Point 2

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 41.68' @ 12.39 hrs Surf.Area= 37,325 sf Storage= 1,406 cf

Plug-Flow detention time= 8.2 min calculated for 8,675 cf (100% of inflow)
Center-of-Mass det. time= 8.2 min (807.1 - 798.9)

Volume	Invert	Avail.Storage	Storage Description
#1	41.58'	9,003 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 25,008 cf Overall x 36.0% Voids

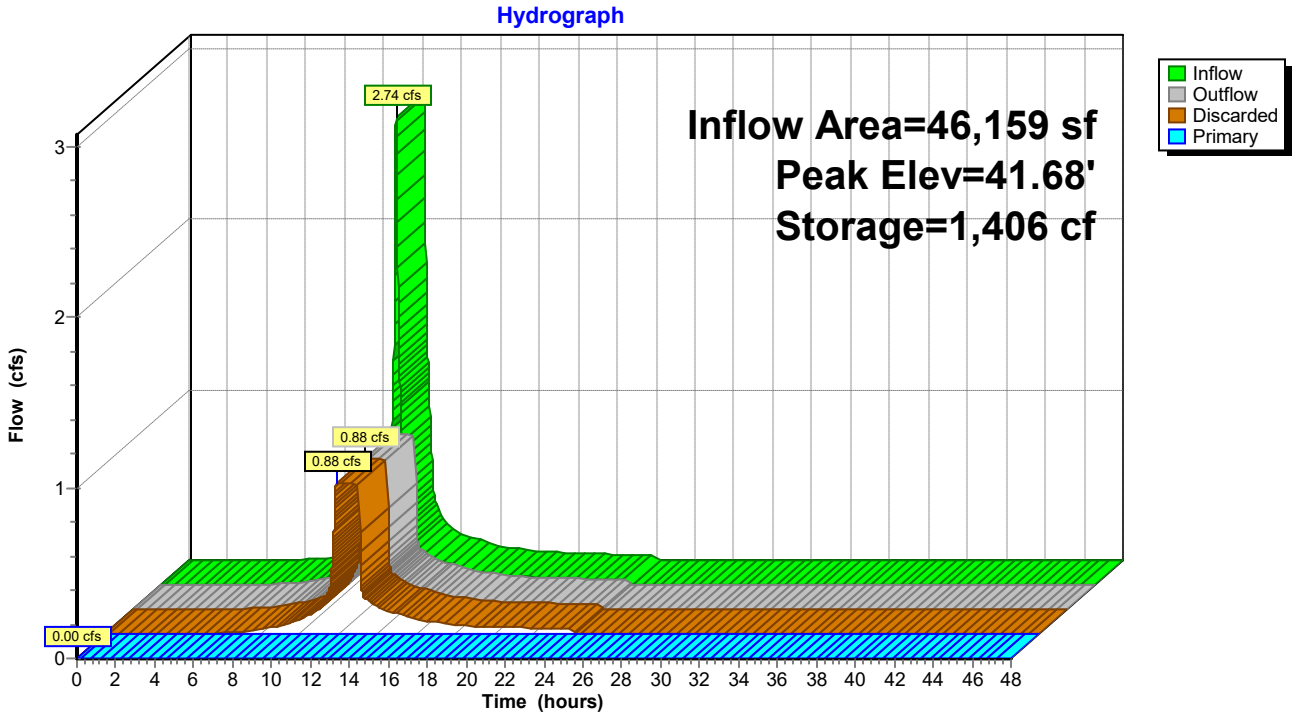
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
41.58	37,325	0	0
42.25	37,325	25,008	25,008

Device	Routing	Invert	Outlet Devices
#1	Discarded	41.58'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	39.17'	**10.0" Round 10" HDPE Pipe** L= 135.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 39.17' / 38.50' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#3	Device 2	41.84'	**12.0" Horiz. Riser Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.88 cfs @ 11.88 hrs HW=41.59' (Free Discharge)
↑└**1=Exfiltration** (Exfiltration Controls 0.88 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=41.58' (Free Discharge)
↑└**2=10" HDPE Pipe** (Passes 0.00 cfs of 2.50 cfs potential flow)
↑└**3=Riser Orifice/Grate** (Controls 0.00 cfs)

Pond P-2: Baseball Field (West)



Summary for Pond P-3: Baseball Field (East)

Inflow Area = 77,639 sf, 0.00% Impervious, Inflow Depth = 2.87" for 2-year event
Inflow = 5.36 cfs @ 12.08 hrs, Volume= 18,555 cf
Outflow = 1.83 cfs @ 11.87 hrs, Volume= 18,555 cf, Atten= 66%, Lag= 0.0 min
Discarded = 1.83 cfs @ 11.87 hrs, Volume= 18,555 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link DP-3 : Design Point 3

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 41.26' @ 12.35 hrs Surf.Area= 77,606 sf Storage= 2,565 cf

Plug-Flow detention time= 6.7 min calculated for 18,551 cf (100% of inflow)
Center-of-Mass det. time= 6.7 min (763.8 - 757.1)

Volume	Invert	Avail.Storage	Storage Description
#1	41.17'	18,719 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 51,996 cf Overall x 36.0% Voids

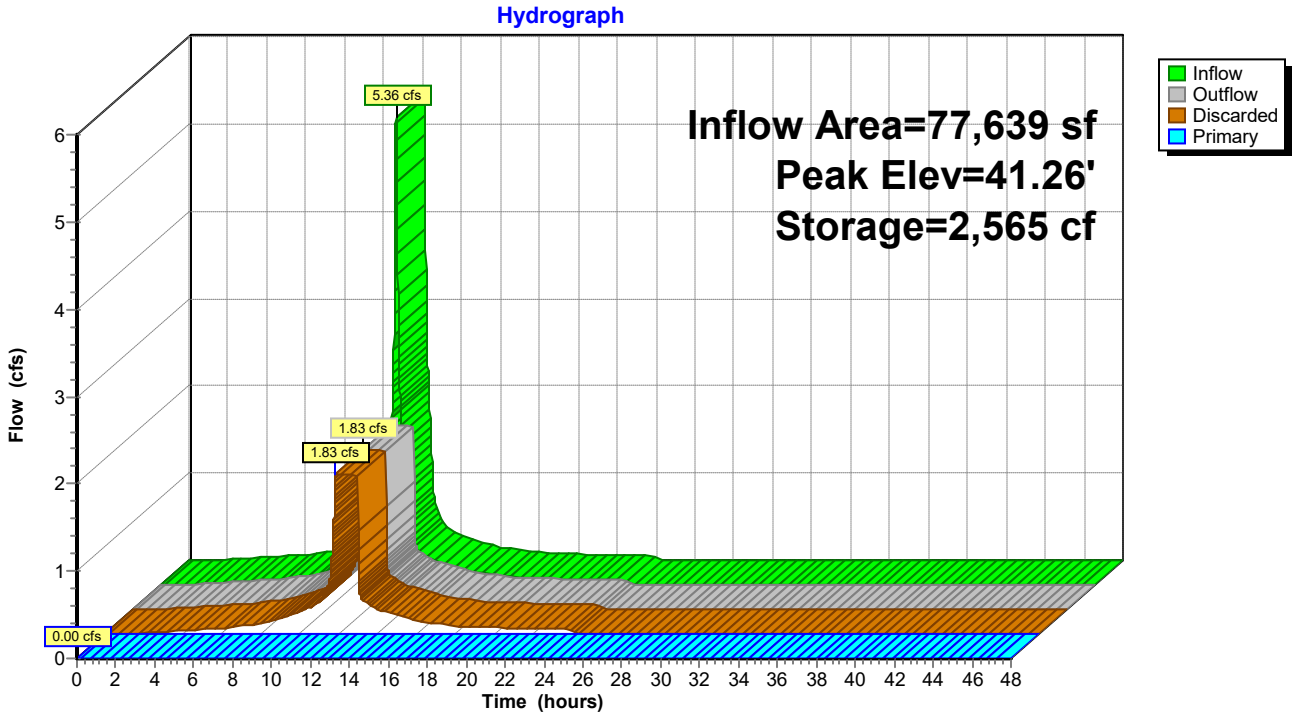
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
41.17	77,606	0	0
41.84	77,606	51,996	51,996

Device	Routing	Invert	Outlet Devices
#1	Discarded	41.17'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	38.76'	**10.0" Round 10" HDPE Pipe** L= 25.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 38.76' / 38.50' S= 0.0104 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#3	Device 2	41.43'	**12.0" Horiz. Riser Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=1.83 cfs @ 11.87 hrs HW=41.18' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 1.83 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=41.17' (Free Discharge)
↑**2=10" HDPE Pipe** (Passes 0.00 cfs of 3.71 cfs potential flow)
↑**3=Riser Orifice/Grate** (Controls 0.00 cfs)

Pond P-3: Baseball Field (East)



Summary for Pond P-4: Softball Field

Inflow Area = 45,899 sf, 0.00% Impervious, Inflow Depth = 2.87" for 2-year event
Inflow = 3.17 cfs @ 12.08 hrs, Volume= 10,969 cf
Outflow = 1.08 cfs @ 11.87 hrs, Volume= 10,969 cf, Atten= 66%, Lag= 0.0 min
Discarded = 1.08 cfs @ 11.87 hrs, Volume= 10,969 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link DP-1 : Design Point 1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 41.66' @ 12.35 hrs Surf.Area= 45,899 sf Storage= 1,516 cf

Plug-Flow detention time= 6.7 min calculated for 10,967 cf (100% of inflow)
Center-of-Mass det. time= 6.7 min (763.7 - 757.1)

Volume	Invert	Avail.Storage	Storage Description
#1	41.57'	11,071 cf	**Custom Stage Data (Irregular)** Listed below (Recalc) 30,752 cf Overall x 36.0% Voids

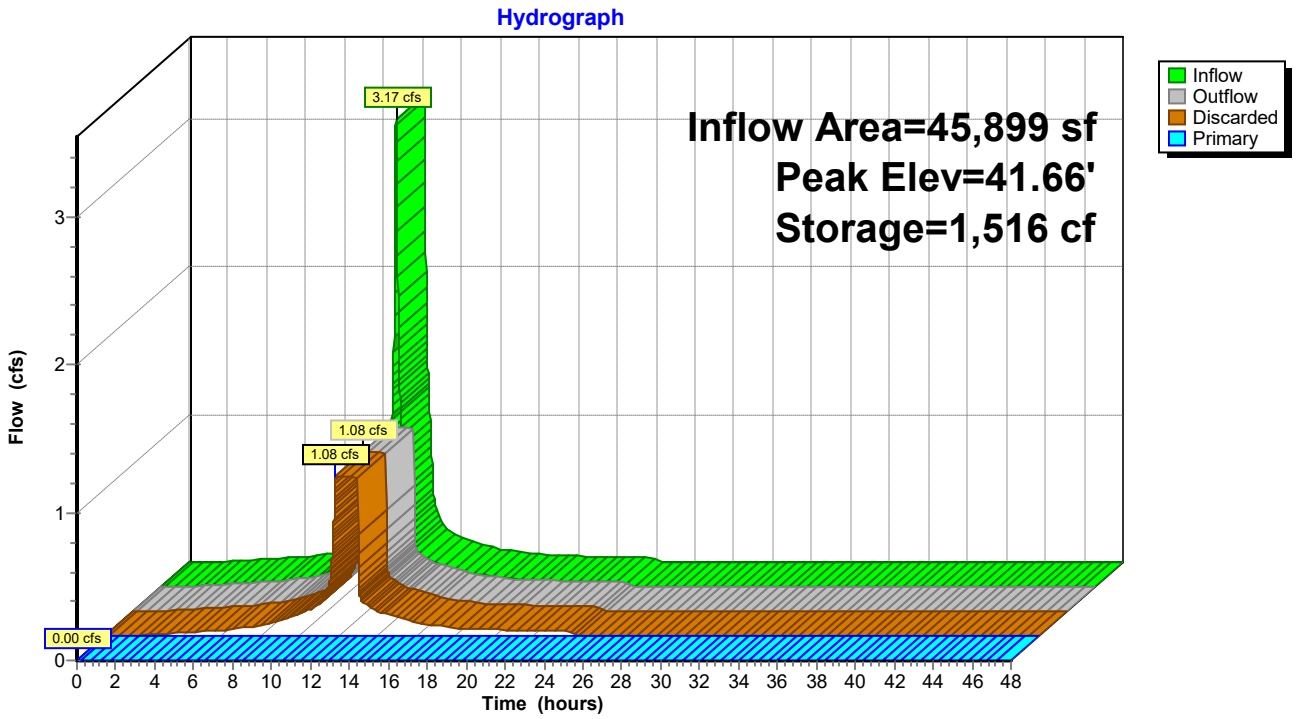
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
41.57	45,899	826.0	0	0	45,899
42.24	45,899	826.0	30,752	30,752	46,452

Device	Routing	Invert	Outlet Devices
#1	Discarded	41.57'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	39.07'	**10.0" Round 10" HDPE Outlet** L= 15.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 39.07' / 39.00' S= 0.0047 '/' Cc= 0.900 n= 0.013 Concrete pipe, straight & clean, Flow Area= 0.55 sf
#3	Device 2	41.83'	**10.0" Horiz. Riser Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=1.08 cfs @ 11.87 hrs HW=41.58' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 1.08 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=41.57' (Free Discharge)
↑**2=10" HDPE Outlet** (Passes 0.00 cfs of 2.99 cfs potential flow)
↑**3=Riser Orifice/Grate** (Controls 0.00 cfs)

Pond P-4: Softball Field



Summary for Pond TRNCH: Tennis Court Exfiltration Trench

Inflow Area = 64,336 sf, 50.56% Impervious, Inflow Depth = 0.72" for 2-year event
Inflow = 1.08 cfs @ 12.10 hrs, Volume= 3,881 cf
Outflow = 0.07 cfs @ 15.68 hrs, Volume= 3,881 cf, Atten= 94%, Lag= 214.7 min
Discarded = 0.07 cfs @ 15.68 hrs, Volume= 3,881 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link DP-1 : Design Point 1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 43.68' @ 15.68 hrs Surf.Area= 2,958 sf Storage= 2,029 cf

Plug-Flow detention time= 448.5 min calculated for 3,881 cf (100% of inflow)
Center-of-Mass det. time= 448.5 min (1,330.4 - 881.9)

Volume	Invert	Avail.Storage	Storage Description
#1	40.91'	200 cf	**Drywell Storage (Prismatic)** Listed below (Recalc) x 2 Inside #2
#2	40.41'	1,653 cf	**Exfiltration stone Layer (Prismatic)** Listed below (Recalc) 4,828 cf Overall - 237 cf Embedded = 4,591 cf x 36.0% Voids
#3	42.91'	1,453 cf	**Freeboard above basins (Prismatic)** Listed below (Recalc)
#4	40.91'	37 cf	**8.0" Round Pipe Storage** Inside #2 L= 105.0'
		3,342 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
40.91	50	0	0
42.91	50	100	100

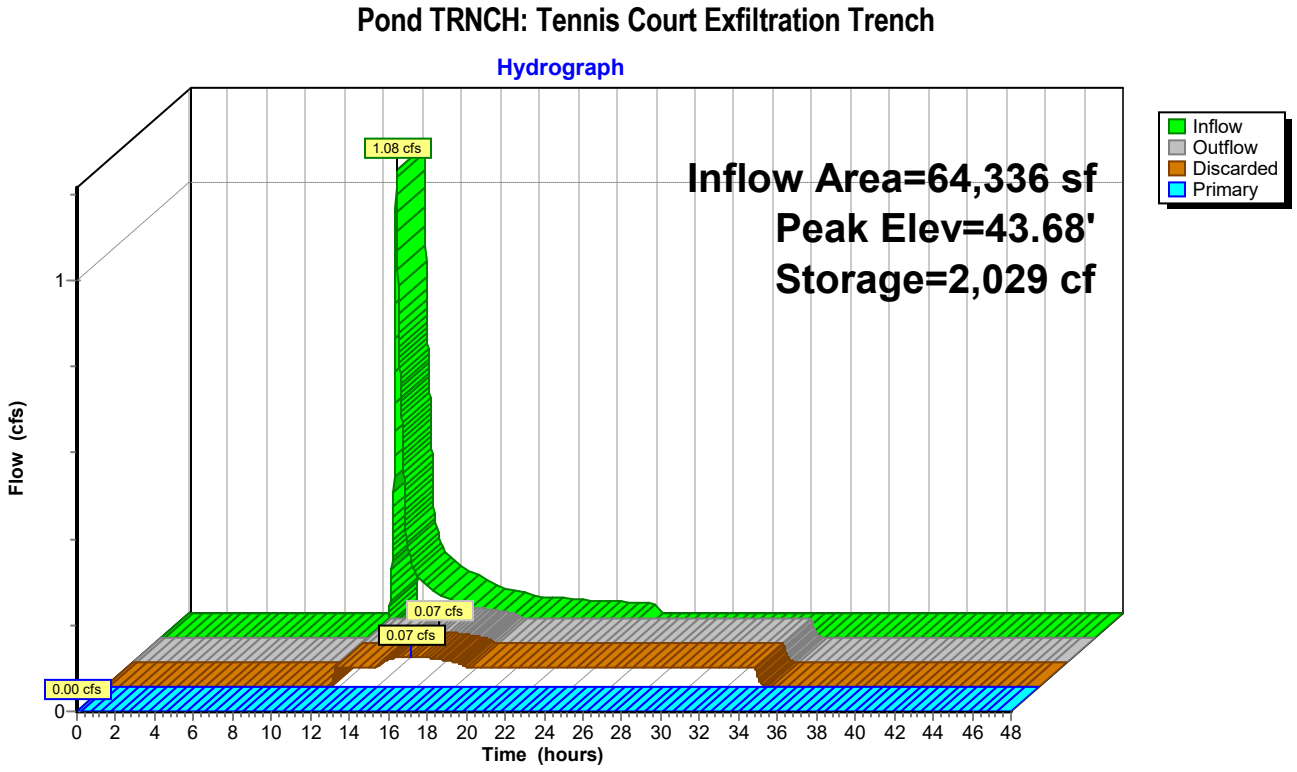
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
40.41	1,931	0	0
42.91	1,931	4,828	4,828

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
42.91	6	0	0
43.41	6	3	3
43.91	1,931	484	487
44.41	1,931	966	1,453

Device	Routing	Invert	Outlet Devices
#1	Discarded	40.41'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	43.91'	**120.0' long x 4.0' 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 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.07 cfs @ 15.68 hrs HW=43.68' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=40.41' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

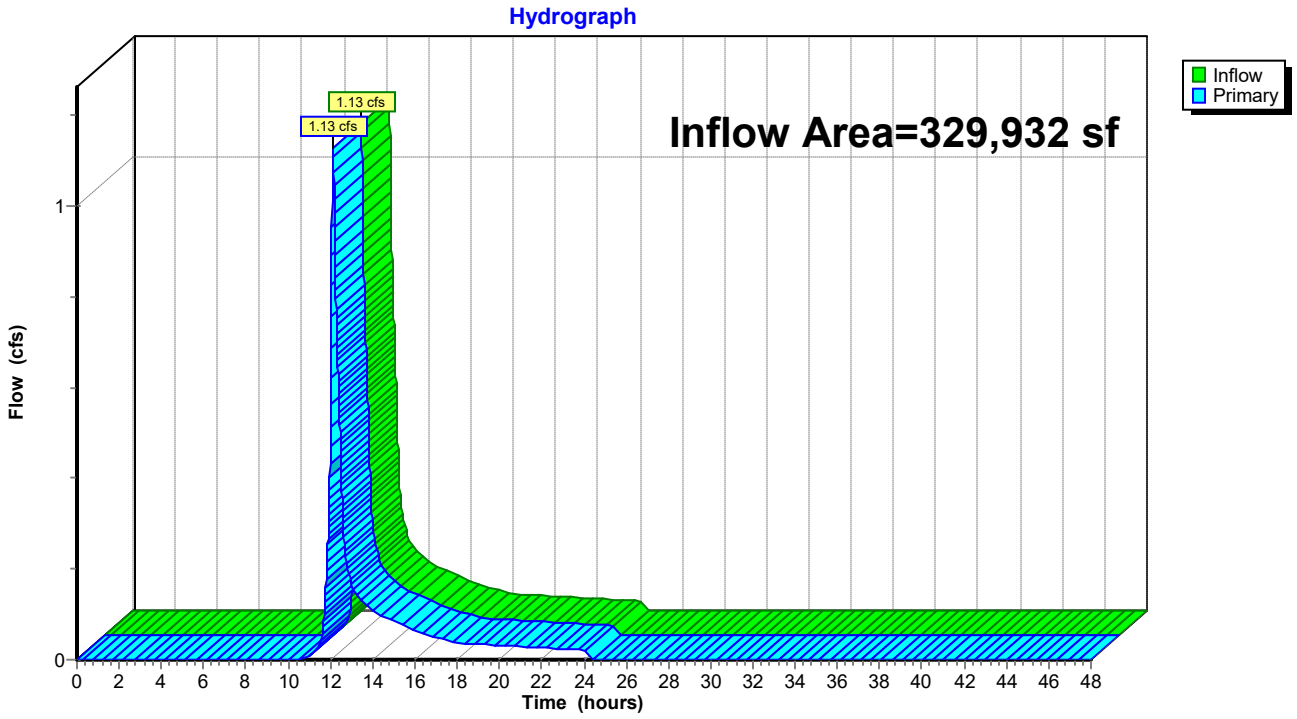


Summary for Link DP-1: Design Point 1

Inflow Area = 329,932 sf, 38.16% Impervious, Inflow Depth = 0.15" for 2-year event
Inflow = 1.13 cfs @ 12.13 hrs, Volume= 4,245 cf
Primary = 1.13 cfs @ 12.13 hrs, Volume= 4,245 cf, Atten= 0%, Lag= 0.0 min
Routed to Reach 1 : Wetlands

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link DP-1: Design Point 1

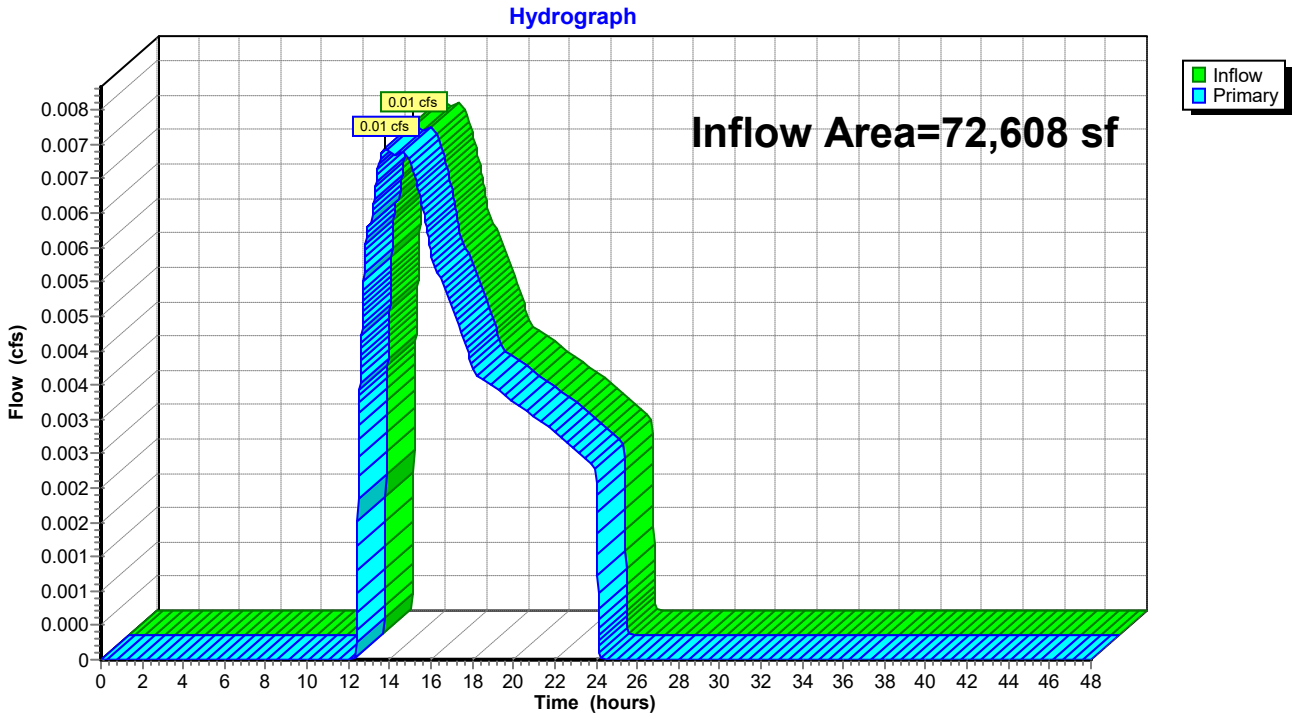


Summary for Link DP-2: Design Point 2

Inflow Area = 72,608 sf, 12.29% Impervious, Inflow Depth = 0.03" for 2-year event
Inflow = 0.01 cfs @ 13.78 hrs, Volume= 200 cf
Primary = 0.01 cfs @ 13.78 hrs, Volume= 200 cf, Atten= 0%, Lag= 0.0 min
Routed to Reach 1 : Wetlands

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link DP-2: Design Point 2

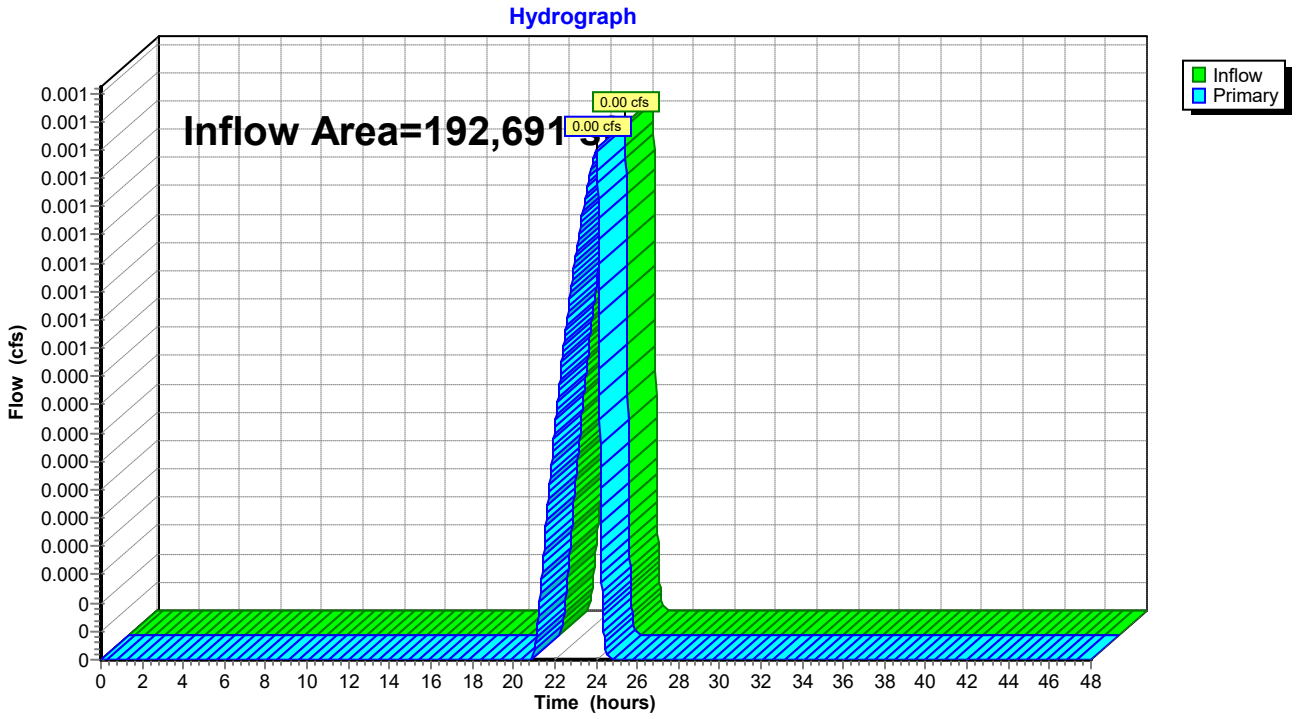


Summary for Link DP-3: Design Point 3

Inflow Area = 192,691 sf, 2.51% Impervious, Inflow Depth = 0.00" for 2-year event
Inflow = 0.00 cfs @ 24.03 hrs, Volume= 6 cf
Primary = 0.00 cfs @ 24.03 hrs, Volume= 6 cf, Atten= 0%, Lag= 0.0 min
Routed to Reach 1 : Wetlands

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link DP-3: Design Point 3



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PWS-1: West of Track Runoff Area=34,493 sf 44.98% Impervious Runoff Depth=1.90"
Flow Length=137' Tc=10.1 min CN=73 Runoff=1.51 cfs 5,449 cf

Subcatchment PWS-2: Track and Field Runoff Area=167,451 sf 43.24% Impervious Runoff Depth=3.82"
Tc=6.0 min CN=94 Runoff=16.10 cfs 53,241 cf

Subcatchment PWS-3: Tennis Court Area Runoff Area=64,336 sf 50.56% Impervious Runoff Depth=1.60"
Tc=6.0 min CN=69 Runoff=2.68 cfs 8,591 cf

Subcatchment PWS-4: North of Baseball Field Runoff Area=26,450 sf 15.13% Impervious Runoff Depth=0.46"
Tc=6.0 min UI Adjusted CN=49 Runoff=0.14 cfs 1,005 cf

Subcatchment PWS-5: Turf Field Runoff Area=46,159 sf 10.66% Impervious Runoff Depth=3.60"
Tc=6.0 min CN=92 Runoff=4.28 cfs 13,856 cf

Subcatchment PWS-6: Turf Field Runoff Area=77,639 sf 0.00% Impervious Runoff Depth=4.26"
Tc=6.0 min CN=98 Runoff=7.84 cfs 27,588 cf

Subcatchment PWS-7: East of Baseball Field Runoff Area=115,052 sf 4.21% Impervious Runoff Depth=0.14"
Flow Length=391' Tc=12.9 min UI Adjusted CN=40 Runoff=0.05 cfs 1,307 cf

Subcatchment PWS-8: Turf Softball Field Runoff Area=45,899 sf 0.00% Impervious Runoff Depth=4.26"
Tc=6.0 min CN=98 Runoff=4.63 cfs 16,310 cf

Subcatchment PWS-9: Surrounding Softball Runoff Area=17,752 sf 30.67% Impervious Runoff Depth=2.13"
Tc=6.0 min CN=76 Runoff=1.01 cfs 3,151 cf

Reach 1: Wetlands Inflow=3.35 cfs 14,196 cf
Outflow=3.35 cfs 14,196 cf

Pond P-1: Football Field Peak Elev=44.92' Storage=16,889 cf Inflow=16.10 cfs 53,241 cf
Discarded=1.96 cfs 52,866 cf Primary=0.17 cfs 374 cf Outflow=2.13 cfs 53,241 cf

Pond P-2: Baseball Field (West) Peak Elev=41.83' Storage=3,343 cf Inflow=4.28 cfs 13,856 cf
Discarded=0.88 cfs 13,856 cf Primary=0.00 cfs 0 cf Outflow=0.88 cfs 13,856 cf

Pond P-3: Baseball Field (East) Peak Elev=41.37' Storage=5,591 cf Inflow=7.84 cfs 27,588 cf
Discarded=1.83 cfs 27,588 cf Primary=0.00 cfs 0 cf Outflow=1.83 cfs 27,588 cf

Pond P-4: Softball Field Peak Elev=41.77' Storage=3,304 cf Inflow=4.63 cfs 16,310 cf
Discarded=1.08 cfs 16,310 cf Primary=0.00 cfs 0 cf Outflow=1.08 cfs 16,310 cf

Pond TRNCH: Tennis Court Exfiltration Trench Peak Elev=43.94' Storage=2,430 cf Inflow=2.68 cfs 8,591 cf
Discarded=0.09 cfs 5,682 cf Primary=1.46 cfs 2,910 cf Outflow=1.56 cfs 8,591 cf

Link DP-1: Design Point 1 Inflow=3.22 cfs 11,884 cf
Primary=3.22 cfs 11,884 cf

Link DP-2: Design Point 2 Inflow=0.14 cfs 1,005 cf
Primary=0.14 cfs 1,005 cf

Link DP-3: Design Point 3 Inflow=0.05 cfs 1,307 cf
Primary=0.05 cfs 1,307 cf

Total Runoff Area = 595,231 sf Runoff Volume = 130,497 cf Average Runoff Depth = 2.63"
76.54% Pervious = 455,570 sf 23.46% Impervious = 139,661 sf

Summary for Subcatchment PWS-1: West of Track

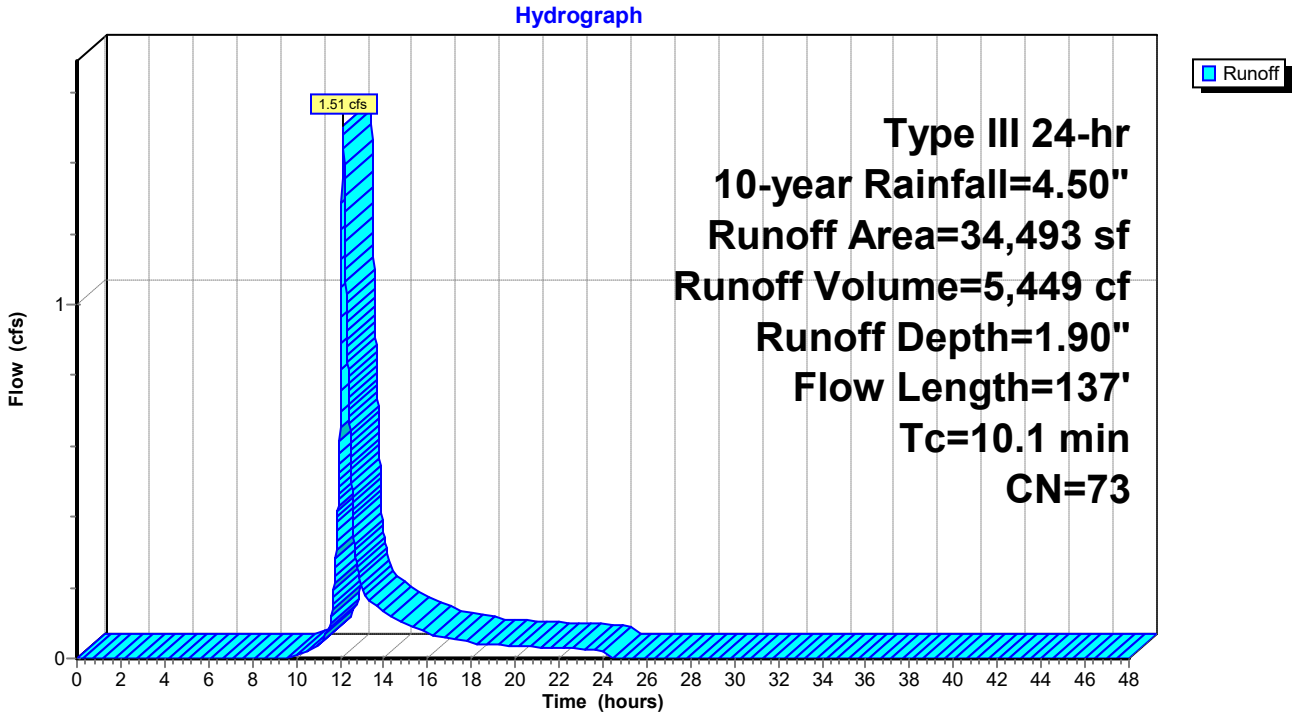
Runoff = 1.51 cfs @ 12.15 hrs, Volume= 5,449 cf, Depth= 1.90"
Routed to Link DP-1 : Design Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.50"

Area (sf)	CN	Description
901	98	Unconnected roofs, HSG B
1,128	98	Unconnected pavement, HSG B
2,984	98	Unconnected pavement, HSG B
42	61	>75% Grass cover, Good, HSG B
7,382	39	>75% Grass cover, Good, HSG A
70	39	>75% Grass cover, Good, HSG A
11,486	61	>75% Grass cover, Good, HSG B
2,766	98	Unconnected pavement, HSG A
1,190	98	Unconnected pavement, HSG A
429	98	Unconnected pavement, HSG A
4,179	98	Unconnected pavement, HSG A
1,935	98	Unconnected roofs, HSG A
34,493	73	Weighted Average
18,980		55.02% Pervious Area
15,513		44.98% Impervious Area
15,513		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	50	0.0140	0.09		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.10"
0.1	21	0.0240	2.49		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.4	66	0.0185	2.76		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
10.1	137	Total			

Subcatchment PWS-1: West of Track



Summary for Subcatchment PWS-2: Track and Field

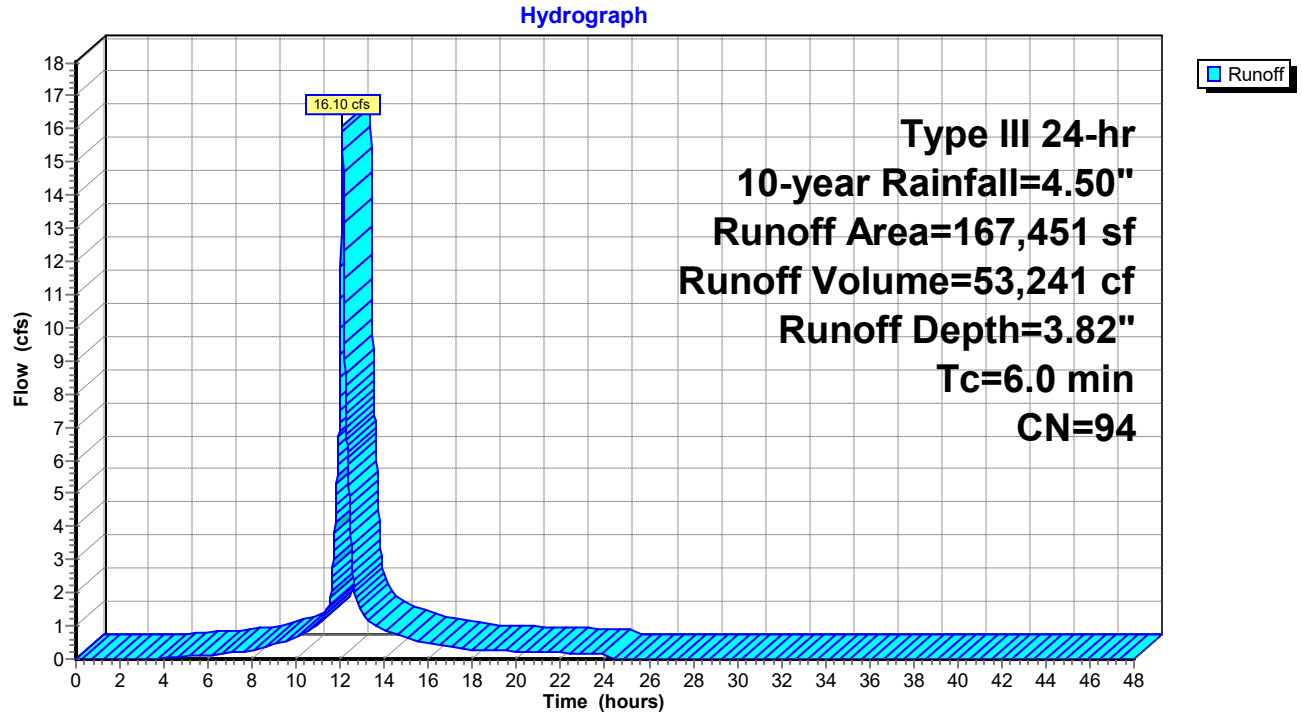
Runoff = 16.10 cfs @ 12.08 hrs, Volume= 53,241 cf, Depth= 3.82"
Routed to Pond P-1 : Football Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.50"

Area (sf)	CN	Description
23,921	98	Unconnected pavement, HSG A
39,732	98	Unconnected pavement, HSG A
8,756	98	Unconnected pavement, HSG B
2	98	Water Surface, 0% imp, HSG B
1	61	>75% Grass cover, Good, HSG B
492	39	>75% Grass cover, Good, HSG A
125	39	>75% Grass cover, Good, HSG A
12,023	39	>75% Grass cover, Good, HSG A
82,400	98	Water Surface, 0% imp, HSG A
167,451	94	Weighted Average
95,043		56.76% Pervious Area
72,408		43.24% Impervious Area
72,408		100.00% Unconnected

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

Subcatchment PWS-2: Track and Field



Summary for Subcatchment PWS-3: Tennis Court Area

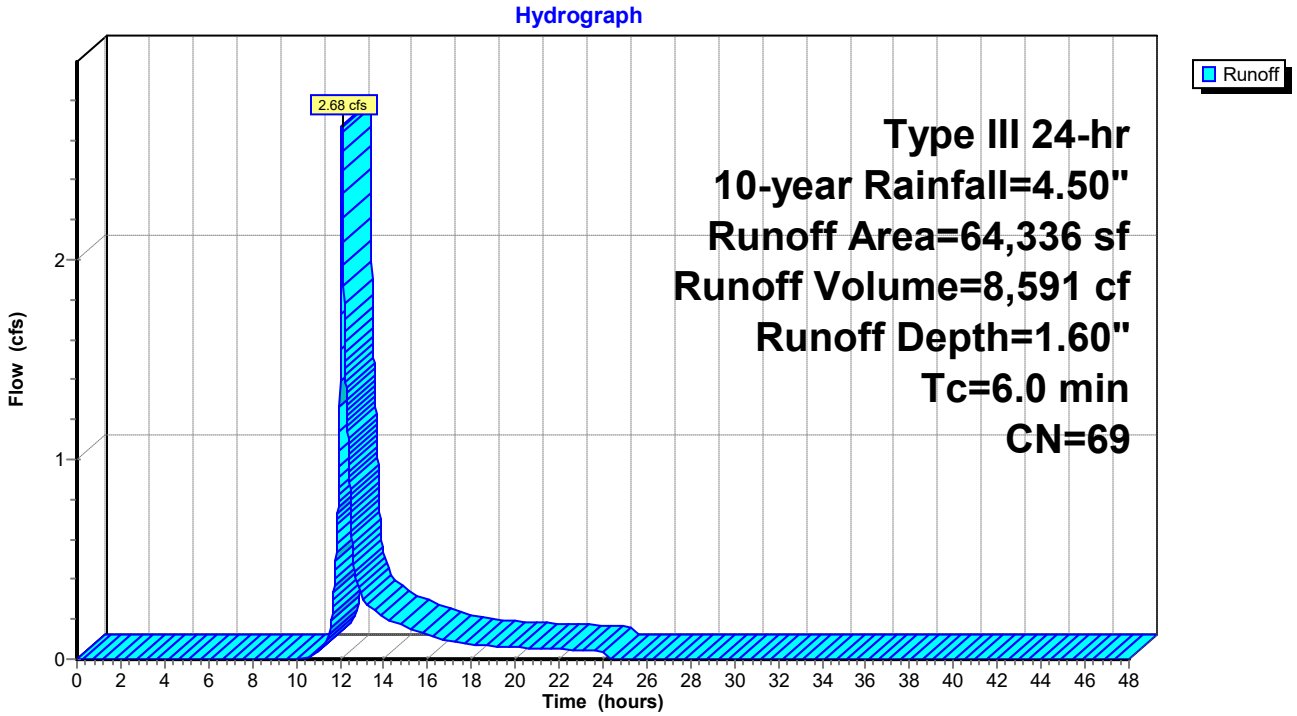
Runoff = 2.68 cfs @ 12.09 hrs, Volume= 8,591 cf, Depth= 1.60"
Routed to Pond TRNCH : Tennis Court Exfiltration Trench

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.50"

Area (sf)	CN	Description
654	98	Unconnected pavement, HSG B
51	61	>75% Grass cover, Good, HSG B
30,220	39	>75% Grass cover, Good, HSG A
1,534	39	>75% Grass cover, Good, HSG A
31,877	98	Unconnected pavement, HSG A
64,336	69	Weighted Average
31,805		49.44% Pervious Area
32,531		50.56% Impervious Area
32,531		100.00% Unconnected

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

Subcatchment PWS-3: Tennis Court Area



Summary for Subcatchment PWS-4: North of Baseball Field

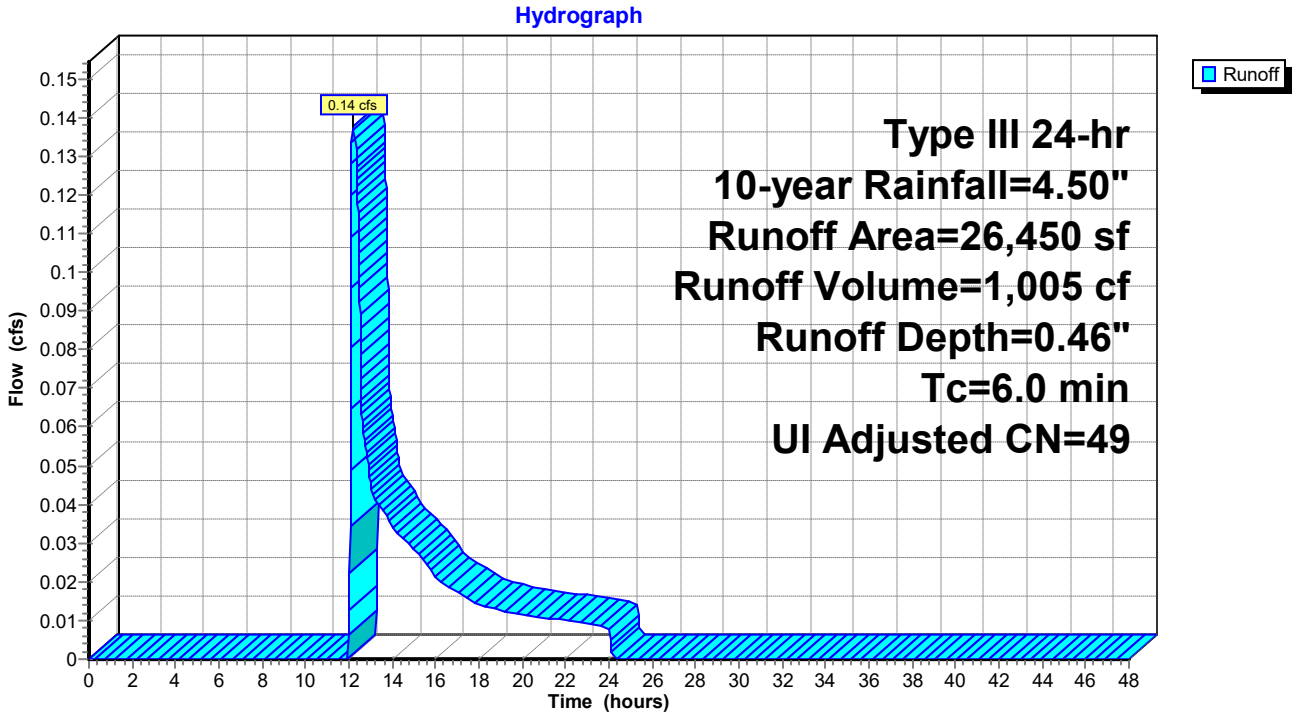
Runoff = 0.14 cfs @ 12.15 hrs, Volume= 1,005 cf, Depth= 0.46"
Routed to Link DP-2 : Design Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.50"

Area (sf)	CN	Adj	Description
2,569	96		Gravel surface, HSG A
96	98		Unconnected pavement, HSG A
3,902	98		Unconnected pavement, HSG A
5	98		Unconnected pavement, HSG A
19,878	39		>75% Grass cover, Good, HSG A
26,450	53	49	Weighted Average, UI Adjusted
22,447			84.87% Pervious Area
4,003			15.13% Impervious Area
4,003			100.00% Unconnected

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

Subcatchment PWS-4: North of Baseball Field



Summary for Subcatchment PWS-5: Turf Field

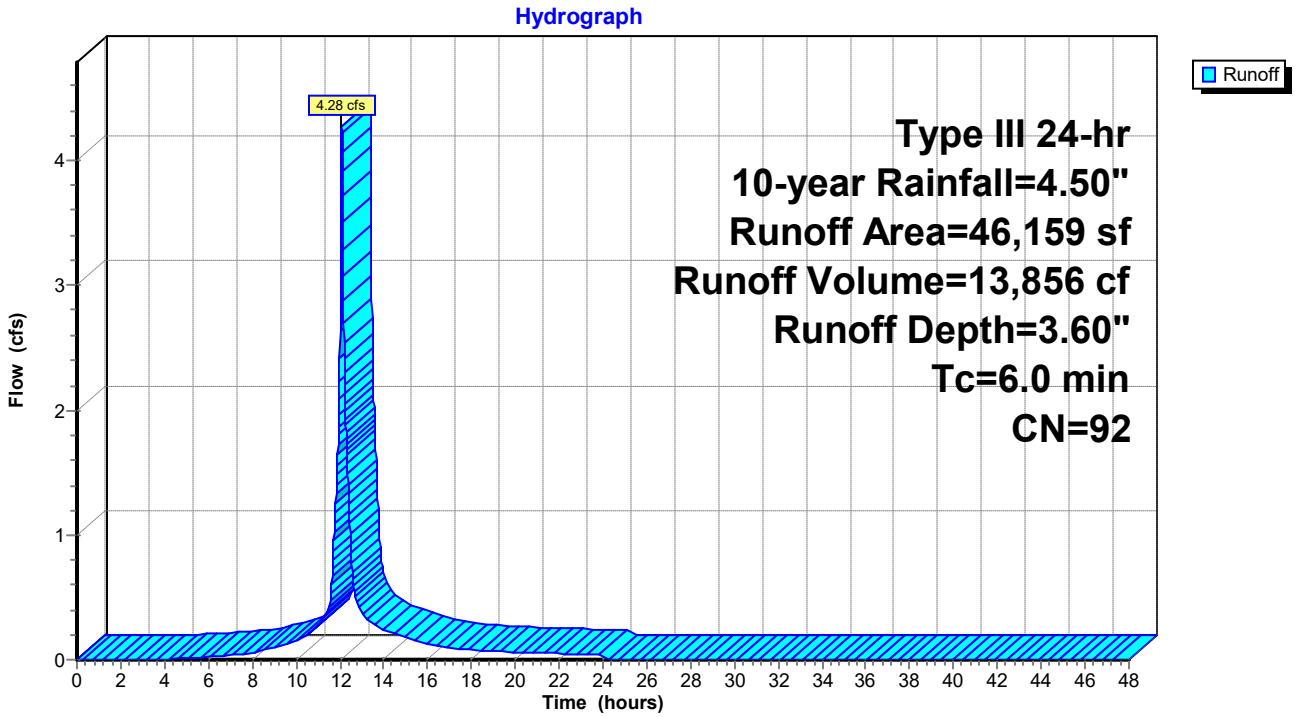
Runoff = 4.28 cfs @ 12.08 hrs, Volume= 13,856 cf, Depth= 3.60"
Routed to Pond P-2 : Baseball Field (West)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.50"

Area (sf)	CN	Description
558	39	>75% Grass cover, Good, HSG A
552	39	>75% Grass cover, Good, HSG A
3,255	39	>75% Grass cover, Good, HSG A
36,873	98	Water Surface, 0% imp, HSG A
4,864	98	Unconnected pavement, HSG A
58	98	Unconnected pavement, HSG A
46,159	92	Weighted Average
41,238		89.34% Pervious Area
4,921		10.66% Impervious Area
4,921		100.00% Unconnected

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

Subcatchment PWS-5: Turf Field



Summary for Subcatchment PWS-6: Turf Field

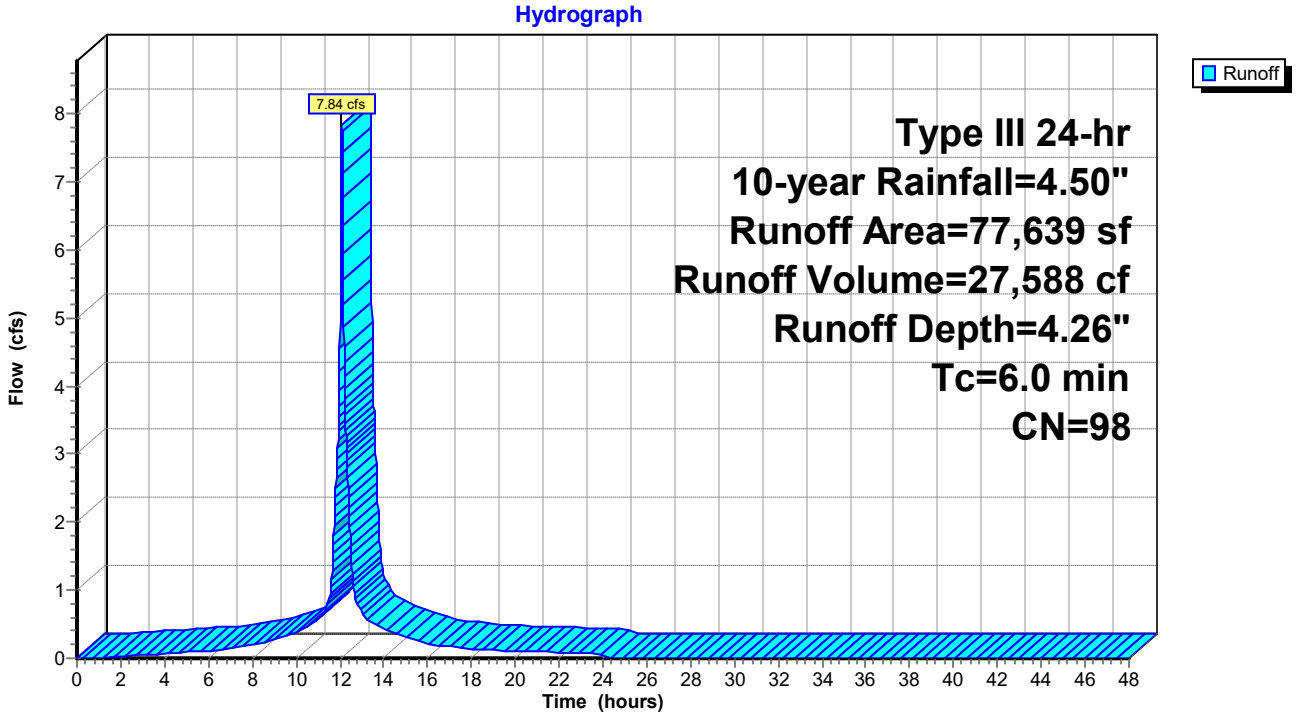
Runoff = 7.84 cfs @ 12.08 hrs, Volume= 27,588 cf, Depth= 4.26"
Routed to Pond P-3 : Baseball Field (East)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.50"

Area (sf)	CN	Description
12	39	>75% Grass cover, Good, HSG A
21	39	>75% Grass cover, Good, HSG A
77,606	98	Water Surface, 0% imp, HSG A
77,639	98	Weighted Average
77,639		100.00% Pervious Area

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

Subcatchment PWS-6: Turf Field



Summary for Subcatchment PWS-7: East of Baseball Field

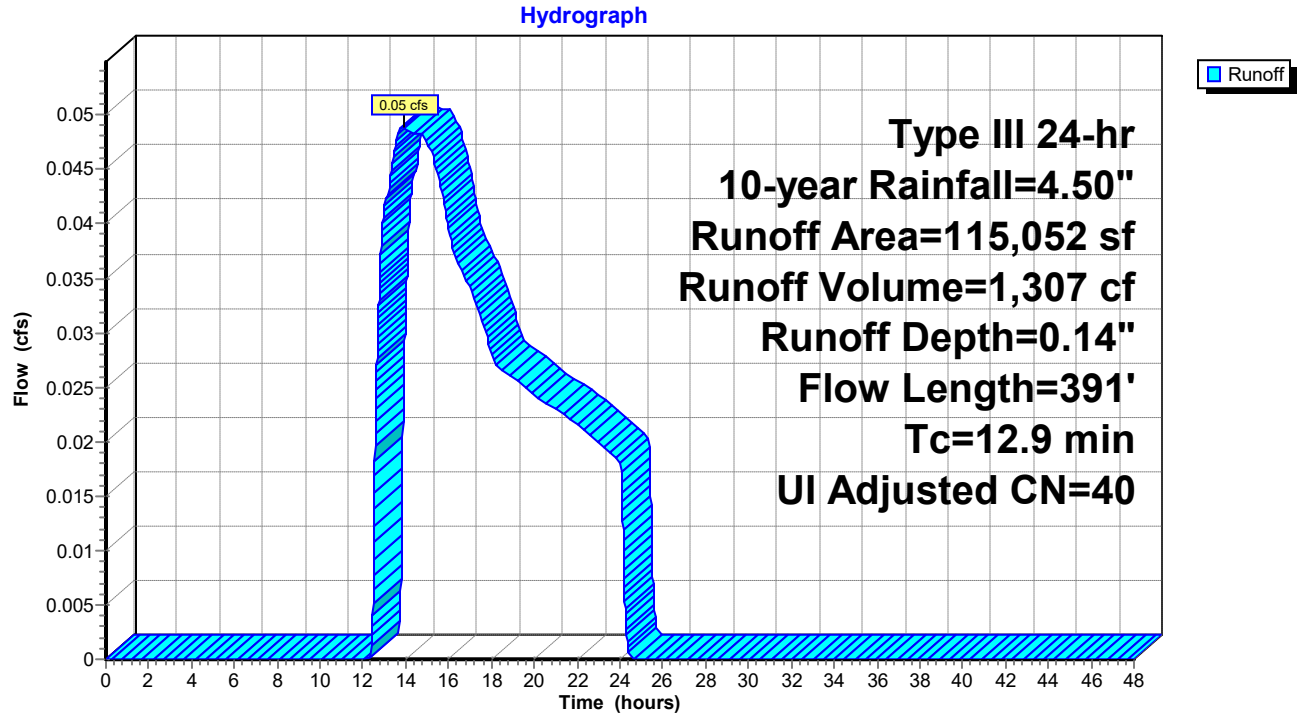
Runoff = 0.05 cfs @ 13.89 hrs, Volume= 1,307 cf, Depth= 0.14"
Routed to Link DP-3 : Design Point 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.50"

Area (sf)	CN	Adj	Description
99	98		Unconnected pavement, HSG A
4,742	98		Unconnected pavement, HSG A
110,211	39		>75% Grass cover, Good, HSG A
115,052	41	40	Weighted Average, UI Adjusted
110,211			95.79% Pervious Area
4,841			4.21% Impervious Area
4,841			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	50	0.0120	0.08		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.10"
2.6	309	0.0153	1.99		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.1	32	0.0770	4.47		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
12.9	391	Total			

Subcatchment PWS-7: East of Baseball Field



Summary for Subcatchment PWS-8: Turf Softball Field

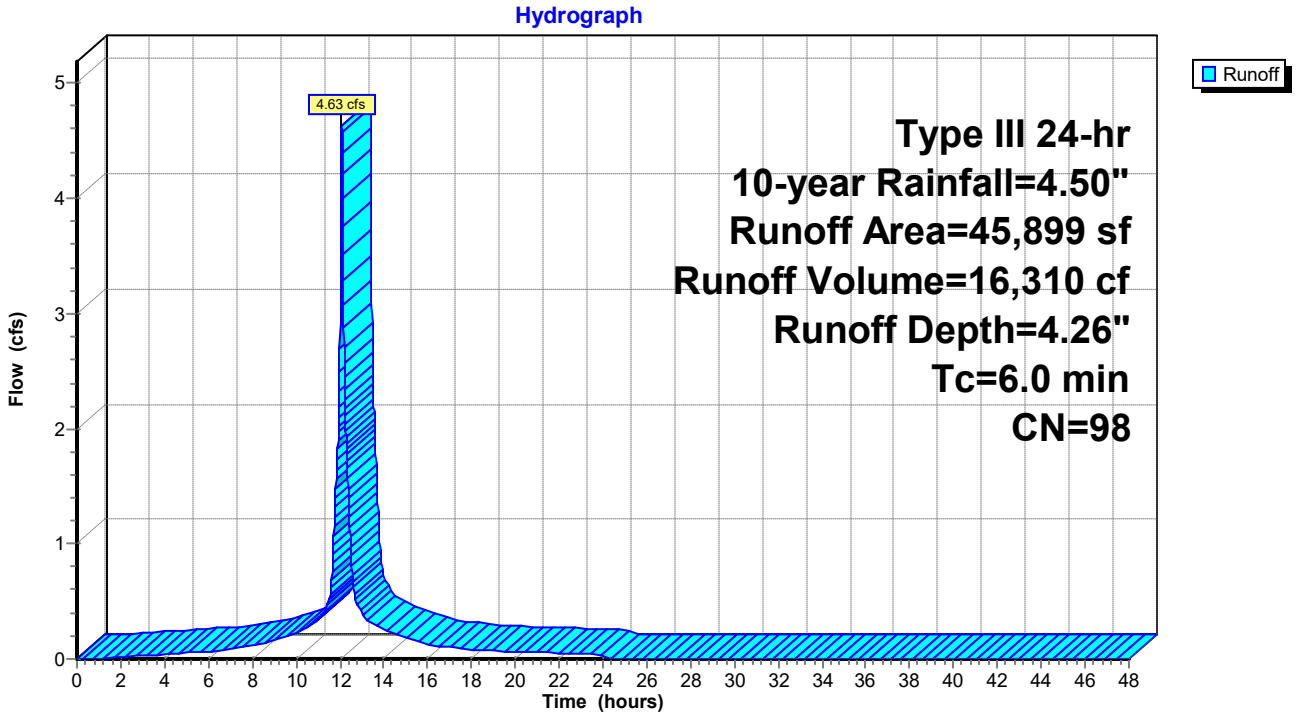
Runoff = 4.63 cfs @ 12.08 hrs, Volume= 16,310 cf, Depth= 4.26"
Routed to Pond P-4 : Softball Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.50"

Area (sf)	CN	Description
45,899	98	Water Surface, 0% imp, HSG B
45,899		100.00% Pervious Area

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

Subcatchment PWS-8: Turf Softball Field



Summary for Subcatchment PWS-9: Surrounding Softball

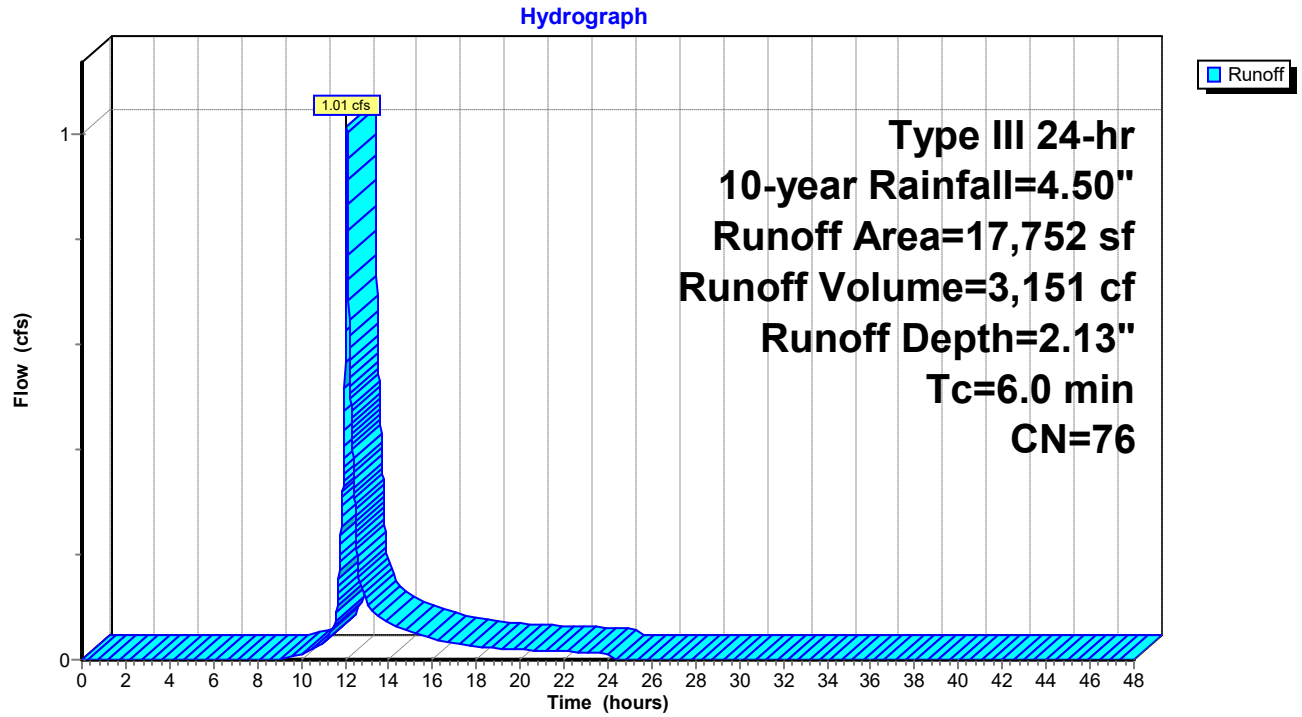
Runoff = 1.01 cfs @ 12.09 hrs, Volume= 3,151 cf, Depth= 2.13"
Routed to Link DP-1 : Design Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.50"

Area (sf)	CN	Description
1,211	98	Water Surface, 0% imp, HSG B
5,444	98	Unconnected pavement, HSG B
632	96	Gravel surface, HSG B
7,095	61	>75% Grass cover, Good, HSG B
3,329	61	>75% Grass cover, Good, HSG B
40	61	>75% Grass cover, Good, HSG B
17,752	76	Weighted Average
12,308		69.33% Pervious Area
5,444		30.67% Impervious Area
5,444		100.00% Unconnected

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

Subcatchment PWS-9: Surrounding Softball

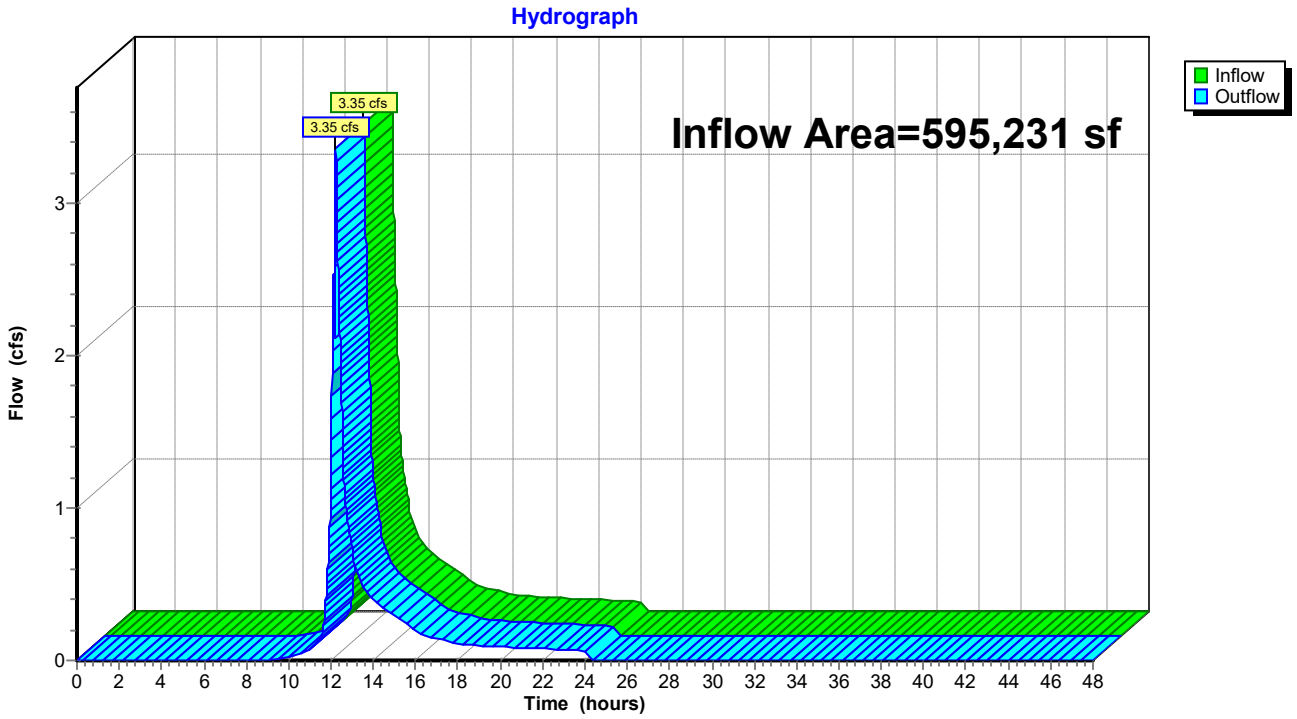


Summary for Reach 1: Wetlands

Inflow Area = 595,231 sf, 23.46% Impervious, Inflow Depth = 0.29" for 10-year event
Inflow = 3.35 cfs @ 12.23 hrs, Volume= 14,196 cf
Outflow = 3.35 cfs @ 12.23 hrs, Volume= 14,196 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 1: Wetlands



Summary for Pond P-1: Football Field

Inflow Area = 167,451 sf, 43.24% Impervious, Inflow Depth = 3.82" for 10-year event
Inflow = 16.10 cfs @ 12.08 hrs, Volume= 53,241 cf
Outflow = 2.13 cfs @ 12.61 hrs, Volume= 53,241 cf, Atten= 87%, Lag= 31.6 min
Discarded = 1.96 cfs @ 11.62 hrs, Volume= 52,866 cf
Primary = 0.17 cfs @ 12.61 hrs, Volume= 374 cf
Routed to Link DP-1 : Design Point 1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 44.92' @ 12.61 hrs Surf.Area= 83,155 sf Storage= 16,889 cf

Plug-Flow detention time= 55.5 min calculated for 53,241 cf (100% of inflow)
Center-of-Mass det. time= 55.5 min (832.0 - 776.5)

Volume	Invert	Avail.Storage	Storage Description
#1	44.36'	27,242 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 75,671 cf Overall x 36.0% Voids

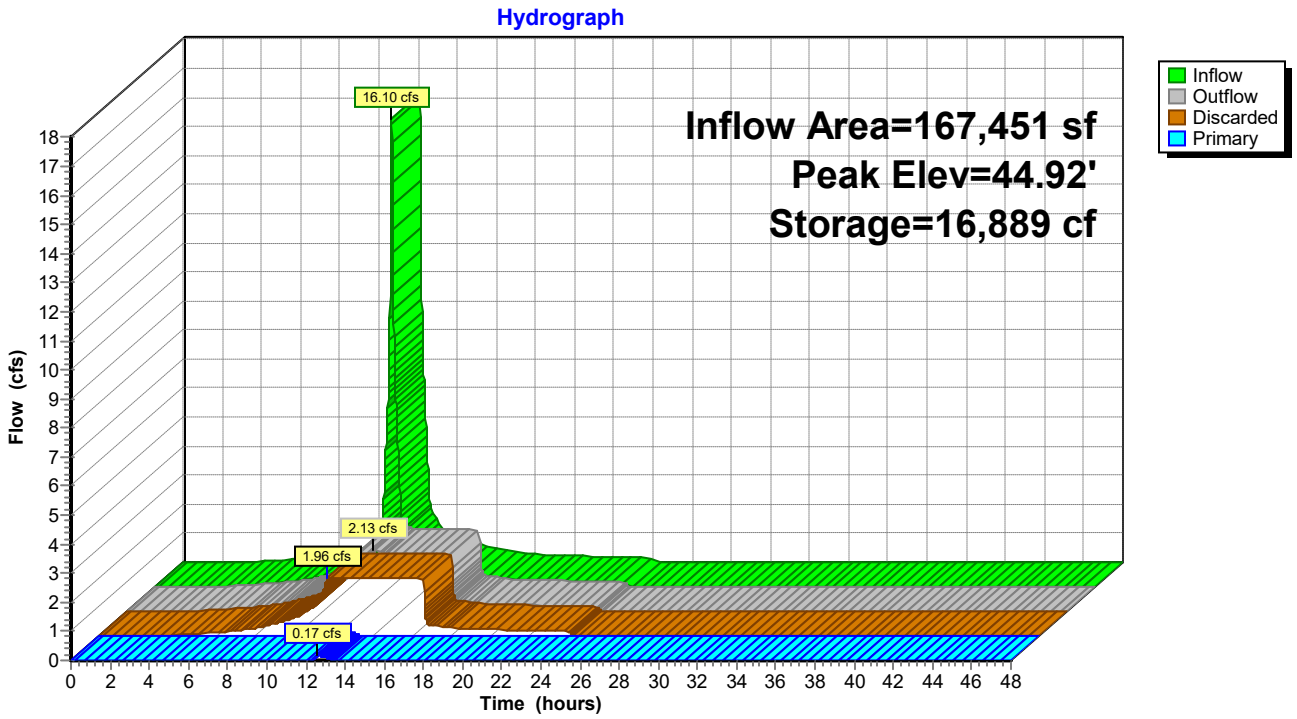
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
44.36	83,155	0	0
45.27	83,155	75,671	75,671

Device	Routing	Invert	Outlet Devices
#1	Discarded	44.36'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	42.19'	**10.0" Round 10" HDPE Pipe** L= 150.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 42.19' / 41.44' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#3	Device 2	44.86'	**12.0" Horiz. Riser Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=1.96 cfs @ 11.62 hrs HW=44.37' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 1.96 cfs)

Primary OutFlow Max=0.17 cfs @ 12.61 hrs HW=44.92' (Free Discharge)
↑**2=10" HDPE Pipe** (Passes 0.17 cfs of 2.60 cfs potential flow)
↑**3=Riser Orifice/Grate** (Weir Controls 0.17 cfs @ 0.83 fps)

Pond P-1: Football Field



Summary for Pond P-2: Baseball Field (West)

Inflow Area = 46,159 sf, 10.66% Impervious, Inflow Depth = 3.60" for 10-year event
Inflow = 4.28 cfs @ 12.08 hrs, Volume= 13,856 cf
Outflow = 0.88 cfs @ 11.74 hrs, Volume= 13,856 cf, Atten= 79%, Lag= 0.0 min
Discarded = 0.88 cfs @ 11.74 hrs, Volume= 13,856 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link DP-2 : Design Point 2

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 41.83' @ 12.51 hrs Surf.Area= 37,325 sf Storage= 3,343 cf

Plug-Flow detention time= 20.7 min calculated for 13,853 cf (100% of inflow)
Center-of-Mass det. time= 20.7 min (806.8 - 786.1)

Volume	Invert	Avail.Storage	Storage Description
#1	41.58'	9,003 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 25,008 cf Overall x 36.0% Voids

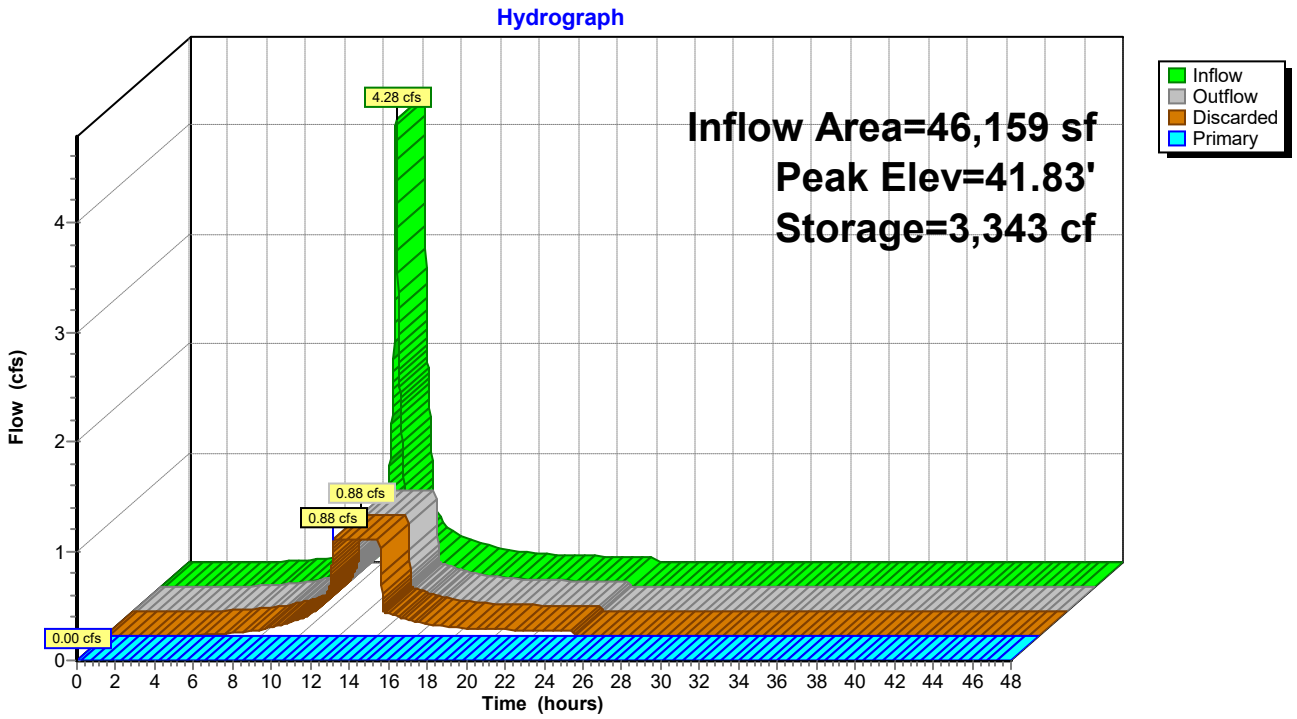
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
41.58	37,325	0	0
42.25	37,325	25,008	25,008

Device	Routing	Invert	Outlet Devices
#1	Discarded	41.58'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	39.17'	**10.0" Round 10" HDPE Pipe** L= 135.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 39.17' / 38.50' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#3	Device 2	41.84'	**12.0" Horiz. Riser Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.88 cfs @ 11.74 hrs HW=41.59' (Free Discharge)
↑└**1=Exfiltration** (Exfiltration Controls 0.88 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=41.58' (Free Discharge)
↑└**2=10" HDPE Pipe** (Passes 0.00 cfs of 2.50 cfs potential flow)
↑└**3=Riser Orifice/Grate** (Controls 0.00 cfs)

Pond P-2: Baseball Field (West)



Summary for Pond P-3: Baseball Field (East)

Inflow Area = 77,639 sf, 0.00% Impervious, Inflow Depth = 4.26" for 10-year event
Inflow = 7.84 cfs @ 12.08 hrs, Volume= 27,588 cf
Outflow = 1.83 cfs @ 11.75 hrs, Volume= 27,588 cf, Atten= 77%, Lag= 0.0 min
Discarded = 1.83 cfs @ 11.75 hrs, Volume= 27,588 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link DP-3 : Design Point 3

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 41.37' @ 12.47 hrs Surf.Area= 77,606 sf Storage= 5,591 cf

Plug-Flow detention time= 14.9 min calculated for 27,582 cf (100% of inflow)
Center-of-Mass det. time= 14.9 min (764.7 - 749.8)

Volume	Invert	Avail.Storage	Storage Description
#1	41.17'	18,719 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 51,996 cf Overall x 36.0% Voids

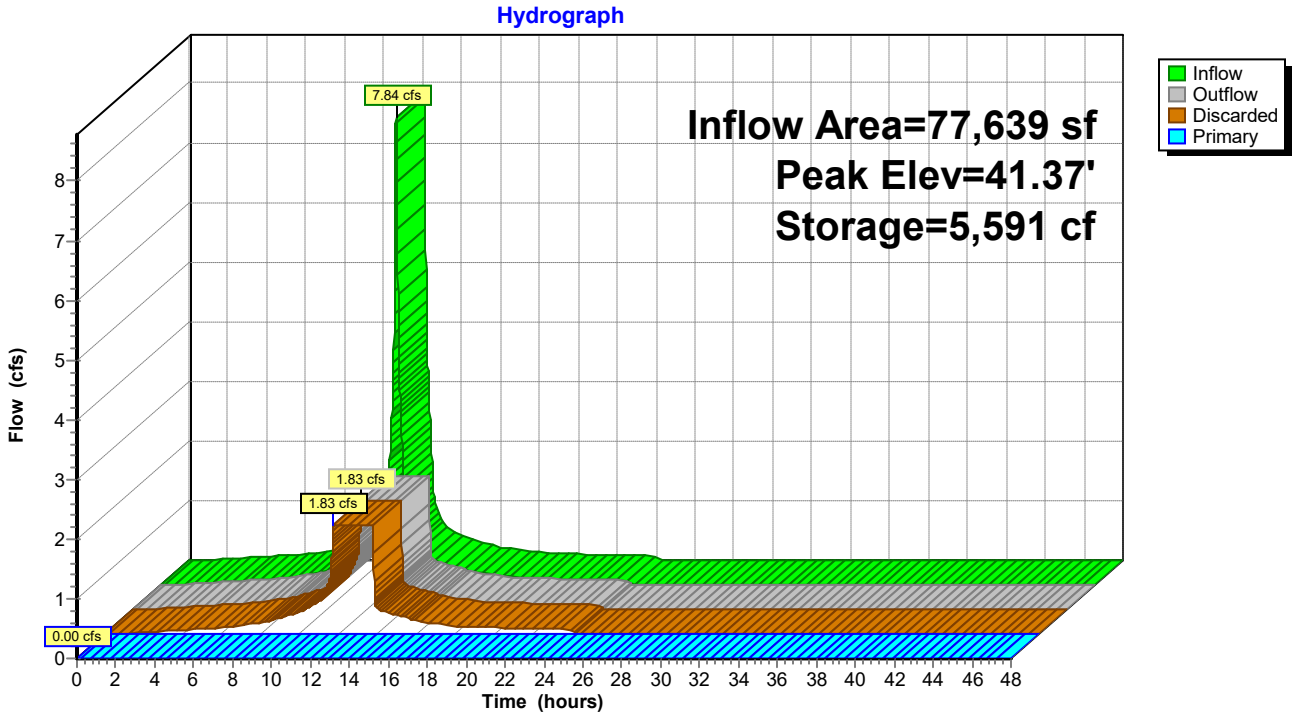
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
41.17	77,606	0	0
41.84	77,606	51,996	51,996

Device	Routing	Invert	Outlet Devices
#1	Discarded	41.17'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	38.76'	**10.0" Round 10" HDPE Pipe** L= 25.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 38.76' / 38.50' S= 0.0104 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#3	Device 2	41.43'	**12.0" Horiz. Riser Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=1.83 cfs @ 11.75 hrs HW=41.18' (Free Discharge)
↑└**1=Exfiltration** (Exfiltration Controls 1.83 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=41.17' (Free Discharge)
↑└**2=10" HDPE Pipe** (Passes 0.00 cfs of 3.71 cfs potential flow)
↑└**3=Riser Orifice/Grate** (Controls 0.00 cfs)

Pond P-3: Baseball Field (East)



Summary for Pond P-4: Softball Field

Inflow Area = 45,899 sf, 0.00% Impervious, Inflow Depth = 4.26" for 10-year event
Inflow = 4.63 cfs @ 12.08 hrs, Volume= 16,310 cf
Outflow = 1.08 cfs @ 11.75 hrs, Volume= 16,310 cf, Atten= 77%, Lag= 0.0 min
Discarded = 1.08 cfs @ 11.75 hrs, Volume= 16,310 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link DP-1 : Design Point 1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 41.77' @ 12.47 hrs Surf.Area= 45,899 sf Storage= 3,304 cf

Plug-Flow detention time= 14.8 min calculated for 16,306 cf (100% of inflow)
Center-of-Mass det. time= 14.8 min (764.7 - 749.8)

Volume	Invert	Avail.Storage	Storage Description
#1	41.57'	11,071 cf	**Custom Stage Data (Irregular)** Listed below (Recalc) 30,752 cf Overall x 36.0% Voids

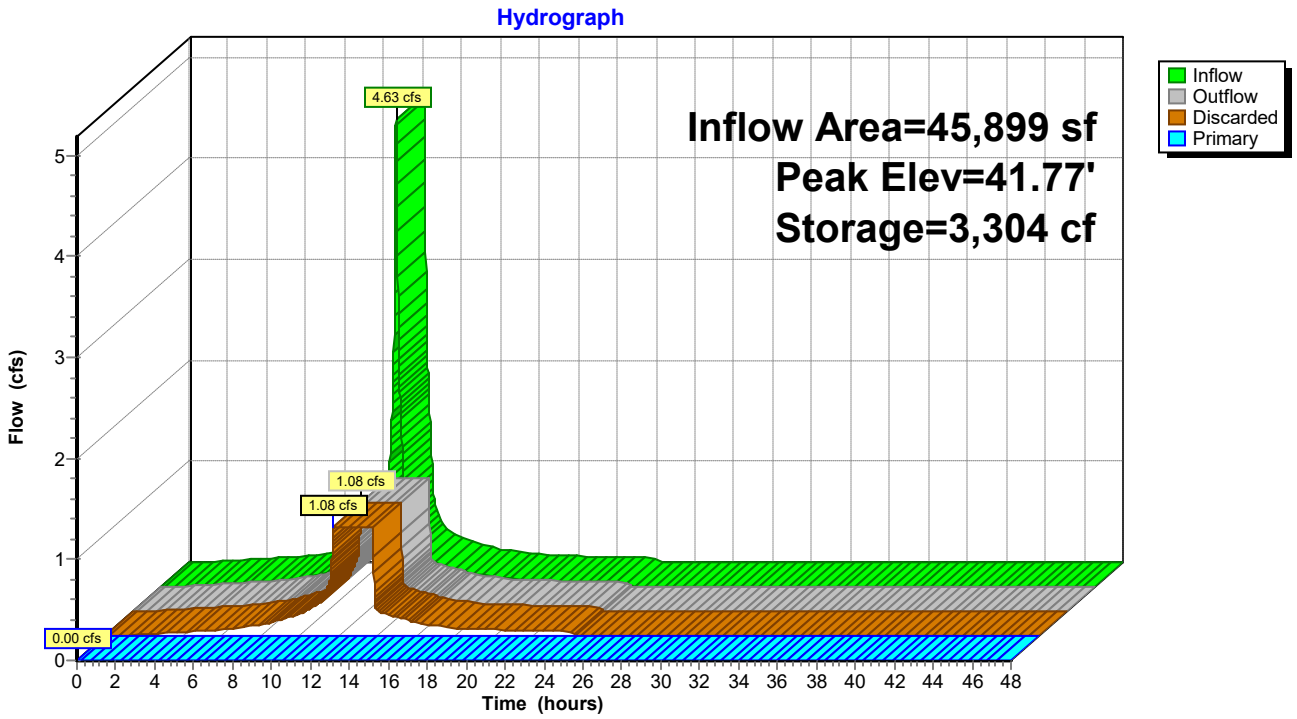
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
41.57	45,899	826.0	0	0	45,899
42.24	45,899	826.0	30,752	30,752	46,452

Device	Routing	Invert	Outlet Devices
#1	Discarded	41.57'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	39.07'	**10.0" Round 10" HDPE Outlet** L= 15.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 39.07' / 39.00' S= 0.0047 '/' Cc= 0.900 n= 0.013 Concrete pipe, straight & clean, Flow Area= 0.55 sf
#3	Device 2	41.83'	**10.0" Horiz. Riser Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=1.08 cfs @ 11.75 hrs HW=41.58' (Free Discharge)
↑└**1=Exfiltration** (Exfiltration Controls 1.08 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=41.57' (Free Discharge)
↑└**2=10" HDPE Outlet** (Passes 0.00 cfs of 2.99 cfs potential flow)
↑└**3=Riser Orifice/Grate** (Controls 0.00 cfs)

Pond P-4: Softball Field



Summary for Pond TRNCH: Tennis Court Exfiltration Trench

Inflow Area = 64,336 sf, 50.56% Impervious, Inflow Depth = 1.60" for 10-year event
Inflow = 2.68 cfs @ 12.09 hrs, Volume= 8,591 cf
Outflow = 1.56 cfs @ 12.23 hrs, Volume= 8,591 cf, Atten= 42%, Lag= 8.4 min
Discarded = 0.09 cfs @ 12.21 hrs, Volume= 5,682 cf
Primary = 1.46 cfs @ 12.23 hrs, Volume= 2,910 cf
Routed to Link DP-1 : Design Point 1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 43.94' @ 12.23 hrs Surf.Area= 3,862 sf Storage= 2,430 cf

Plug-Flow detention time= 267.3 min calculated for 8,591 cf (100% of inflow)
Center-of-Mass det. time= 267.3 min (1,123.5 - 856.3)

Volume	Invert	Avail.Storage	Storage Description
#1	40.91'	200 cf	**Drywell Storage (Prismatic)** Listed below (Recalc) x 2 Inside #2
#2	40.41'	1,653 cf	**Exfiltration stone Layer (Prismatic)** Listed below (Recalc) 4,828 cf Overall - 237 cf Embedded = 4,591 cf x 36.0% Voids
#3	42.91'	1,453 cf	**Freeboard above basins (Prismatic)** Listed below (Recalc)
#4	40.91'	37 cf	**8.0" Round Pipe Storage** Inside #2 L= 105.0'
		3,342 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
40.91	50	0	0
42.91	50	100	100

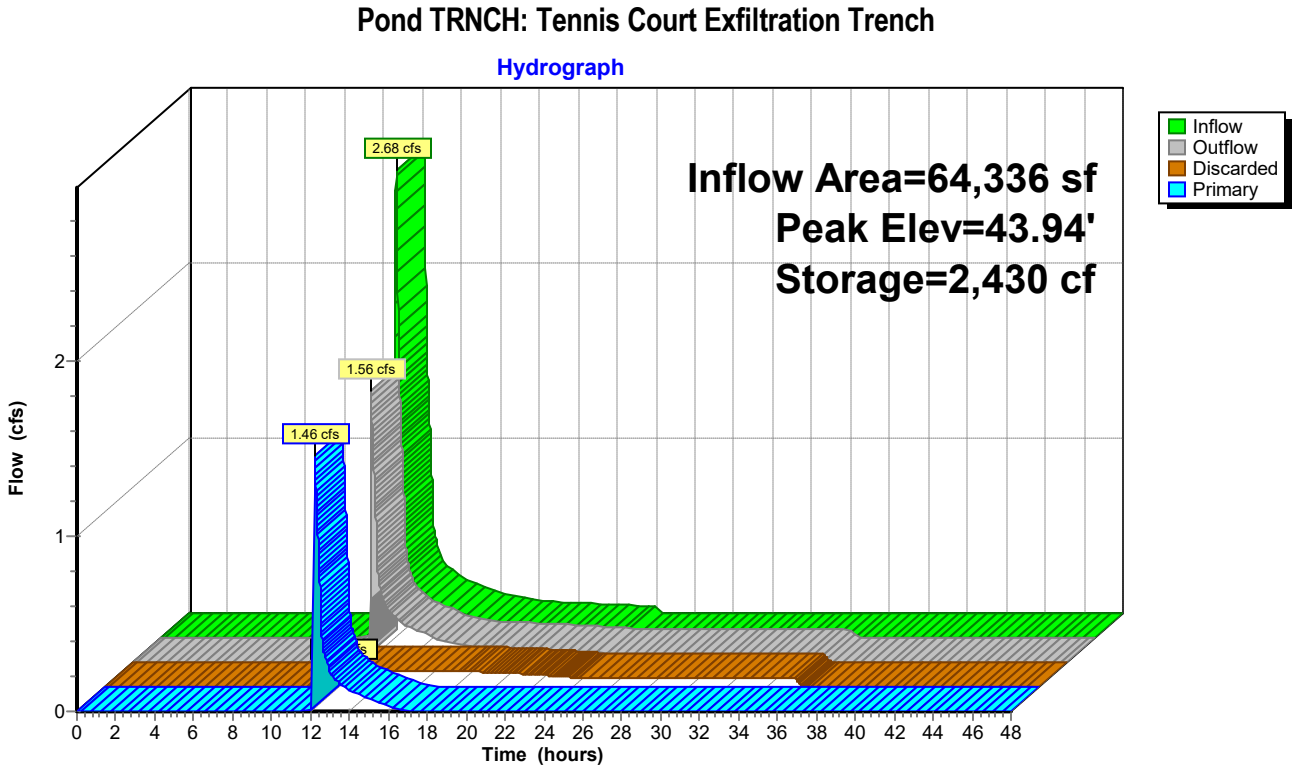
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
40.41	1,931	0	0
42.91	1,931	4,828	4,828

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
42.91	6	0	0
43.41	6	3	3
43.91	1,931	484	487
44.41	1,931	966	1,453

Device	Routing	Invert	Outlet Devices
#1	Discarded	40.41'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	43.91'	**120.0' long x 4.0' 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 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.09 cfs @ 12.21 hrs HW=43.92' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=1.30 cfs @ 12.23 hrs HW=43.94' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 1.30 cfs @ 0.39 fps)

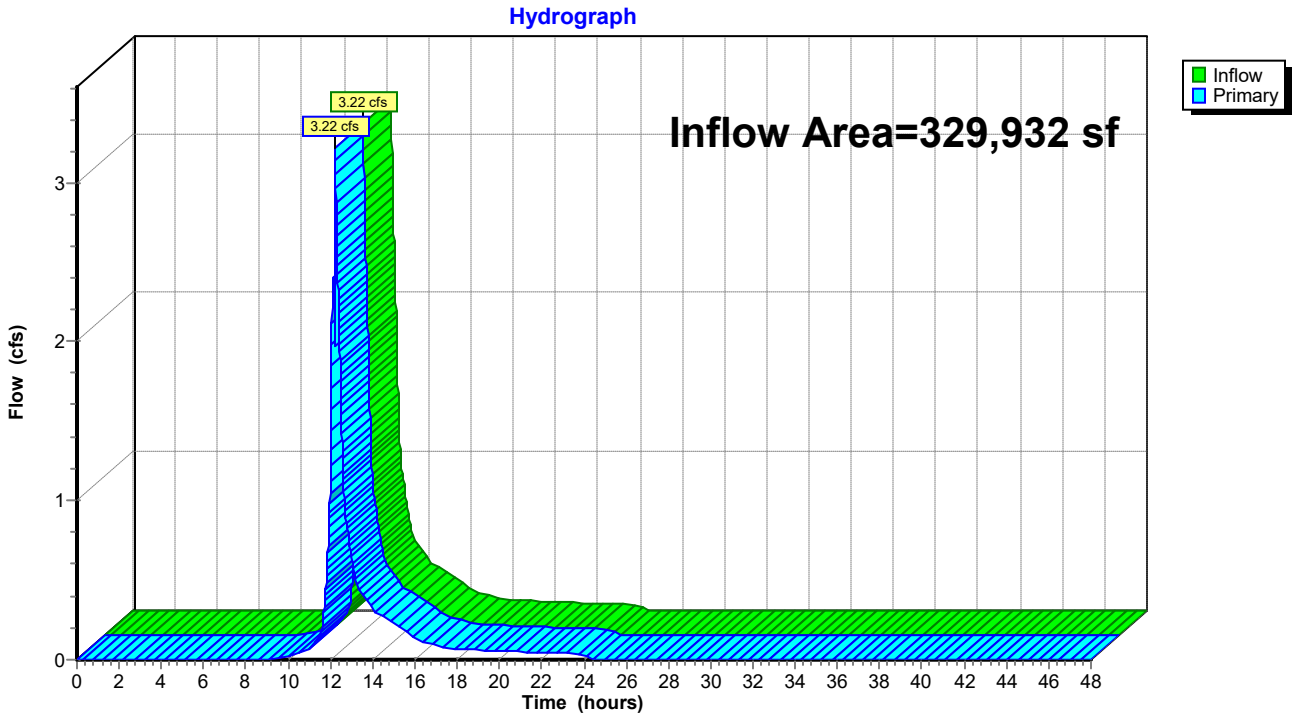


Summary for Link DP-1: Design Point 1

Inflow Area = 329,932 sf, 38.16% Impervious, Inflow Depth = 0.43" for 10-year event
Inflow = 3.22 cfs @ 12.23 hrs, Volume= 11,884 cf
Primary = 3.22 cfs @ 12.23 hrs, Volume= 11,884 cf, Atten= 0%, Lag= 0.0 min
Routed to Reach 1 : Wetlands

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link DP-1: Design Point 1

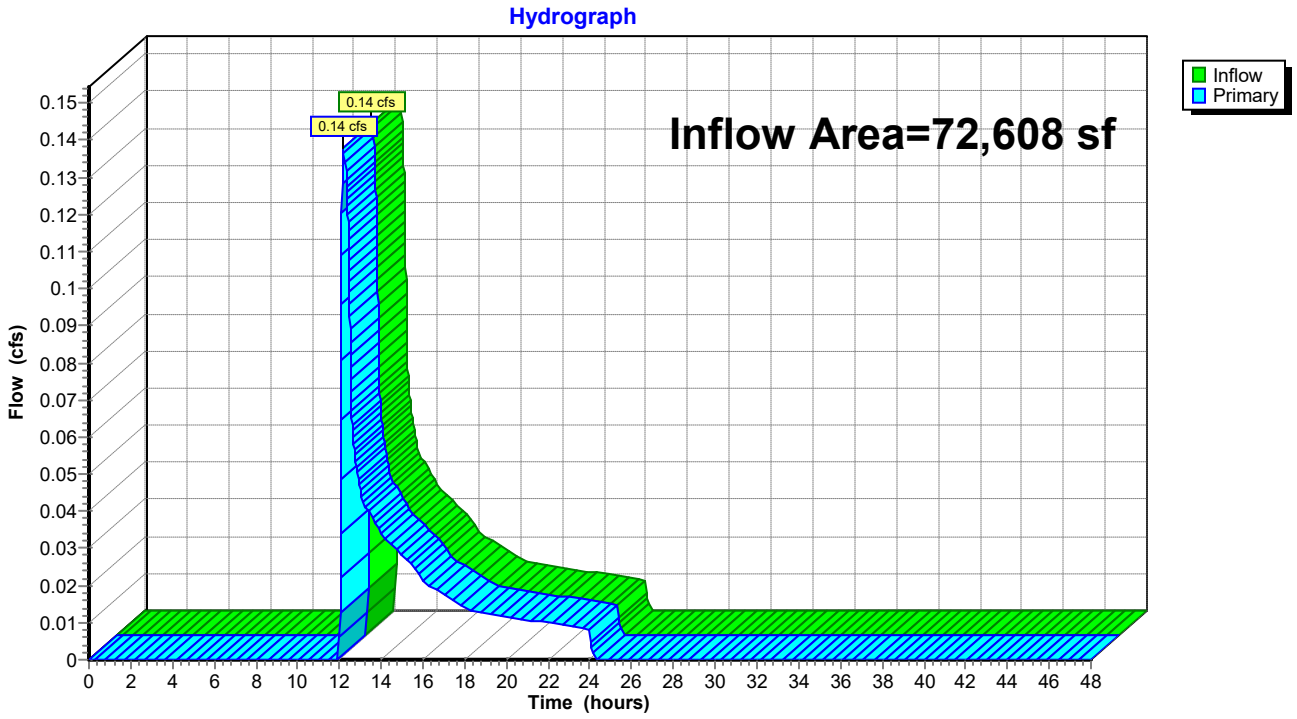


Summary for Link DP-2: Design Point 2

Inflow Area = 72,608 sf, 12.29% Impervious, Inflow Depth = 0.17" for 10-year event
Inflow = 0.14 cfs @ 12.15 hrs, Volume= 1,005 cf
Primary = 0.14 cfs @ 12.15 hrs, Volume= 1,005 cf, Atten= 0%, Lag= 0.0 min
Routed to Reach 1 : Wetlands

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link DP-2: Design Point 2

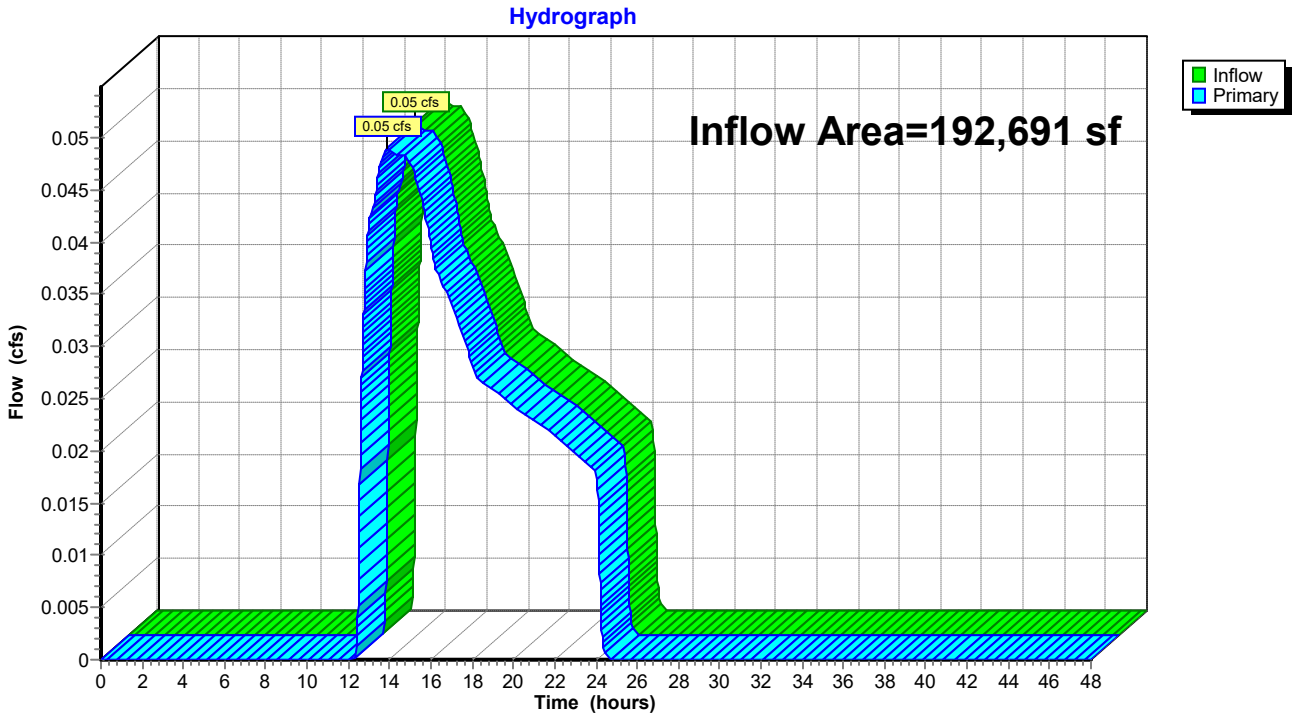


Summary for Link DP-3: Design Point 3

Inflow Area = 192,691 sf, 2.51% Impervious, Inflow Depth = 0.08" for 10-year event
Inflow = 0.05 cfs @ 13.89 hrs, Volume= 1,307 cf
Primary = 0.05 cfs @ 13.89 hrs, Volume= 1,307 cf, Atten= 0%, Lag= 0.0 min
Routed to Reach 1 : Wetlands

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link DP-3: Design Point 3



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PWS-1: West of Track Runoff Area=34,493 sf 44.98% Impervious Runoff Depth=3.51"
Flow Length=137' Tc=10.1 min CN=73 Runoff=2.83 cfs 10,083 cf

Subcatchment PWS-2: Track and Field Runoff Area=167,451 sf 43.24% Impervious Runoff Depth=5.79"
Tc=6.0 min CN=94 Runoff=23.87 cfs 80,825 cf

Subcatchment PWS-3: Tennis Court Area Runoff Area=64,336 sf 50.56% Impervious Runoff Depth=3.11"
Tc=6.0 min CN=69 Runoff=5.36 cfs 16,665 cf

Subcatchment PWS-4: North of Baseball Field Runoff Area=26,450 sf 15.13% Impervious Runoff Depth=1.32"
Tc=6.0 min UI Adjusted CN=49 Runoff=0.76 cfs 2,902 cf

Subcatchment PWS-5: Turf Field Runoff Area=46,159 sf 10.66% Impervious Runoff Depth=5.56"
Tc=6.0 min CN=92 Runoff=6.44 cfs 21,393 cf

Subcatchment PWS-6: Turf Field Runoff Area=77,639 sf 0.00% Impervious Runoff Depth=6.26"
Tc=6.0 min CN=98 Runoff=11.36 cfs 40,511 cf

Subcatchment PWS-7: East of Baseball Field Runoff Area=115,052 sf 4.21% Impervious Runoff Depth=0.66"
Flow Length=391' Tc=12.9 min UI Adjusted CN=40 Runoff=0.81 cfs 6,349 cf

Subcatchment PWS-8: Turf Softball Field Runoff Area=45,899 sf 0.00% Impervious Runoff Depth=6.26"
Tc=6.0 min CN=98 Runoff=6.72 cfs 23,949 cf

Subcatchment PWS-9: Surrounding Softball Runoff Area=17,752 sf 30.67% Impervious Runoff Depth=3.82"
Tc=6.0 min CN=76 Runoff=1.82 cfs 5,644 cf

Reach 1: Wetlands Inflow=10.69 cfs 48,490 cf
Outflow=10.69 cfs 48,490 cf

Pond P-1: Football Field Peak Elev=45.24' Storage=26,279 cf Inflow=23.87 cfs 80,825 cf
Discarded=1.96 cfs 70,485 cf Primary=2.32 cfs 10,340 cf Outflow=4.29 cfs 80,825 cf

Pond P-2: Baseball Field (West) Peak Elev=42.00' Storage=5,709 cf Inflow=6.44 cfs 21,393 cf
Discarded=0.88 cfs 19,663 cf Primary=0.69 cfs 1,730 cf Outflow=1.57 cfs 21,393 cf

Pond P-3: Baseball Field (East) Peak Elev=41.54' Storage=10,199 cf Inflow=11.36 cfs 40,511 cf
Discarded=1.83 cfs 39,710 cf Primary=0.35 cfs 801 cf Outflow=2.18 cfs 40,511 cf

Pond P-4: Softball Field Peak Elev=41.93' Storage=5,969 cf Inflow=6.72 cfs 23,949 cf
Discarded=1.08 cfs 23,351 cf Primary=0.28 cfs 598 cf Outflow=1.36 cfs 23,949 cf

Pond TRNCH: Tennis Court Exfiltration Trench Peak Elev=43.98' Storage=2,509 cf Inflow=5.36 cfs 16,665 cf
Discarded=0.09 cfs 6,622 cf Primary=5.26 cfs 10,043 cf Outflow=5.35 cfs 16,665 cf

Link DP-1: Design Point 1 Inflow=9.73 cfs 36,709 cf
Primary=9.73 cfs 36,709 cf

Link DP-2: Design Point 2 Inflow=1.04 cfs 4,632 cf
Primary=1.04 cfs 4,632 cf

Link DP-3: Design Point 3 Inflow=1.12 cfs 7,149 cf
Primary=1.12 cfs 7,149 cf

Total Runoff Area = 595,231 sf Runoff Volume = 208,321 cf Average Runoff Depth = 4.20"
76.54% Pervious = 455,570 sf 23.46% Impervious = 139,661 sf

Summary for Subcatchment PWS-1: West of Track

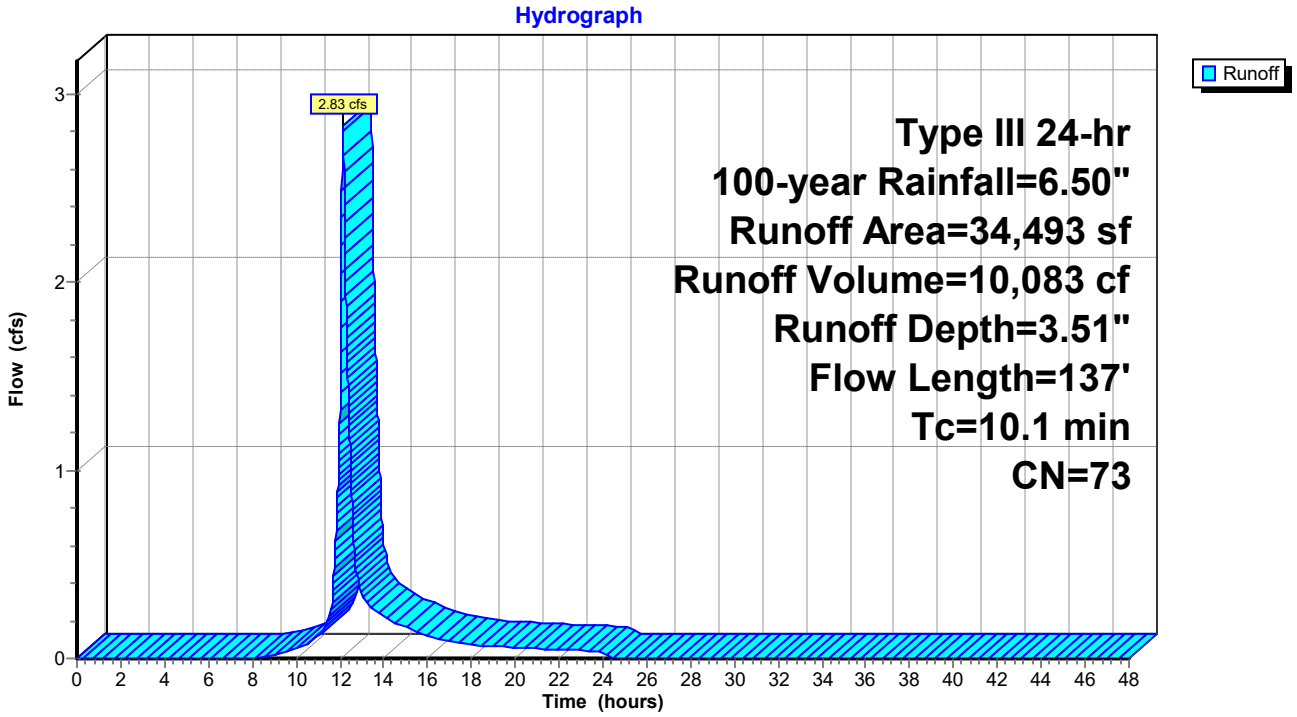
Runoff = 2.83 cfs @ 12.14 hrs, Volume= 10,083 cf, Depth= 3.51"
Routed to Link DP-1 : Design Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=6.50"

Area (sf)	CN	Description
901	98	Unconnected roofs, HSG B
1,128	98	Unconnected pavement, HSG B
2,984	98	Unconnected pavement, HSG B
42	61	>75% Grass cover, Good, HSG B
7,382	39	>75% Grass cover, Good, HSG A
70	39	>75% Grass cover, Good, HSG A
11,486	61	>75% Grass cover, Good, HSG B
2,766	98	Unconnected pavement, HSG A
1,190	98	Unconnected pavement, HSG A
429	98	Unconnected pavement, HSG A
4,179	98	Unconnected pavement, HSG A
1,935	98	Unconnected roofs, HSG A
34,493	73	Weighted Average
18,980		55.02% Pervious Area
15,513		44.98% Impervious Area
15,513		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	50	0.0140	0.09		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.10"
0.1	21	0.0240	2.49		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.4	66	0.0185	2.76		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
10.1	137	Total			

Subcatchment PWS-1: West of Track



Summary for Subcatchment PWS-2: Track and Field

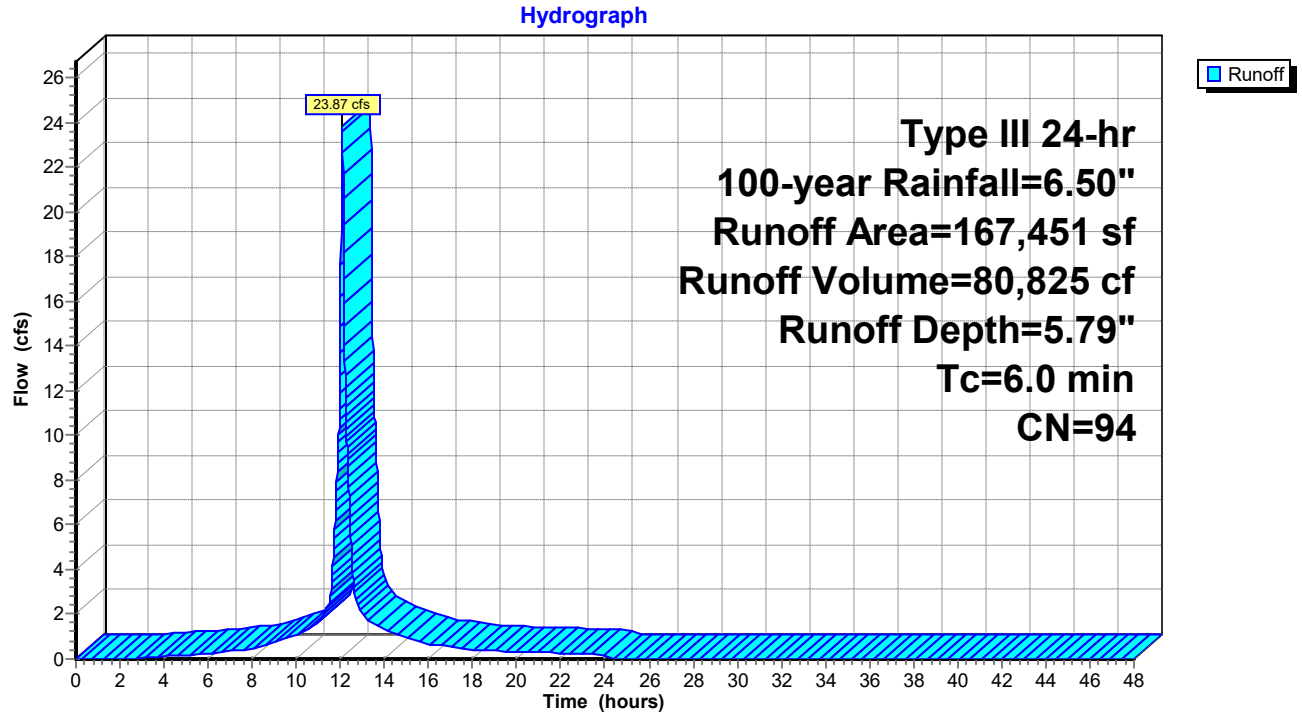
Runoff = 23.87 cfs @ 12.08 hrs, Volume= 80,825 cf, Depth= 5.79"
Routed to Pond P-1 : Football Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=6.50"

Area (sf)	CN	Description
23,921	98	Unconnected pavement, HSG A
39,732	98	Unconnected pavement, HSG A
8,756	98	Unconnected pavement, HSG B
2	98	Water Surface, 0% imp, HSG B
1	61	>75% Grass cover, Good, HSG B
492	39	>75% Grass cover, Good, HSG A
125	39	>75% Grass cover, Good, HSG A
12,023	39	>75% Grass cover, Good, HSG A
82,400	98	Water Surface, 0% imp, HSG A
167,451	94	Weighted Average
95,043		56.76% Pervious Area
72,408		43.24% Impervious Area
72,408		100.00% Unconnected

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

Subcatchment PWS-2: Track and Field



Summary for Subcatchment PWS-3: Tennis Court Area

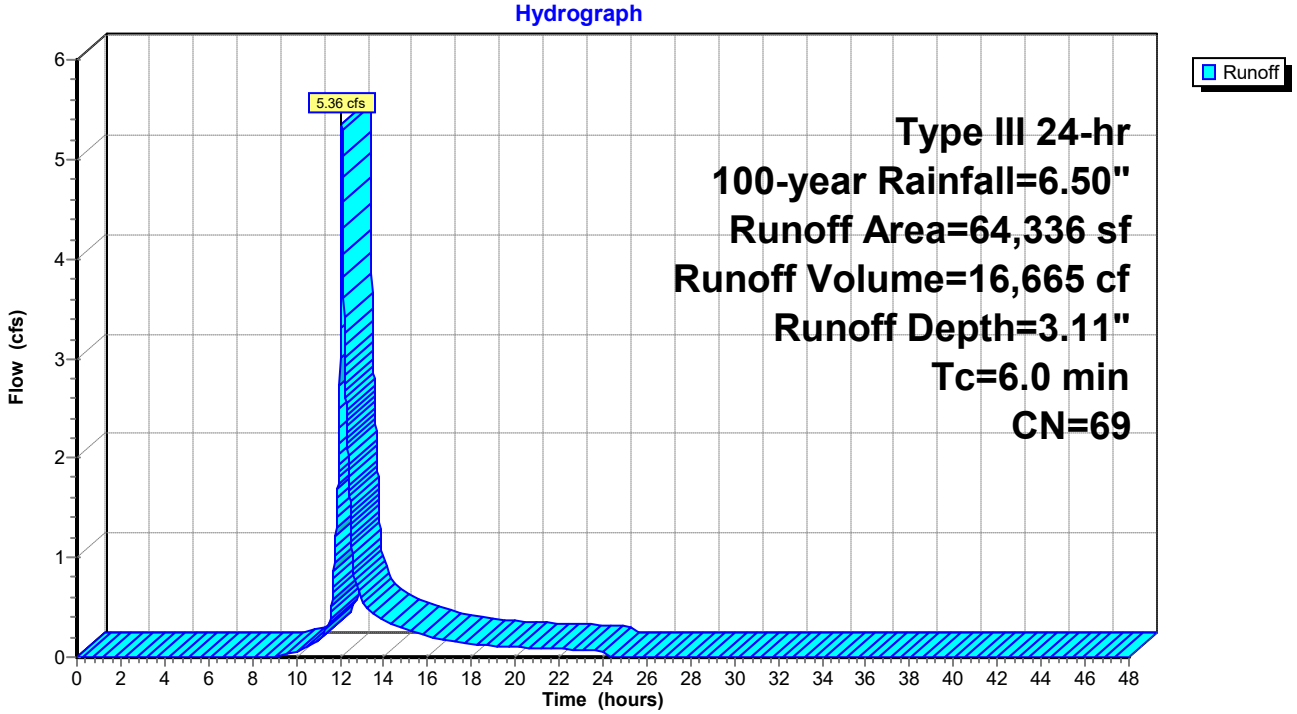
Runoff = 5.36 cfs @ 12.09 hrs, Volume= 16,665 cf, Depth= 3.11"
Routed to Pond TRNCH : Tennis Court Exfiltration Trench

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=6.50"

Area (sf)	CN	Description
654	98	Unconnected pavement, HSG B
51	61	>75% Grass cover, Good, HSG B
30,220	39	>75% Grass cover, Good, HSG A
1,534	39	>75% Grass cover, Good, HSG A
31,877	98	Unconnected pavement, HSG A
64,336	69	Weighted Average
31,805		49.44% Pervious Area
32,531		50.56% Impervious Area
32,531		100.00% Unconnected

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

Subcatchment PWS-3: Tennis Court Area



Summary for Subcatchment PWS-4: North of Baseball Field

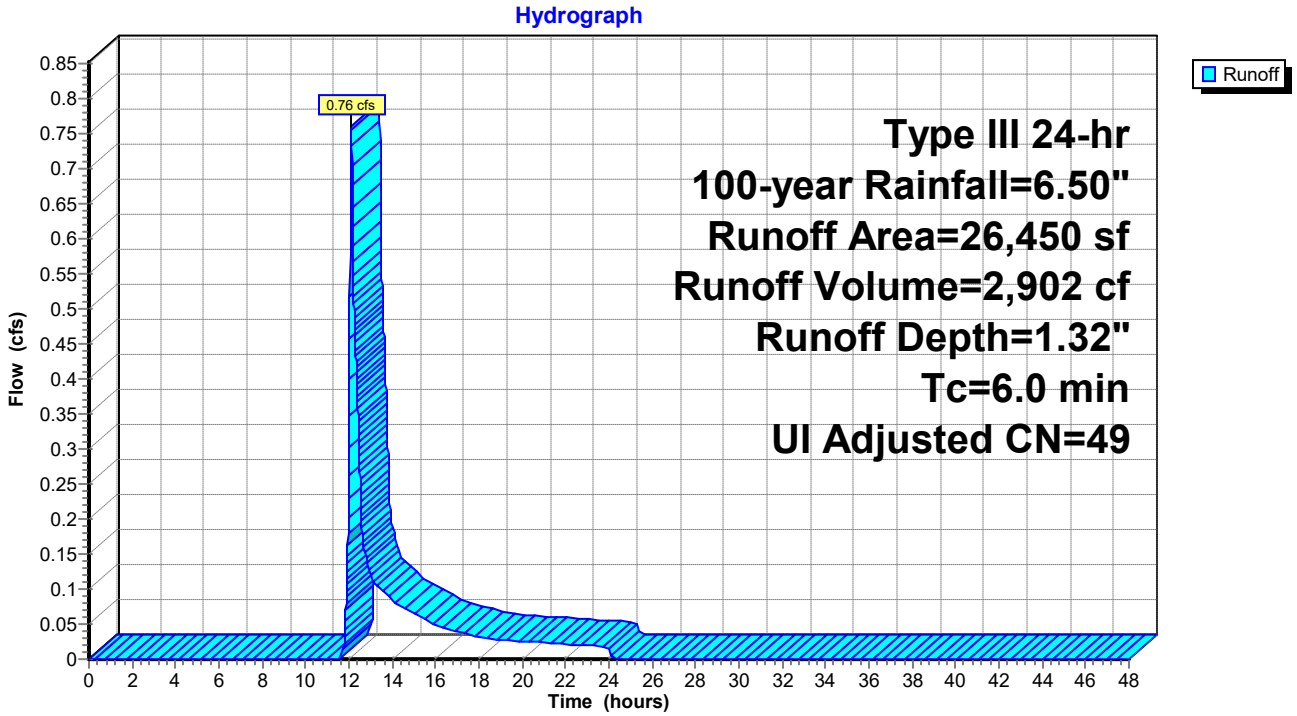
Runoff = 0.76 cfs @ 12.11 hrs, Volume= 2,902 cf, Depth= 1.32"
Routed to Link DP-2 : Design Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=6.50"

Area (sf)	CN	Adj	Description
2,569	96		Gravel surface, HSG A
96	98		Unconnected pavement, HSG A
3,902	98		Unconnected pavement, HSG A
5	98		Unconnected pavement, HSG A
19,878	39		>75% Grass cover, Good, HSG A
26,450	53	49	Weighted Average, UI Adjusted
22,447			84.87% Pervious Area
4,003			15.13% Impervious Area
4,003			100.00% Unconnected

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

Subcatchment PWS-4: North of Baseball Field



Summary for Subcatchment PWS-5: Turf Field

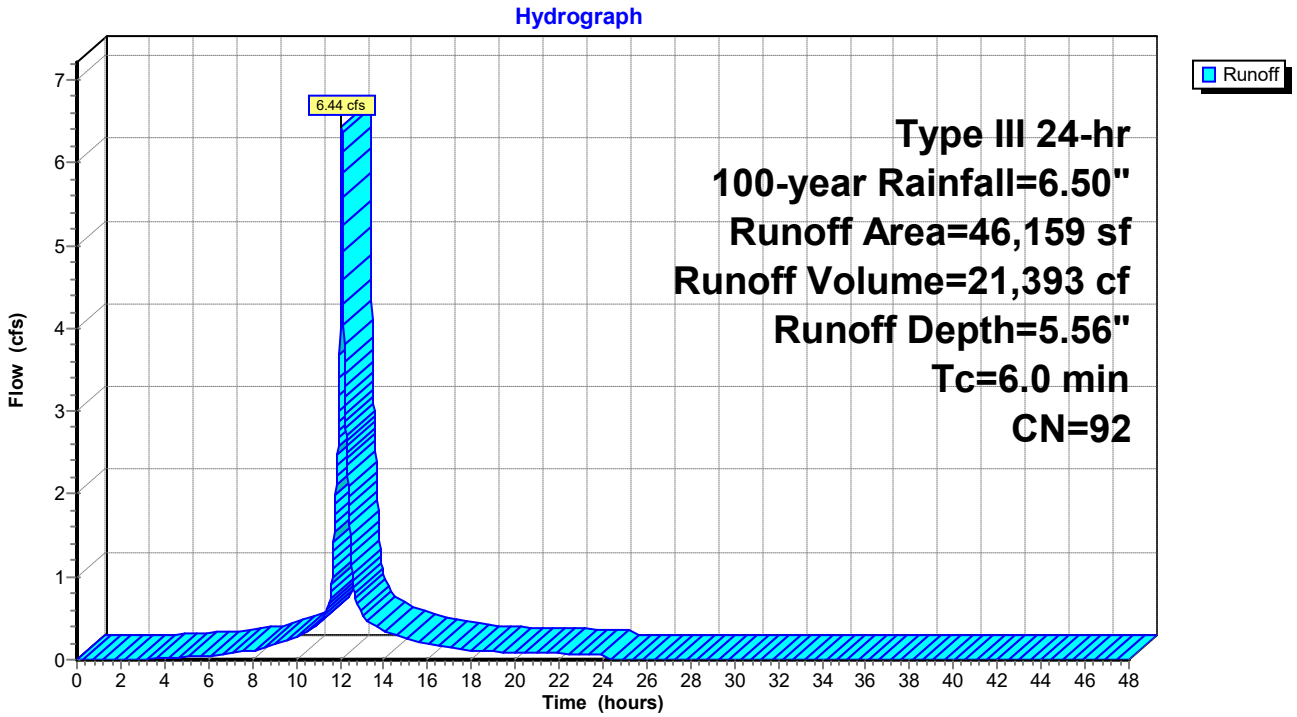
Runoff = 6.44 cfs @ 12.08 hrs, Volume= 21,393 cf, Depth= 5.56"
Routed to Pond P-2 : Baseball Field (West)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=6.50"

Area (sf)	CN	Description
558	39	>75% Grass cover, Good, HSG A
552	39	>75% Grass cover, Good, HSG A
3,255	39	>75% Grass cover, Good, HSG A
36,873	98	Water Surface, 0% imp, HSG A
4,864	98	Unconnected pavement, HSG A
58	98	Unconnected pavement, HSG A
46,159	92	Weighted Average
41,238		89.34% Pervious Area
4,921		10.66% Impervious Area
4,921		100.00% Unconnected

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

Subcatchment PWS-5: Turf Field



Summary for Subcatchment PWS-6: Turf Field

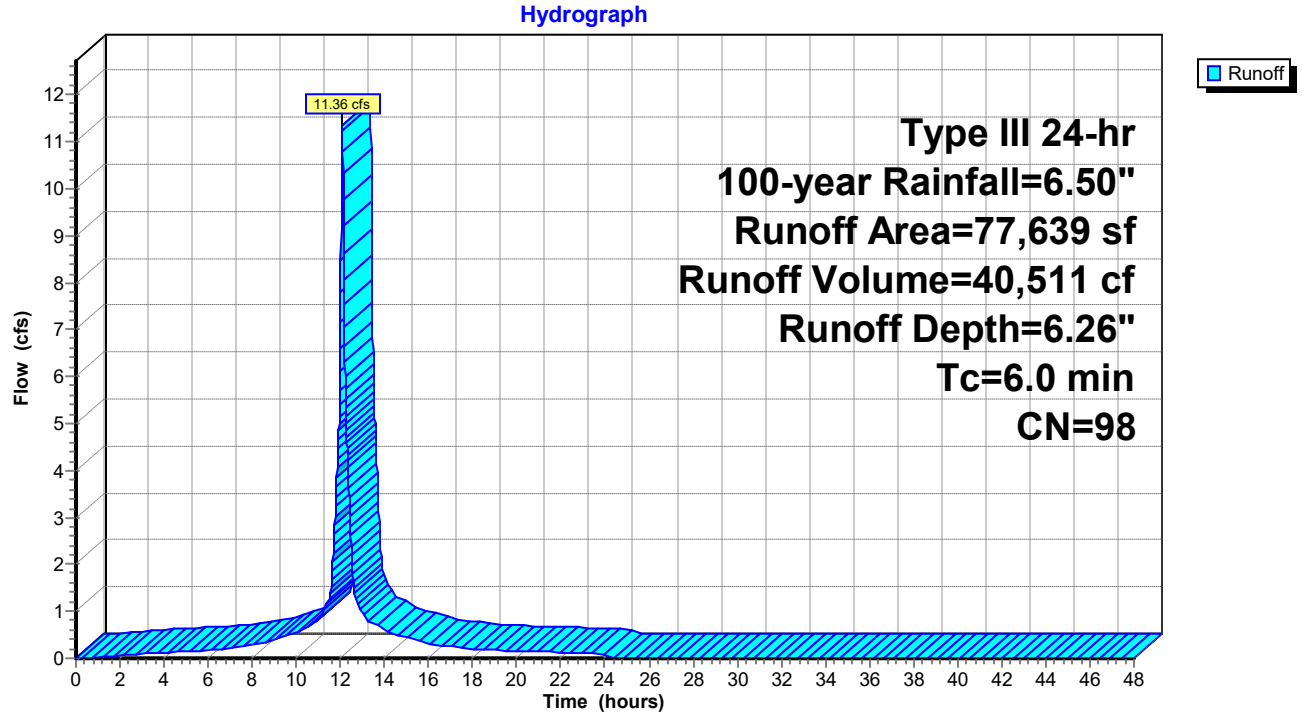
Runoff = 11.36 cfs @ 12.08 hrs, Volume= 40,511 cf, Depth= 6.26"
Routed to Pond P-3 : Baseball Field (East)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=6.50"

Area (sf)	CN	Description
12	39	>75% Grass cover, Good, HSG A
21	39	>75% Grass cover, Good, HSG A
77,606	98	Water Surface, 0% imp, HSG A
77,639	98	Weighted Average
77,639		100.00% Pervious Area

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

Subcatchment PWS-6: Turf Field



Summary for Subcatchment PWS-7: East of Baseball Field

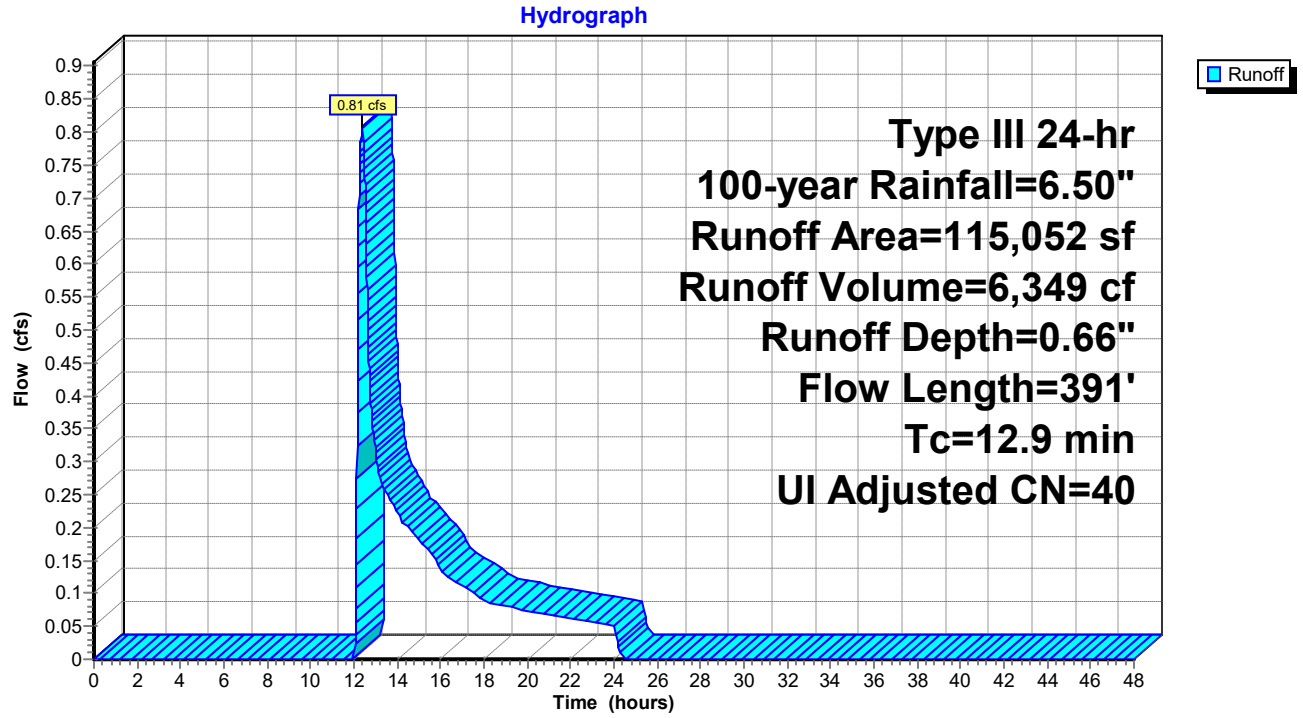
Runoff = 0.81 cfs @ 12.37 hrs, Volume= 6,349 cf, Depth= 0.66"
Routed to Link DP-3 : Design Point 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=6.50"

Area (sf)	CN	Adj	Description
99	98		Unconnected pavement, HSG A
4,742	98		Unconnected pavement, HSG A
110,211	39		>75% Grass cover, Good, HSG A
115,052	41	40	Weighted Average, UI Adjusted
110,211			95.79% Pervious Area
4,841			4.21% Impervious Area
4,841			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	50	0.0120	0.08		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.10"
2.6	309	0.0153	1.99		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.1	32	0.0770	4.47		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
12.9	391	Total			

Subcatchment PWS-7: East of Baseball Field



Summary for Subcatchment PWS-8: Turf Softball Field

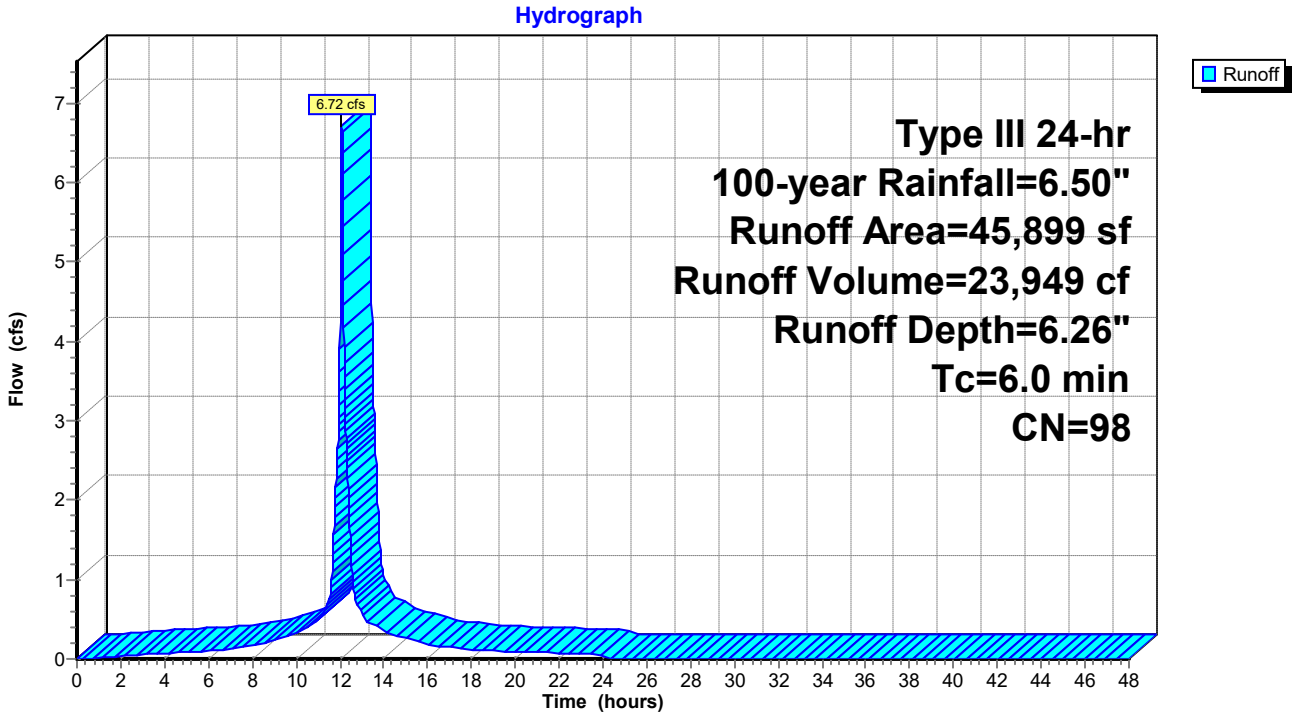
Runoff = 6.72 cfs @ 12.08 hrs, Volume= 23,949 cf, Depth= 6.26"
Routed to Pond P-4 : Softball Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=6.50"

Area (sf)	CN	Description
45,899	98	Water Surface, 0% imp, HSG B
45,899		100.00% Pervious Area

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

Subcatchment PWS-8: Turf Softball Field



Summary for Subcatchment PWS-9: Surrounding Softball

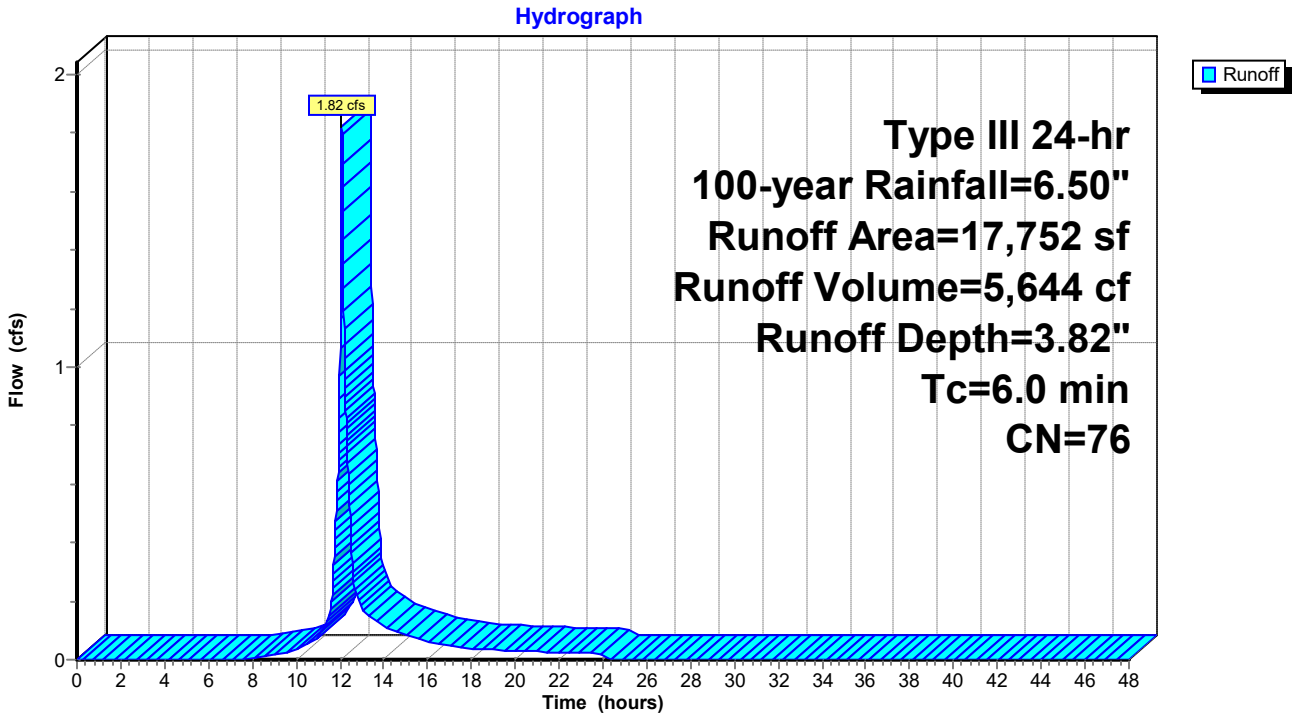
Runoff = 1.82 cfs @ 12.09 hrs, Volume= 5,644 cf, Depth= 3.82"
Routed to Link DP-1 : Design Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=6.50"

Area (sf)	CN	Description
1,211	98	Water Surface, 0% imp, HSG B
5,444	98	Unconnected pavement, HSG B
632	96	Gravel surface, HSG B
7,095	61	>75% Grass cover, Good, HSG B
3,329	61	>75% Grass cover, Good, HSG B
40	61	>75% Grass cover, Good, HSG B
17,752	76	Weighted Average
12,308		69.33% Pervious Area
5,444		30.67% Impervious Area
5,444		100.00% Unconnected

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

Subcatchment PWS-9: Surrounding Softball

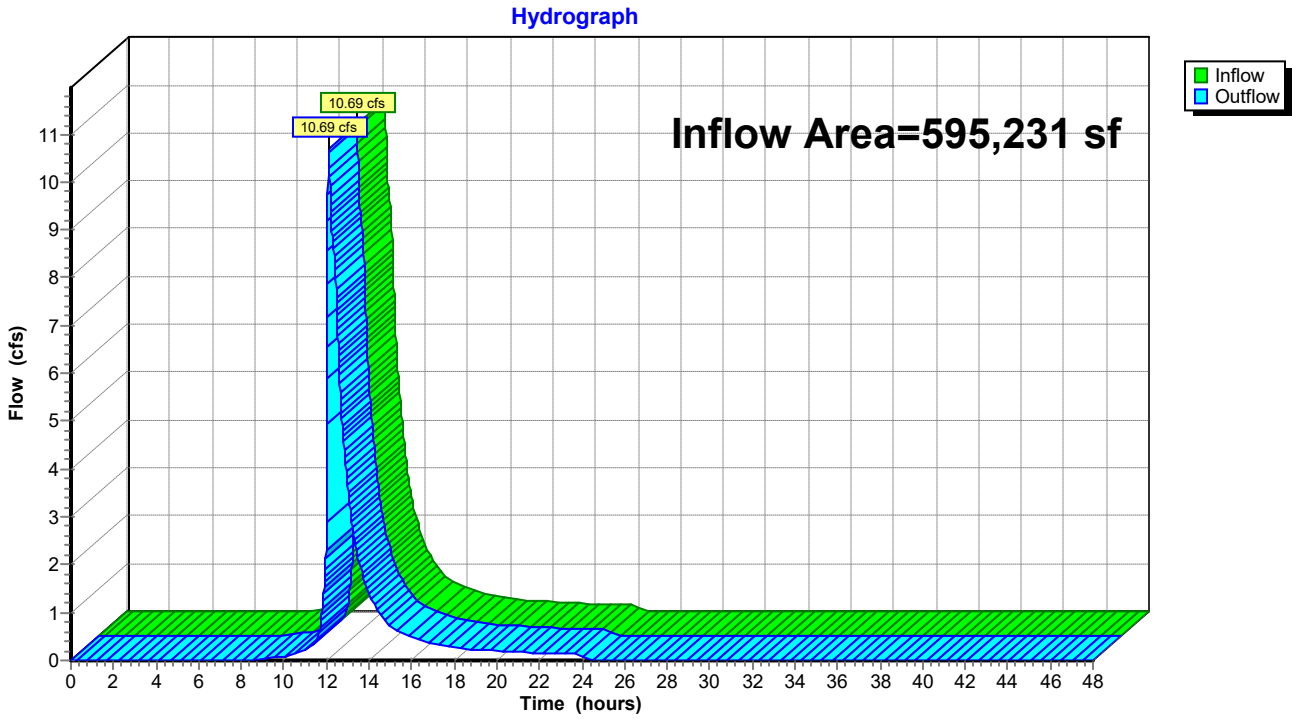


Summary for Reach 1: Wetlands

Inflow Area = 595,231 sf, 23.46% Impervious, Inflow Depth = 0.98" for 100-year event
Inflow = 10.69 cfs @ 12.12 hrs, Volume= 48,490 cf
Outflow = 10.69 cfs @ 12.12 hrs, Volume= 48,490 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 1: Wetlands



Summary for Pond P-1: Football Field

Inflow Area = 167,451 sf, 43.24% Impervious, Inflow Depth = 5.79" for 100-year event
Inflow = 23.87 cfs @ 12.08 hrs, Volume= 80,825 cf
Outflow = 4.29 cfs @ 12.53 hrs, Volume= 80,825 cf, Atten= 82%, Lag= 26.9 min
Discarded = 1.96 cfs @ 11.27 hrs, Volume= 70,485 cf
Primary = 2.32 cfs @ 12.53 hrs, Volume= 10,340 cf
Routed to Link DP-1 : Design Point 1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 45.24' @ 12.53 hrs Surf.Area= 83,155 sf Storage= 26,279 cf

Plug-Flow detention time= 66.1 min calculated for 80,825 cf (100% of inflow)
Center-of-Mass det. time= 66.1 min (832.6 - 766.4)

Volume	Invert	Avail.Storage	Storage Description
#1	44.36'	27,242 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 75,671 cf Overall x 36.0% Voids

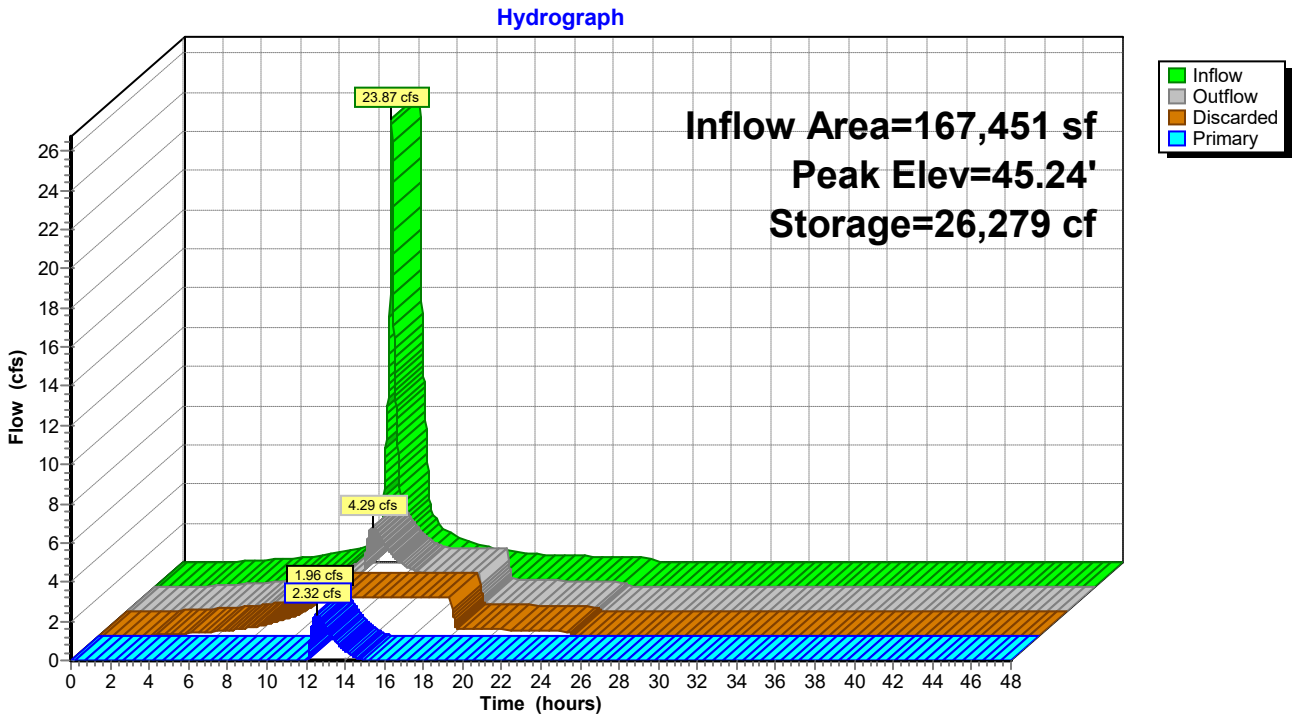
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
44.36	83,155	0	0
45.27	83,155	75,671	75,671

Device	Routing	Invert	Outlet Devices
#1	Discarded	44.36'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	42.19'	**10.0" Round 10" HDPE Pipe** L= 150.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 42.19' / 41.44' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#3	Device 2	44.86'	**12.0" Horiz. Riser Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=1.96 cfs @ 11.27 hrs HW=44.37' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 1.96 cfs)

Primary OutFlow Max=2.32 cfs @ 12.53 hrs HW=45.24' (Free Discharge)
↑**2=10" HDPE Pipe** (Passes 2.32 cfs of 2.75 cfs potential flow)
↑**3=Riser Orifice/Grate** (Orifice Controls 2.32 cfs @ 2.96 fps)

Pond P-1: Football Field



Summary for Pond P-2: Baseball Field (West)

Inflow Area = 46,159 sf, 10.66% Impervious, Inflow Depth = 5.56" for 100-year event
Inflow = 6.44 cfs @ 12.08 hrs, Volume= 21,393 cf
Outflow = 1.57 cfs @ 12.46 hrs, Volume= 21,393 cf, Atten= 76%, Lag= 22.8 min
Discarded = 0.88 cfs @ 11.64 hrs, Volume= 19,663 cf
Primary = 0.69 cfs @ 12.46 hrs, Volume= 1,730 cf
Routed to Link DP-2 : Design Point 2

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 42.00' @ 12.46 hrs Surf.Area= 37,325 sf Storage= 5,709 cf

Plug-Flow detention time= 30.7 min calculated for 21,389 cf (100% of inflow)
Center-of-Mass det. time= 30.7 min (805.5 - 774.8)

Volume	Invert	Avail.Storage	Storage Description
#1	41.58'	9,003 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 25,008 cf Overall x 36.0% Voids

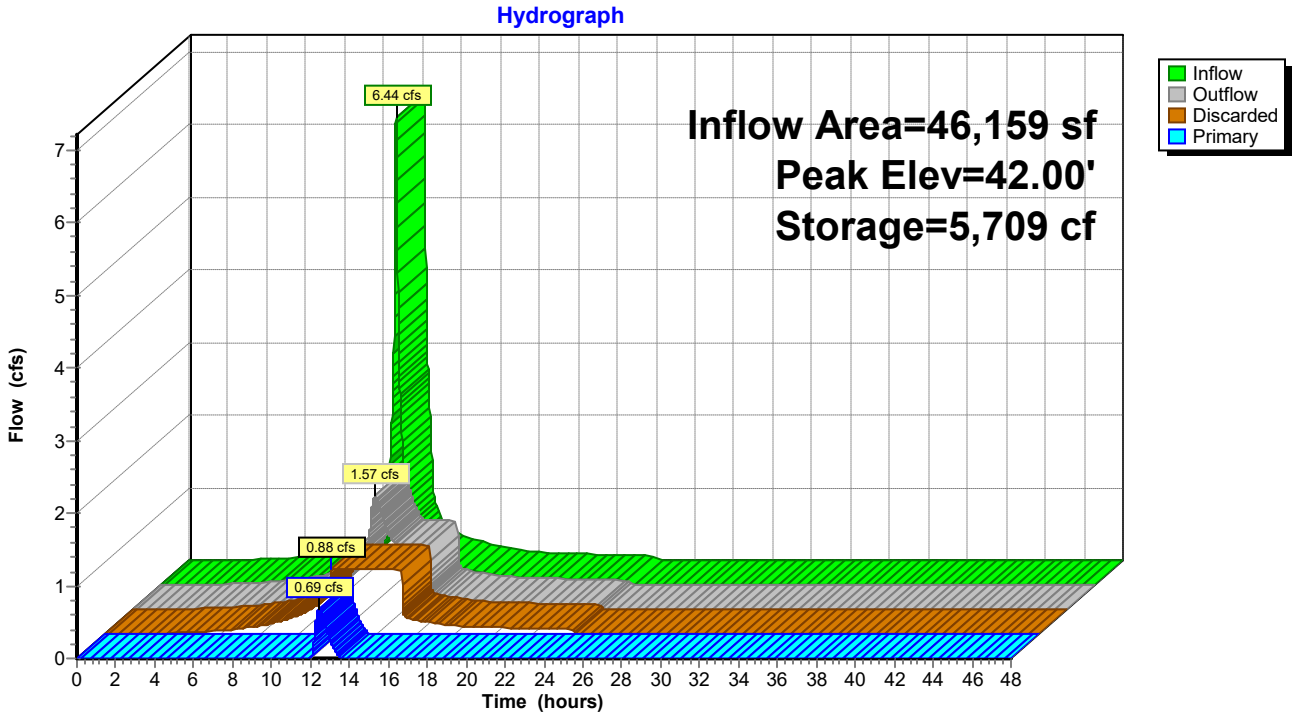
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
41.58	37,325	0	0
42.25	37,325	25,008	25,008

Device	Routing	Invert	Outlet Devices
#1	Discarded	41.58'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	39.17'	**10.0" Round 10" HDPE Pipe** L= 135.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 39.17' / 38.50' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#3	Device 2	41.84'	**12.0" Horiz. Riser Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.88 cfs @ 11.64 hrs HW=41.59' (Free Discharge)
↑└**1=Exfiltration** (Exfiltration Controls 0.88 cfs)

Primary OutFlow Max=0.69 cfs @ 12.46 hrs HW=42.00' (Free Discharge)
↑└**2=10" HDPE Pipe** (Passes 0.69 cfs of 2.72 cfs potential flow)
↑└**3=Riser Orifice/Grate** (Weir Controls 0.69 cfs @ 1.33 fps)

Pond P-2: Baseball Field (West)



Summary for Pond P-3: Baseball Field (East)

Inflow Area = 77,639 sf, 0.00% Impervious, Inflow Depth = 6.26" for 100-year event
Inflow = 11.36 cfs @ 12.08 hrs, Volume= 40,511 cf
Outflow = 2.18 cfs @ 12.52 hrs, Volume= 40,511 cf, Atten= 81%, Lag= 25.9 min
Discarded = 1.83 cfs @ 11.66 hrs, Volume= 39,710 cf
Primary = 0.35 cfs @ 12.52 hrs, Volume= 801 cf
Routed to Link DP-3 : Design Point 3

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 41.54' @ 12.52 hrs Surf.Area= 77,606 sf Storage= 10,199 cf

Plug-Flow detention time= 28.1 min calculated for 40,502 cf (100% of inflow)
Center-of-Mass det. time= 28.1 min (772.1 - 744.0)

Volume	Invert	Avail.Storage	Storage Description
#1	41.17'	18,719 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 51,996 cf Overall x 36.0% Voids

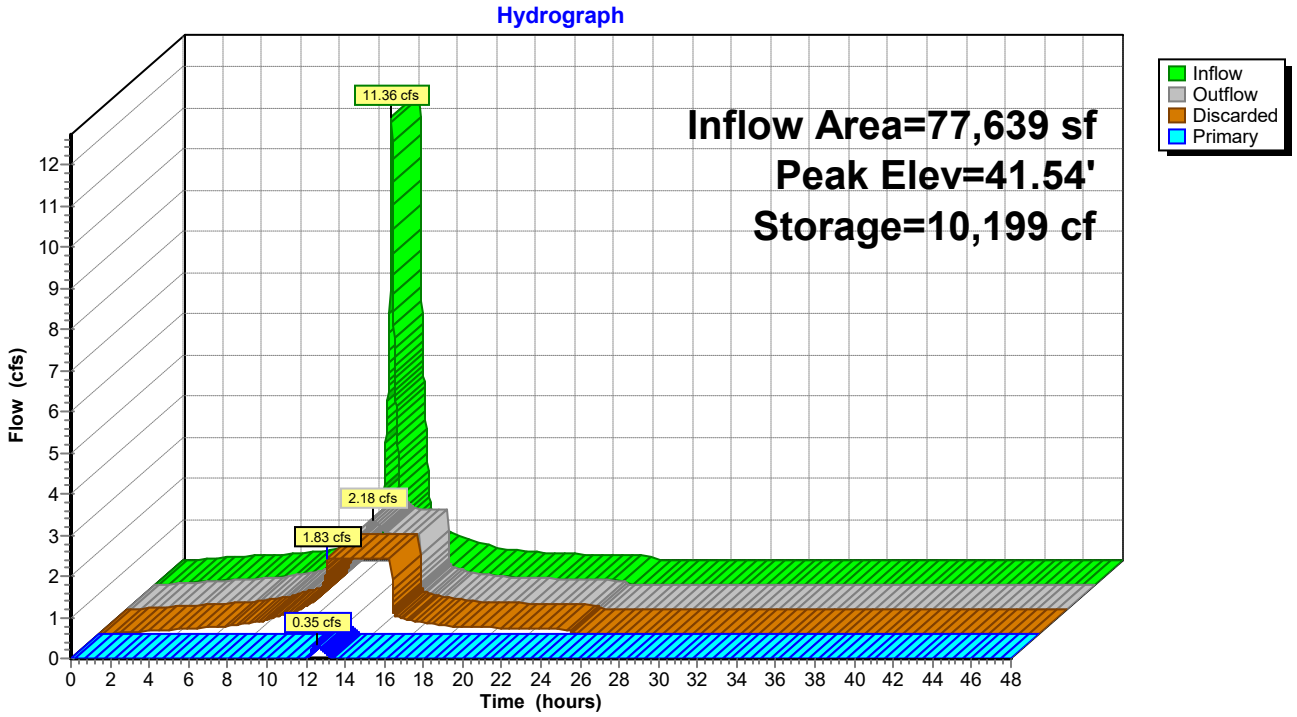
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
41.17	77,606	0	0
41.84	77,606	51,996	51,996

Device	Routing	Invert	Outlet Devices
#1	Discarded	41.17'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	38.76'	**10.0" Round 10" HDPE Pipe** L= 25.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 38.76' / 38.50' S= 0.0104 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#3	Device 2	41.43'	**12.0" Horiz. Riser Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=1.83 cfs @ 11.66 hrs HW=41.18' (Free Discharge)
↑└**1=Exfiltration** (Exfiltration Controls 1.83 cfs)

Primary OutFlow Max=0.35 cfs @ 12.52 hrs HW=41.54' (Free Discharge)
↑└**2=10" HDPE Pipe** (Passes 0.35 cfs of 4.03 cfs potential flow)
↑└**3=Riser Orifice/Grate** (Weir Controls 0.35 cfs @ 1.06 fps)

Pond P-3: Baseball Field (East)



Summary for Pond P-4: Softball Field

Inflow Area = 45,899 sf, 0.00% Impervious, Inflow Depth = 6.26" for 100-year event
Inflow = 6.72 cfs @ 12.08 hrs, Volume= 23,949 cf
Outflow = 1.36 cfs @ 12.50 hrs, Volume= 23,949 cf, Atten= 80%, Lag= 25.2 min
Discarded = 1.08 cfs @ 11.66 hrs, Volume= 23,351 cf
Primary = 0.28 cfs @ 12.50 hrs, Volume= 598 cf
Routed to Link DP-1 : Design Point 1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 41.93' @ 12.50 hrs Surf.Area= 45,899 sf Storage= 5,969 cf

Plug-Flow detention time= 27.3 min calculated for 23,949 cf (100% of inflow)
Center-of-Mass det. time= 27.3 min (771.3 - 744.0)

Volume	Invert	Avail.Storage	Storage Description
#1	41.57'	11,071 cf	**Custom Stage Data (Irregular)** Listed below (Recalc) 30,752 cf Overall x 36.0% Voids

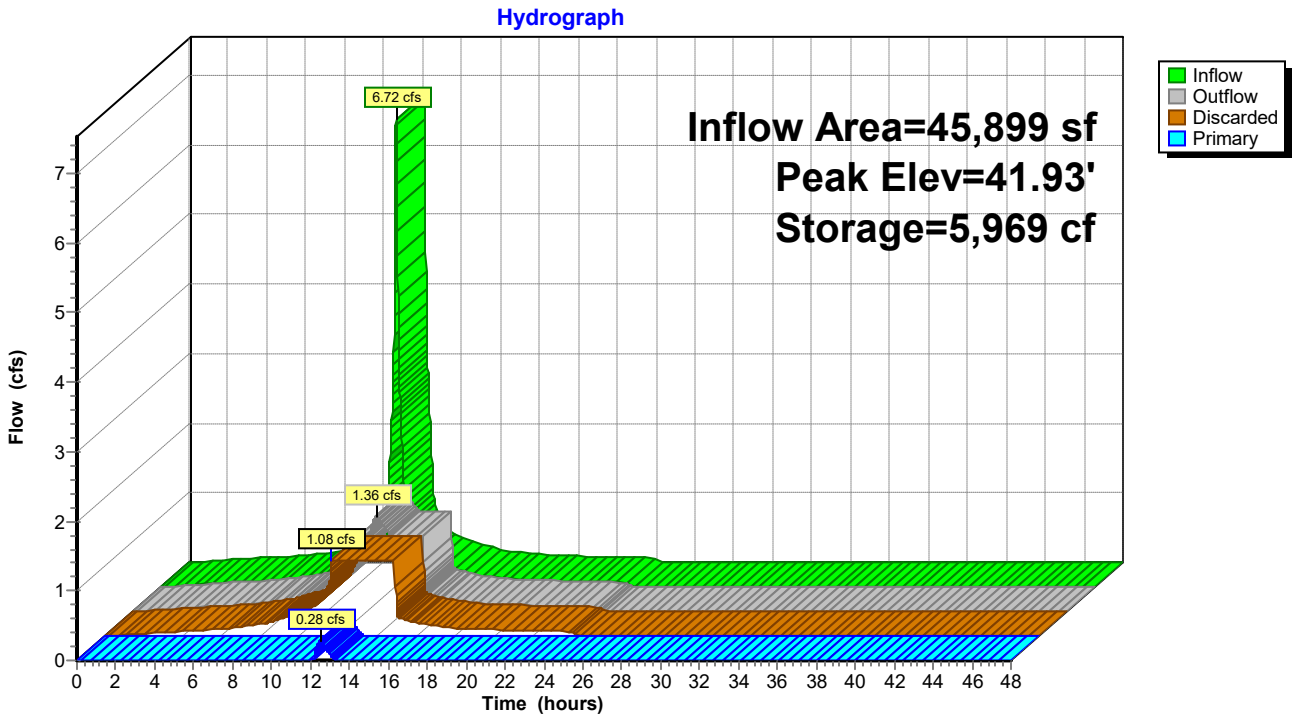
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
41.57	45,899	826.0	0	0	45,899
42.24	45,899	826.0	30,752	30,752	46,452

Device	Routing	Invert	Outlet Devices
#1	Discarded	41.57'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	39.07'	**10.0" Round 10" HDPE Outlet** L= 15.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 39.07' / 39.00' S= 0.0047 '/' Cc= 0.900 n= 0.013 Concrete pipe, straight & clean, Flow Area= 0.55 sf
#3	Device 2	41.83'	**10.0" Horiz. Riser Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=1.08 cfs @ 11.66 hrs HW=41.58' (Free Discharge)
↑└**1=Exfiltration** (Exfiltration Controls 1.08 cfs)

Primary OutFlow Max=0.28 cfs @ 12.50 hrs HW=41.93' (Free Discharge)
↑└**2=10" HDPE Outlet** (Passes 0.28 cfs of 3.24 cfs potential flow)
↑└**3=Riser Orifice/Grate** (Weir Controls 0.28 cfs @ 1.04 fps)

Pond P-4: Softball Field



Summary for Pond TRNCH: Tennis Court Exfiltration Trench

Inflow Area = 64,336 sf, 50.56% Impervious, Inflow Depth = 3.11" for 100-year event
Inflow = 5.36 cfs @ 12.09 hrs, Volume= 16,665 cf
Outflow = 5.35 cfs @ 12.10 hrs, Volume= 16,665 cf, Atten= 0%, Lag= 0.3 min
Discarded = 0.09 cfs @ 11.99 hrs, Volume= 6,622 cf
Primary = 5.26 cfs @ 12.10 hrs, Volume= 10,043 cf
Routed to Link DP-1 : Design Point 1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 43.98' @ 12.10 hrs Surf.Area= 3,862 sf Storage= 2,509 cf

Plug-Flow detention time= 156.9 min calculated for 16,665 cf (100% of inflow)
Center-of-Mass det. time= 156.8 min (993.5 - 836.6)

Volume	Invert	Avail.Storage	Storage Description
#1	40.91'	200 cf	**Drywell Storage (Prismatic)** Listed below (Recalc) x 2 Inside #2
#2	40.41'	1,653 cf	**Exfiltration stone Layer (Prismatic)** Listed below (Recalc) 4,828 cf Overall - 237 cf Embedded = 4,591 cf x 36.0% Voids
#3	42.91'	1,453 cf	**Freeboard above basins (Prismatic)** Listed below (Recalc)
#4	40.91'	37 cf	**8.0" Round Pipe Storage** Inside #2 L= 105.0'
		3,342 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
40.91	50	0	0
42.91	50	100	100

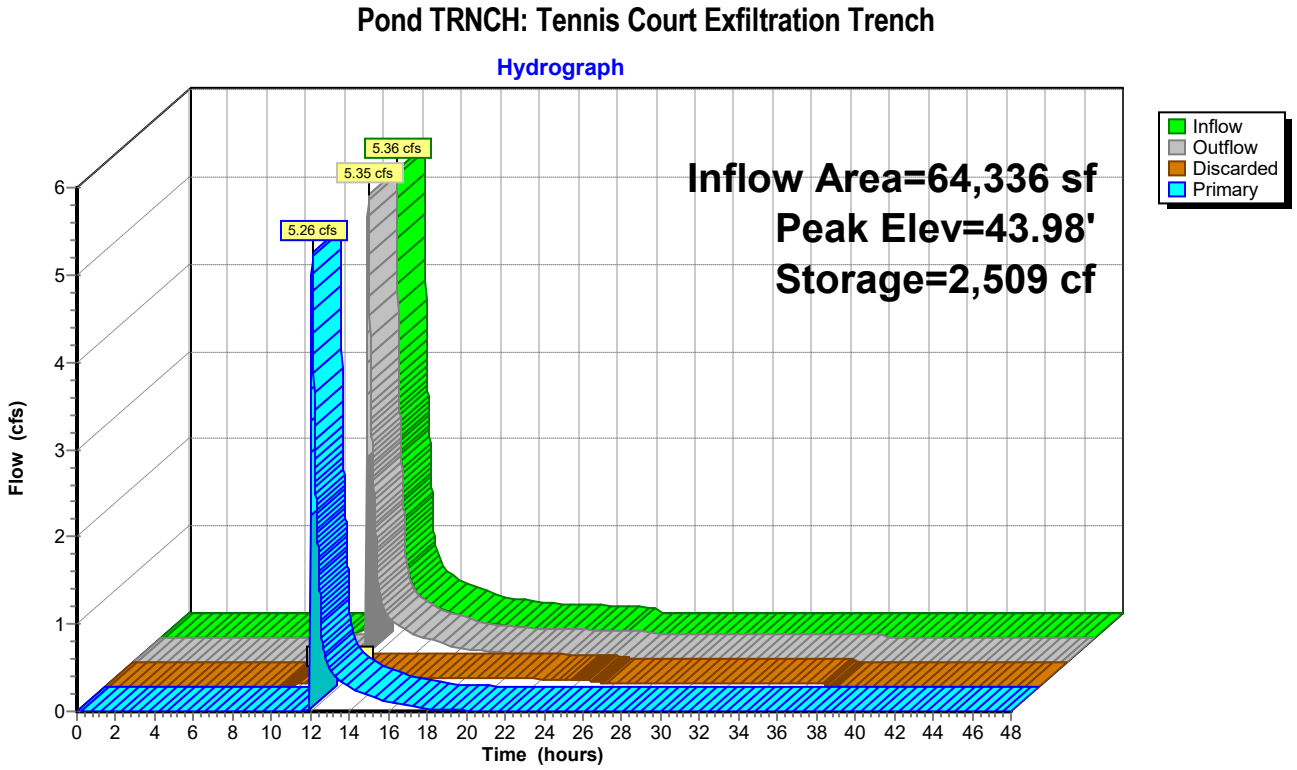
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
40.41	1,931	0	0
42.91	1,931	4,828	4,828

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
42.91	6	0	0
43.41	6	3	3
43.91	1,931	484	487
44.41	1,931	966	1,453

Device	Routing	Invert	Outlet Devices
#1	Discarded	40.41'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	43.91'	**120.0' long x 4.0' 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 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.09 cfs @ 11.99 hrs HW=43.92' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=5.15 cfs @ 12.10 hrs HW=43.98' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 5.15 cfs @ 0.62 fps)

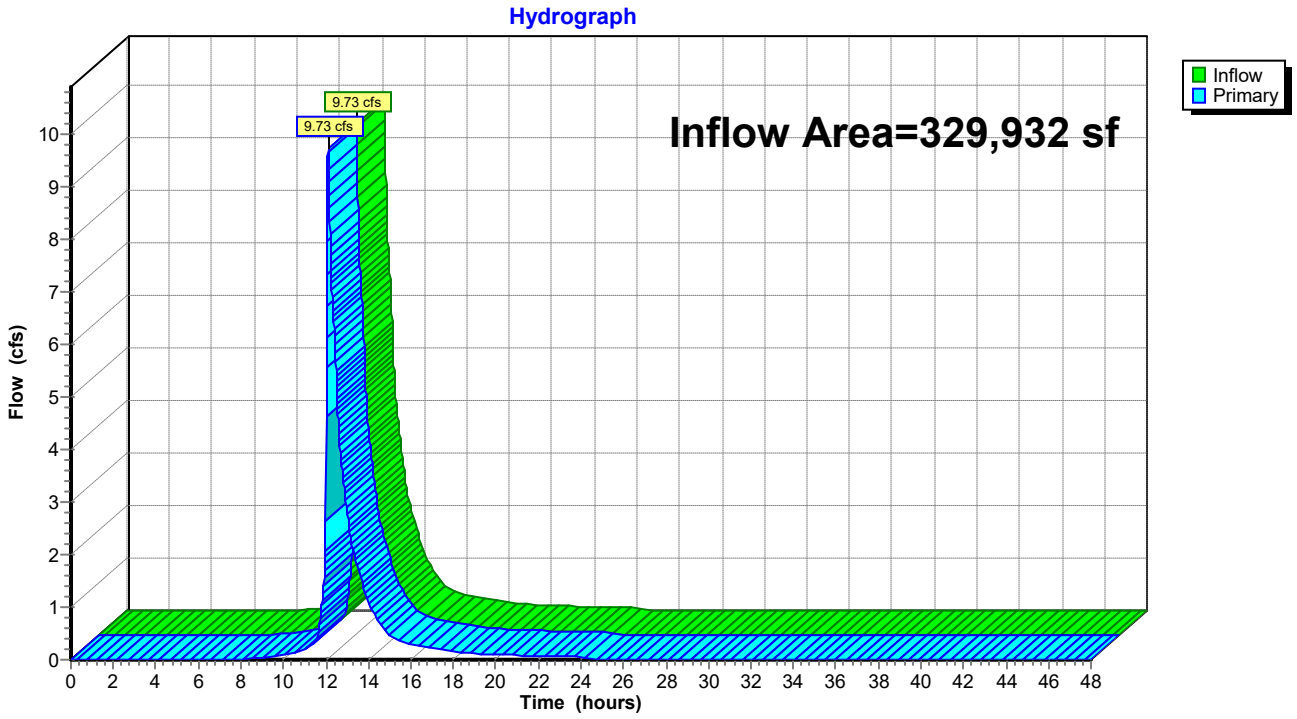


Summary for Link DP-1: Design Point 1

Inflow Area = 329,932 sf, 38.16% Impervious, Inflow Depth = 1.34" for 100-year event
Inflow = 9.73 cfs @ 12.11 hrs, Volume= 36,709 cf
Primary = 9.73 cfs @ 12.11 hrs, Volume= 36,709 cf, Atten= 0%, Lag= 0.0 min
Routed to Reach 1 : Wetlands

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link DP-1: Design Point 1

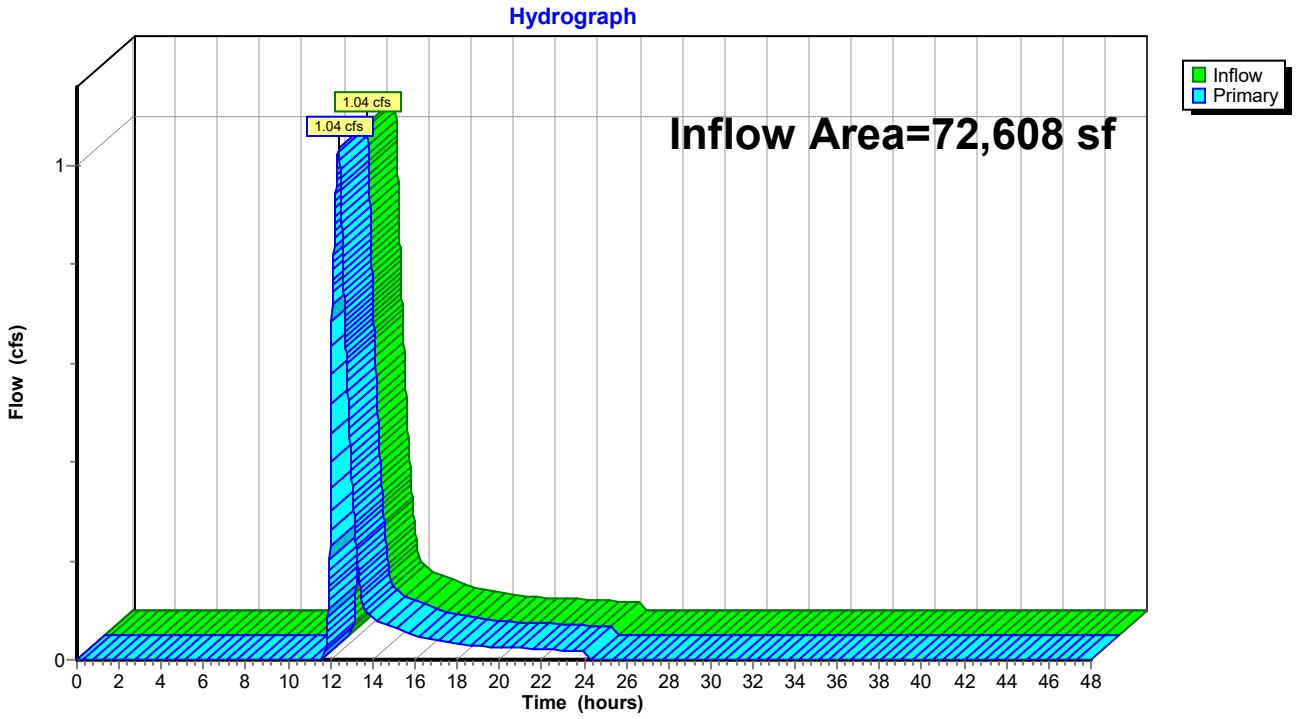


Summary for Link DP-2: Design Point 2

Inflow Area = 72,608 sf, 12.29% Impervious, Inflow Depth = 0.77" for 100-year event
Inflow = 1.04 cfs @ 12.38 hrs, Volume= 4,632 cf
Primary = 1.04 cfs @ 12.38 hrs, Volume= 4,632 cf, Atten= 0%, Lag= 0.0 min
Routed to Reach 1 : Wetlands

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link DP-2: Design Point 2

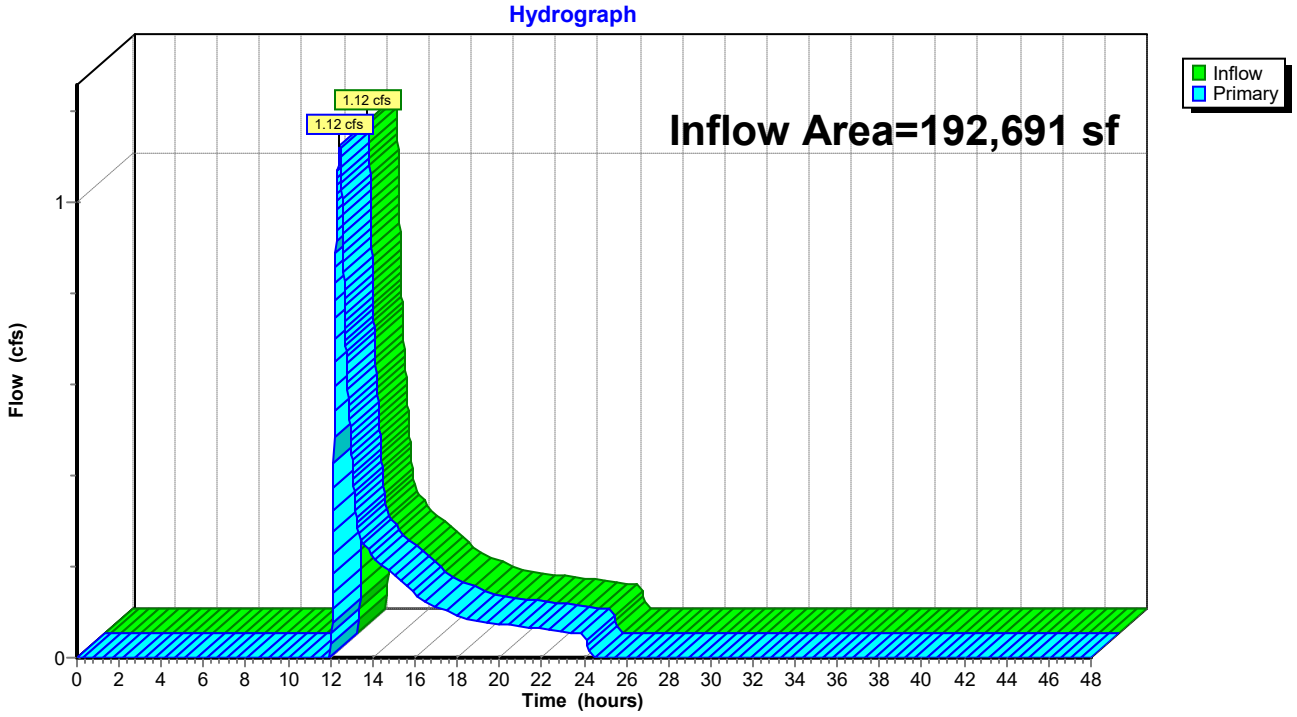


Summary for Link DP-3: Design Point 3

Inflow Area = 192,691 sf, 2.51% Impervious, Inflow Depth = 0.45" for 100-year event
Inflow = 1.12 cfs @ 12.43 hrs, Volume= 7,149 cf
Primary = 1.12 cfs @ 12.43 hrs, Volume= 7,149 cf, Atten= 0%, Lag= 0.0 min
Routed to Reach 1 : Wetlands

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link DP-3: Design Point 3



INSTRUCTIONS:

Version 1, Automated: Mar. 4, 2008

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Location: Hamilton, MA

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Infiltration Basin	**0.80**	**1.00**	**0.80**	**0.20**
Drainage Channel	**0.00**	**0.20**	**0.00**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**

Total TSS Removal = **80%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: **HWRHS Athletic Campus**

Prepared By: **RDT**

Date: **11/15/2023**

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

ATTACHMENT 6

Operation & Maintenance Plan

OPERATION AND MAINTENANCE PLAN

HAMILTON-WENHAM REGIONAL SCHOOL DISTRICT
HAMILTON-WENHAM HIGH SCHOOL ATHLETIC CAMPUS IMPROVEMENTS
HAMILTON, MASSACHUSETTS 01982

FEBRUARY 2024

Hamilton-Wenham Regional School District

Prepared for:

Hamilton-Wenham Regional School District
5 School Street
Wenham, Massachusetts 01984

Prepared by:

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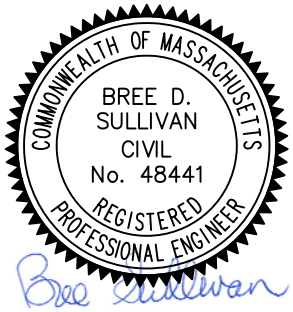

Prepared by: Ryan Thackeray
Ryan D. Thackeray, E.I.T.

Reviewed by: Bree Sullivan
Bree D. Sullivan, P.E.

OPERATION AND MAINTENANCE PLAN

HAMILTON-WENHAM REGIONAL SCHOOL DISTRICT
HAMILTON-WENHAM REGIONAL HIGH SCHOOL ATHLETIC CAMPUS IMPROVEMENTS

TABLE OF CONTENTS

OPERATION & MAINTENANCE PLAN

HAMILTON-WENHAM REGIONAL SCHOOL DISTRICT
HAMILTON-WENHAM REGIONAL HIGH SCHOOL ATHLETIC CAMPUS IMPROVEMENTS

Basic Information

Project Address:	775 Bay Road, Hamilton, MA 01982
Owner:	Hamilton-Wenham Regional School District
Town:	Hamilton, MA

SECTION I: CONSTRUCTION ACTIVITIES

1. Contact the Owner in writing at least seven (7) days prior to the start of construction.
2. Place the site sign (with contact numbers) prior to any work on site.
3. Install the erosion control BMPs as shown on the construction documents.
4. The silt fence and silt sock line shall be inspected on a weekly basis; any breaks in the line shall be repaired as soon as possible.
5. All erosion and sedimentation controls shall be in accordance with the DEP's Erosion and Sedimentation Control Guidelines and the USDA SCS Erosion and Sedimentation Control during site development.
6. All stockpile areas are to be protected by silt fence and silt socks, and shall be covered with a tarp to prevent moisture intrusion and dust concerns.
7. All disturbed areas shall be stabilized with mulch or seed immediately upon completion of construction activity. In no case, shall an area be left unstabilized for more than 14 days after the construction activity in that area has ceased.
8. All erosion control measures shall be inspected after any rainfall of 0.5" or greater.
9. All catch basins are to be ringed with silt socks and covered with a sediment filter until all up-gradient disturbed areas are stabilized.
10. Any outlet orifices are to be ringed with silt socks until the detention structure or infiltration area is stabilized, if applicable
11. All slopes greater than 3:1 shall be stabilized with an erosion control blanket.
12. The contractor shall keep additional silt fence and straw bales on site to mitigate any emergency condition.
13. All proposed drainage structures (catch basins, manholes, outlet control structures and detention systems) should be cleaned at the end of construction and at any time the sediment within the structures equals 12" deep.
14. The contractor shall only disturb the minimum area necessary.
15. All illicit discharges are prohibited.
16. The entire project area shall be stabilized with vegetation upon completion of construction and prior to the removal of the erosion control devices.

OPERATION & MAINTENANCE PLAN

HAMILTON-WENHAM REGIONAL SCHOOL DISTRICT
HAMILTON-WENHAM REGIONAL HIGH SCHOOL ATHLETIC CAMPUS IMPROVEMENTS

SECTION II: POST-DEVELOPMENT ACTIVITIES

PART A - GENERAL

- It shall be the responsibility of the owner to implement the procedures outlined herein.
- The closed drainage system shall be inspected every 6 months and any excess sediment within the structures or detention systems shall be properly disposed of.
- Any problems found with the drainage system shall be repaired within one week of discovery.
- The Owner shall employ a qualified professional to perform periodic maintenance, as described herein.
- All maintenance personnel shall be trained annually on the operation and maintenance procedures. A training log shall be maintained for records to document the annual training of employees.
- Inspection logs are included with this O&M Plan. The qualified professional shall provide the Owner with maintenance logs after each inspection or corrective action. The Owner shall keep record of these logs for at least three (3) years and shall provide copies to the Town, if requested.
- In the event that an infiltration BMP (stone/pipe trenches, synthetic turf fields) fails to drain within 72-hours of a storm event, a qualified professional should be consulted to determine what corrective actions may be necessary.
- All illicit discharges are prohibited.

PART B - BMP MANAGEMENT

Each Best Management Practice shall be maintained per the below requirements:

SYNTHETIC TURF FIELDS

- Perform preventative maintenance twice a year.
- Inspect cleanouts and drain manholes after every major storm during the first 3 months of operation and twice a year thereafter.

STONE/PIPE TRENCHES (INFILTRATION SYSTEM OR EQUIVALENT)

- Inspect and remove debris every 6 months and after every major storm.
- Remove all sediment from pre-treatment BMPs.

CATCH BASINS, TRENCH DRAINS, SLOT DRAINS, AND AREA DRAINS

- Inspect and clean at least four times per year (quarterly).
- Sediment shall be removed when the depth is greater than one half the distance from the bottom invert to the manhole floor.
- Use of a vacuum truck is the preferred cleaning method.

LEVEL SPREADERS

- Inspect and clean at after every major storm event and least four times per year (quarterly) for the first two years of operation and two times per year thereafter. Accumulations of sediment should be removed.
- Remove sediment and debris at least two times per year.
- Regrade and reseed vegetation and the area below the level spreader as necessary to avoid erosion or pooling water.
- Inspect for settling of the curb leading to degradation of the system's function.

OPERATION & MAINTENANCE PLAN

HAMILTON-WENHAM REGIONAL SCHOOL DISTRICT
HAMILTON-WENHAM REGIONAL HIGH SCHOOL ATHLETIC CAMPUS IMPROVEMENTS

SECTION III: LONG TERM POLLUTION PREVENTION PLAN

GOOD HOUSEKEEPING PRACTICES

- Prevent or reduce pollutant runoff by performing periodic landscape maintenance, trash clean up, erosion control measures, and site cleaning.

STORING MATERIALS AND WASTE PRODUCTS

- All materials stored on site shall be stored in a neat and orderly fashion, in their appropriate containers, and under a roof or other secure enclosure. Waste products should be placed in secure receptacles until they are emptied by a licensed solid waste management company.

ROUTINE INSPECTIONS AND MAINTENANCE OF STORMWATER BMPS

- Follow the guidelines outlined above.

MAINTENANCE OF LAWNS, GARDENS, AND OTHER LANDSCAPED AREAS

- The Owner will be responsible for these activities.

PET WASTE MANAGEMENT

- Pet waste shall be placed in secure receptacles until they are emptied by a licensed solid waste management company.

PROPER MANAGEMENT OF DEICING CHEMICALS AND SNOW

- Snow disposal shall be in accordance with the Department of Environmental Protection, Bureau of Resource Protection, Snow Disposal Guidelines, Guideline No. BRPG01-01. In general, snow will be plowed in accordance with standard operating procedures. Whenever possible, the use of environmentally friendly alternatives (e.g., calcium chloride and sand instead of salt for melting ice) will be considered. Within the limits of the Athletic Campus, the use of road salt (sodium chloride) is prohibited.

OPERATION & MAINTENANCE PLAN

HAMILTON-WENHAM REGIONAL SCHOOL DISTRICT
HAMILTON-WENHAM REGIONAL HIGH SCHOOL ATHLETIC CAMPUS IMPROVEMENTS

INSPECTION & MAINTENANCE LOG

Inspected By:_____ Date:_____

Days Since Last Rainfall:_____ Amount of Last Rainfall:_____ Inches

BMP Being Inspected:

SYNTHETIC TURF FIELD

Opened Inspection Ports or Manhole Covers	YES	NO
Standing Water Observed	YES	NO
Depth of Standing Water (inches)		Not Applicable
Sediment Observed	YES	NO
Depth of Sediment (inches)		Not Applicable

Corrective Actions Taken:

Other Remarks:

OPERATION & MAINTENANCE PLAN

HAMILTON-WENHAM REGIONAL SCHOOL DISTRICT
HAMILTON-WENHAM REGIONAL HIGH SCHOOL ATHLETIC CAMPUS IMPROVEMENTS

INSPECTION & MAINTENANCE LOG

Inspected By:_____ Date:_____

Days Since Last Rainfall:_____ Amount of Last Rainfall:_____ Inches

BMP Being Inspected:

STONE/PIPE TRENCHES

Opened Inspection Ports or Manhole Covers	YES	NO
Standing Water Observed	YES	NO
Depth of Standing Water (inches)		Not Applicable
Sediment Observed	YES	NO
Depth of Sediment (inches)		Not Applicable

Corrective Actions Taken:

Other Remarks:

OPERATION & MAINTENANCE PLAN

HAMILTON-WENHAM REGIONAL SCHOOL DISTRICT
HAMILTON-WENHAM REGIONAL HIGH SCHOOL ATHLETIC CAMPUS IMPROVEMENTS

INSPECTION & MAINTENANCE LOG

Inspected By:_____ Date:_____

Days Since Last Rainfall:_____ Amount of Last Rainfall:_____ Inches

BMP Being Inspected:

TRENCH DRAINS

Opened Inspection Ports or Manhole Covers	YES	NO
Standing Water Observed	YES	NO
Depth of Standing Water (inches)		Not Applicable
Sediment Observed	YES	NO
Depth of Sediment (inches)		Not Applicable
Downstream Vegetation Cover Inspected	YES	NO
Settlement of Curb Observed	YES	NO

Corrective Actions Taken:

Other Remarks:

OPERATION & MAINTENANCE PLAN

HAMILTON-WENHAM REGIONAL SCHOOL DISTRICT
HAMILTON-WENHAM REGIONAL HIGH SCHOOL ATHLETIC CAMPUS IMPROVEMENTS

INSPECTION & MAINTENANCE LOG

Inspected By:_____ Date:_____

Days Since Last Rainfall:_____ Amount of Last Rainfall:_____ Inches

BMP Being Inspected:

LEVEL SPREADERS

Standing Water Observed	YES	NO
Depth of Standing Water (inches)		Not Applicable
Sediment Observed	YES	NO
Depth of Sediment (inches)		Not Applicable

Corrective Actions Taken:

Other Remarks:

Stream Sample Locations	
Symbol	Location
S1	100 ft upstream of where stormwater overflow from the turf field will enter the waterway
S2	The area the stormwater will enter the stream

*Note: Locations at the mouth of the stream just prior to and just after stormwater reaches the waters of the Miles River Marsh are to the East ±1,350 ft. (access may be limited outside the limits of this plan sheet)

Operation and Maintenance						
	Preventative Maintenance	Inspect	Clean	Remove Debris	Regrade and Reseed	Stream Sampling
Synthetic Turf Field	X	X				
Stone Trench		X		X		
Area Drain		X	X			
Drywell		X	X			
Catch Basin		X	X			
Level Spreader		X	X	X	X	
Drain Manhole		X	X	X		
Miles River						X*

*As noted on this plan

NORTH

S1
S2
Rip-Rap Level Spreader
Existing DMH
Existing CB
Existing CB
Synthetic Turf Field
Stone Trench
DW 104
DW 105
Rip-Rap Level Spreader
Rip-Rap Level Spreader
DMH 104
K-901G In-line CB
DMH 103
ACO K1-020 Trench Drain
Synthetic Turf Field
Synthetic Turf Field
DW 102
ACO K1 Trench Drain
TD 101
DMH 102
CB 102
DW 103
DMH 101
CB 101
ACO K1-020 Trench Drain
DW 101
Rip-Rap Level Spreader

GALE
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Boston Baltimore Orlando Hartford Bedford

PROJECT
ATHLETIC CAMPUS IMPROVEMENTS
HAMILTON-WENHAM REGIONAL HIGH SCHOOL
775 BAY ROAD
SOUTH HAMILTON, MA 01982

OWNER
HAMILTON-WENHAM REGIONAL SCHOOL DISTRICT
5 SCHOOL STREET
WENHAM, MA 01984

NO.	DATE	DESCRIPTION	BY

PROJECT NO.	718601
CADD FILE	718601_C201
DESIGNED BY	MSK
DRAWN BY	MSK
CHECKED BY	KDH / PS
DATE	2/1/2024
DRAWING SCALE	1" = 60'

GRAPHIC SCALE
0 60' 120'

SHEET TITLE
BMP LOCATION PLAN

DRAWING NO.

HAMILTON-WENHAM REGIONAL SCHOOL DISTRICT
HAMILTON-WENHAM REGIONAL HIGH SCHOOL ATHLETIC CAMPUS IMPROVEMENTS

SECTION IV: ILLICIT DISCHARGE STATEMENT

Standard 10 of the Massachusetts Stormwater Regulations prohibits illicit discharges to stormwater management systems. The stormwater management system is the system for conveying, treating, and infiltrating stormwater on site, including stormwater best management practices and any pipes intended to transport stormwater to the ground water, a surface water, or a municipal separate storm sewer system.

Illicit discharges to the stormwater management system are discharges that are not entirely comprised of stormwater. Notwithstanding the foregoing, an illicit discharge does not include discharges from the following activities or facilities: firefighting, water line flushing, landscape irrigation, uncontaminated ground water, potable water sources, foundation drains, air conditioning condensation, footing drains, individual resident car washing, flows from riparian habitats and wetlands, dechlorinated water from swimming pools, water used for street washing, and water used to clean residential buildings without detergents.

I, _____ (print name), certify that I have conducted a proper site investigation and verify that to the best of my knowledge there are no illicit discharges located at HAMILTON-WENHAM REGIONAL HIGH SCHOOL, HAMILTON, MA.

Signature_____

Date_____

Gale Associates, Inc.
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February 13, 2024

Town of Hamilton Planning Board
Town Hall
577 Bay Road
Hamilton, MA 01936

Attn: Mr. Patrick Reffett, Director of Planning and Inspectional Services

Re: Hamilton-Wenham Regional High School Athletic Campus Redevelopment
Ipswich River Watershed Association Stormwater Management – Response to Comments
Gale JN 718601

Dear Mr. Reffett,

On behalf of the Hamilton-Wenham Regional School District (HWRSD), Gale Associates, Inc. (Gale) is submitting this letter in response to the Ipswich River Watershed Association comments on December 12, 2023 regarding the Stormwater Management Package. Below you will find the peer review comments in **bold** font and Gale's responses in plain text.

BMPS COMMENTS:

1. **The Board should require the posting of a bond in an amount sufficient to pay for regular inspection and rehabilitation of the proposed stormwater systems for the anticipated life expectancy of the athletic facilities.**

   Response: Under the stormwater permit, HWRSD is committed to long term maintenance of the proposed stormwater system and are currently determining an annual budget to do so.

2. **Although the proposed underground BMPs are meant to treat and attenuate the stormwater to meet the standards, we recommend that an additional traditional aboveground detention or retention basin be installed in line after the proposed systems as a fail-safe to afford long-term protection as underground systems are virtually guaranteed to degrade and fail over time.**

   Response: Synthetic turf fields are not your typical underground BMP, they do not receive runoff from any offsite areas, just what rain falls on the actual field. Since these systems do not receive sediments etc., they perform for many years without issue.

3. **The proponent should include a safety factor in its stormwater calculations on the order of 30% to account for the reduced efficacy of the BMPs over time.**

Response: Refer to the response to comment 2. Because the turf fields do not receive any laden runoff like a typical BMP, their efficiency does not reduce. These systems have been designed in accordance with MassDEP Stormwater Handbook and the local stormwater regulations.

PFAS COMMENTS:

4. **The General Contractor/Turf Supplier will conduct 3rd party testing for the currently regulated perfluoroalkyl and polyfluoroalkyl substances (PFAS) for the turf and infill to be installed and provide written certification that the products are PFAS free.**

   Response: The requested testing will be specified in the construction documents, but please note that limits will be based on the current State and Federal testing and regulations, at the time of construction.

5. **A third party, other than the property owners, should be contracted with to maintain the stormwater systems perpetuity, including implementation and compliance with the Long Term Pollution Prevention Plan.**

   Response: HWRSD has committed to the Long Term Pollution Prevention of the facility as noted above.

6. **As a part of the Long Term Pollution Prevention Plan, routine water quality testing on the project site should be conducted at regular intervals, annually at a minimum, throughout the lifetime of the project and results reported to the town. Monitoring data will provide the Town with long-term information on the effects of the projects on water quality and provide a basis for the Town to take corrective action as necessary.**

   Response: Per the Order of Conditions, HWRSD is required to provide water quality testing in accordance with the current regulations.

In response to the Ipswich River Watershed Association comments on January 5, 2024 regarding the Stormwater Management Package. Below you will find the peer review comments in **bold** font and Gale's responses in plain text.

1. **We specifically recommend that the Planning Board require the project to provide third-party total fluorine testing to ensure the final product is PFAS free. While targeted testing methods can measure a subset of certain PFAS chemicals, total fluorine testing measures either total organic fluorine or total fluorine and is an effective screening tool to determine if PFAS is present. Total fluorine testing is also used as a required certification system for PFAS-free firefighting foams and PFAS-free food packaging.**

Response: Per the Order of Conditions, HWRSD is required to test the synthetic turf materials for PFAS in accordance with the current State and Federal testing methods and regulations, at the time of construction.

We hope you find our responses to your comments acceptable. Please do not hesitate to contact the undersigned, at kdh@gainc.com or (508) 259-3534 if you require additional information or clarification.

Best regards,

GALE ASSOCIATES, INC.

Kathleen D. Hervol/cmh

Kathleen D. Hervol
Director of Athletics

KDH/cmh

Enclosures:

CC:
- Mr. Thomas Geary – Hamilton-Wenham Regional School District
- Mr. Wayne Castonguay – Ipswich River Watershed Association