Stormwater Management Report

Winchendon School - Synthetic Turf Fields

Winchendon, Massachusetts

SMRT

Submitted by:
SMRT Architects and Engineers
April 6, 2022
Project # 21193
smrtinc.com

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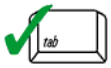
Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

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.

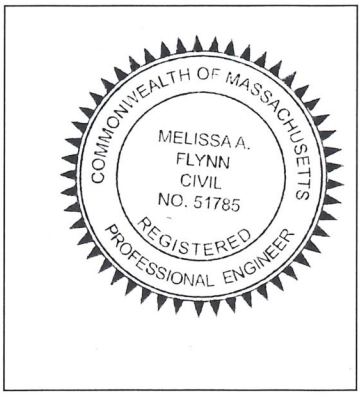
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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



Signature and Date 4/6/22

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): _____

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.

EXECUTIVE SUMMARY

This executive summary provides a general overview of the project and the proposed stormwater management plan.

- The project area is presently developed and consists of grassed playing fields.
- The project is maintenance in nature that it will replace the existing grassed playing fields with turf playing fields in generally the same location.
- The turf fields represent a significantly higher infiltration rate than the existing grass fields. The anticipated impact to stormwater management is that runoff will likely not discharge off the fields, but rather through the turf buildup to be collected into underdrains.
- The soccer underdrain will discharge into the existing stormwater pond and be conveyed with other runoff off site via an existing swale in channel flow. The baseball field underdrain will discharge into a swales and level lip spreaders to be returned to a sheet flow condition.
- While not specifically providing treatment, the turf field does act as a filter for coarse and fine sediment and the underdrain discharge likely has a lower pollutant load than the present runoff from the existing fields. It should be noted that the conversion of the fields from natural grass to synthetic will eliminate maintenance applications of fertilizers, herbicides and other typical lawn chemicals.
- A hydrologic stormwater analysis was performed by creating a stormwater model to represent the maintenance project. This model showed that showed that there are minimal changes from pre and post stormwater runoff.

1 STORMWATER NARRATIVE

1.1 General

The Winchendon School has an athletic facility as part of their campus and intend to redevelop two playing fields. The project area is presently developed and consists of natural grass playing fields. The project is maintenance in nature in that it will replace the existing natural grass playing fields with synthetic turf playing fields in generally the same location.

1.2 Project Watershed

The project area is divided into two watersheds, with one draining westerly and the other draining easterly. The easterly watershed drains through an existing detention pond and subsequently to a vegetated swale which discharges into woodlands including wetlands. The westerly watershed drains the playing field easterly to woodlands including wetlands.

1.3 Alterations to Natural Drainage Ways

The project areas are generally limited to the existing developed areas and will not alter existing drainage ways and patterns. The proposed fields will be graded in a similar manner to existing conditions and consequently drainage characteristics will generally remain the same from the pre to the post development condition.

1.4 Methodology and Modeling Assumptions

The project model is based on the general approach that the proposed project has the following:

- The project is maintenance in nature in that the existing natural grass surface will be replaced by a synthetic turf surface. This will not significantly alter the existing drainage patterns and discharge points.
- The significant difference between pre and post condition is that the infiltration rate of the turf field is such that almost all of the runoff will be collected through the field underdrain and then discharged to the same discharge points.
- Modeling for a turf field is fully appropriate for the higher infiltration rate. The higher infiltration rate is a benefit in that it generally removes any surface runoff, such that areas that previously saw discharge from grassed areas will no longer see runoff. A challenge is that stormwater modeling typically generates a higher peak rate of runoff due to methodology and also concentrates the runoff in channel flow which requires dissipation of velocity.
- Runoff and routing calculations have been performed for the watershed areas affected by the proposed development under pre-development and post-development conditions scenarios. Times of concentration and runoff curve number calculations have been performed using the method described in Natural Resource Conservation Service (NRCS) Technical Release 55 (TR-55) – Urban Hydrology for Small Watersheds. The TR-20 based HydroCad modeling software has been utilized to perform the more complex runoff and routing calculations, some of which are beyond the scope of the TR-55 method. Time of concentration calculations have been amended where the value given by the TR-55 method is less than five minutes. In these cases a standard minimum value of five minutes has been used to keep this parameter within the acceptable working range of the model and prevent computational errors.
- Design rainfall events have been modeled using the SCS Type III hydrograph for 24-hour duration storms. The rainfall values for standard design storm frequencies were identified from NOAA references and are including in the Appendix.

24-Hour Rainfalls for Winchendon, MA Point Precipitation Frequency Estimates				
Frequency	2-Year	10-Year	25-Year	100-Year
Rainfall Depth	2.87 in	4.38 in	5.32 in	6.76 in

The onsite soils have been generally identified as Hydrologic Group D through published sources. The existing topography of the site was determined by previous field survey and existing surface covers were identified by site inspection.

Proposed Stormwater Management Features

The stormwater management system for this development is intended to provide effective mitigation from impacts from the maintenance project. This mitigation is intended to protect downstream stormwater infrastructure and natural resources from potential detrimental impacts. The following treatment features will be used to provide mitigation:

Turf Field Underdrains

Turf fields typically have an underdrain system due to the high infiltration rate of the turf material. Runoff is collected in underdrains (i.e. slot drains and pipes) below the turf field area and conveyed to a surface discharge adjacent to the field.

Maintain existing detention pond

The existing detention pond for the westerly watershed presently provides attenuation of the existing soccer field through surface and pipe conveyances. This feature will be maintained and the turf field underdrain will be conveyed through the existing pipe to discharge into the pond.

Level Lip Spreader

The easterly watershed presently has a surface conveyance which discharges into adjacent woodlands. Due to the addition of the turf field underdrains, two level lip spreaders have been provided to dissipate flow and velocity into the woodlands. These features allow runoff in pipe flow to be restored to a surface conveyance condition by spreading the flow out in a more natural manner.

2 STORMWATER CALCULATIONS

2.1 General

The model evaluates the two fields (soccer and playing field) as two individual systems for replacing the grass field with turf material. Woodlands 1 and 2 represent the discharge points for each system. Woodlands 1 is the point of analysis at the outlet of the existing stormwater pond and Woodlands 2 is the point of analysis at the edge of existing woodlands after conveyance thru two level lip spreaders.

2.2 Pre-Development Conditions

The stormwater model was created with two systems representing the project's two fields as follows:

Woodlands 1

This system represents the existing soccer field which discharges westerly to an existing detention basin. Subcatchment Soccer represents this watershed and runoff from the existing grass cover was represented by a CN of 80. The discharge is represented by two pond structures, Ex Det Pond Forebay and Ex Det Pond A which together represent the function of the existing basin.

Reach Woodlands 1 represent the discharge point from the existing detention pond and is an undefined structure for comparison purposes only.

Woodlands 2

This system represents the playing field which discharges easterly to woodlands. Subcatchment Ballfield represents this watershed and runoff from the existing grass cover.

Reach Woodlands 2 represent the discharge point from the edge of the existing grassed playing field and is an undefined structure for comparison purposes only.

2.3 Post-Development Conditions

Woodlands 1

This system represents the soccer field and was altered for post development conditions. Subcatchment Soccer was modified to reflect runoff from a turf field, using a CN value of 89 to represent the highly porous surface. The subcatchment was routed through a pond structure representing the soccer field underdrain to represent the attenuation action of runoff filtering through the turf buildup. The two pond structures representing the existing basin are unchanged.

Reach Woodlands 1 represent the discharge point from the existing detention pond and is an undefined structure for comparison purposes only.

Woodlands 2

This system represents the playing field and was revised to reflect soccer field and was altered to reflect runoff from a turf field, using a CN value of 89 to represent the highly porous surface. Due to the underdrain system, this subcatchment was divided into two subcatchments to accurately model two separate discharges into the woodlands. These subcatchments were routed through two additional pond structures (UD 2A and UD 2B) representing the soccer field underdrain to represent the attenuation action of runoff filtering through the turf buildup. The underdrain structures will discharge to two separate level lip spreaders, which are represented by ponds Level Lip Spreader 2A and Level Lip Spreader 2B.

Reach Woodlands 2 represent the discharge point from the edge of the existing grassed playing field and is an undefined structure for comparison purposes only.

2.4 Stormwater Modeling

HydroCAD software (based on TR-20 methods) was utilized to model the change in discharges from the two fields for pre and post development conditions. A summary of the pre-development versus post-development conditions runoff rates for each field is as follows:

Peak Flows discharging from the existing detention pond (Reach Woodlands 1)			
Storm Event	Pre- Development (cfs)	Post Development (cfs)	Net (cfs)
2 yr storm	0.22	2.04	+1.82
10 yr storm	3.89	4.38	+0.49
25 yr storm	5.03	5.53	+0.50
100 yr storm	6.97	7.28	+0.31

The stormwater model shows increases slightly at each storm event, with a significant increase in the 2 year event. One factor of stormwater modeling in this manner is that the software is based on hydrographs intended for watersheds of no less than 20 acres. Smaller watersheds and storm events tend to provide less accurate results in that the hydrographs are at the edge of their information. For perspective, the peak flow values above have been translated to the actual increase in flow over the outlet weir of the existing detention pond, as follows:

Storm Event	Pre-Depth over ex. pond weir (ft)	Post Depth over ex. pond weir (ft)	Difference in depth (ft)	English units
2 year	0.02	0.10	0.08	1”
10 year	0.14	0.16	0.02	1/4”
25 year	0.18	0.19	0.01	1/8”
100 year	0.22	0.23	0.01	1/8”

For all four storm events, the existing detention pond successfully mitigates runoff from the turf soccer field by a practical increase in flow depth of 1/8” to 1”.

Peak Flows discharging into woodlands (Reach Woodlands 2)			
Storm Event	Pre- Development (cfs)	Post Development (cfs)	Net (cfs)
2 yr storm	2.69	3.69	+1.00
10 yr storm	5.67	6.45	+0.78
25 yr storm	7.62	8.26	+0.64
100 yr storm	10.69	11.29	+0.60

The stormwater model shows slight increases at each storm events, and but all are relatively insignificant. The level lip spreaders are a typical stormwater management feature to revert channel flow to surface flow in a sheet (a.k.a spread out) condition. Sheet flow is the condition that runoff begins and for natural areas is the ideal condition for discharge to woodlands due to their ground cover and topography.

3 STORMWATER COMPLIANCE

Massachusetts Stormwater Standards

Standard 1: No new untreated discharges are proposed

Standard 2: See explanation in report.

Standard 3: Existing soils on site do not allow for recharge. See geotechnical report.

Standard 4: Not applicable for proposed project.

Standard 5: Not applicable for proposed project.

Standard 6: Not applicable for proposed project.

Standard 7: Certain standards are not fully met.

Standard 8: A SWPPP will be submitted before land disturbance begins.

Standard 9: See appendix D.

Standard 10: See appendix E.

4 CONCLUSIONS

The runoff and routing calculations demonstrate that the project is not anticipated to represent a significant impact to downstream areas. Peak rates of runoff from the new turf fields is mitigated by the use of stormwater features and discharged into woodlands areas in a manner similar to the existing conditions.

5 REFERENCES

- Massachusetts Stormwater Handbook
- Town of Winchendon Stormwater Regulations dated September 21, 2021
- NRCS Technical Release 378
- NRCS Web Soil Survey
- Kleinfelder Geotechnical Engineering Report – Winchendon School Athletic Improvements dated January 21, 2022.

Soils & Rainfall Information — Appendix A

CONTENTS:

1. Kleinfelder Geotechnical Engineering Report – Winchendon School Athletic Improvements dated January 21, 2022
2. NRCS Custom Soil Resource Report for Worcester Country, Massachusetts, Northwestern Part
3. NOAA Atlas 14, Volume 10, Version 3 – Winchendon, Massachusetts Precipitation Frequency Estimates

GEOTECHNICAL ENGINEERING REPORT

WINCHENDON SCHOOL ATHLETIC IMPROVEMENTS

WINCHENDON, WORCESTER COUNTY, MASSACHUSETTS

PREPARED FOR:

MR. JOHN LEAHEY
DIRECTOR OF FACILITIES
THE WINCHENDON SCHOOL
172 ASH STREET
WINCHENDON, MA 01475

PREPARED BY:

MICHAEL D. OWEN
PROJECT MANAGER

BRUCE G. STEGMAN, P.E.
PRINCIPAL PROFESSIONAL
MA LICENSE NO: 54719

PROJECT NUMBER – 20224029.001A

JANUARY 21, 2022

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Appendix

1.0 INTRODUCTION

This report was prepared by Kleinfelder, Inc. (Kleinfelder), on behalf of the Winchendon School, of Winchendon, Massachusetts, and contains the results of a geotechnical engineering exploration conducted for the proposed synthetic turf athletic fields. The purpose of this exploration has been to evaluate the suitability of the existing subsurface conditions to support the proposed improvements. The scope of work for this project included a subsurface exploration, laboratory testing program and geotechnical engineering analysis. This report summarizes the results of the work performed and provides geotechnical and general construction recommendations.

2.0 SITE AND PROJECT DESCRIPTION

The project site currently consists of the grass covered soccer and softball fields located on the grounds of the Winchendon School located at 172 Ash Street in Winchendon, Worcester County, Massachusetts. The site is bordered to the north, east and south by wooded parcels, and to the west by the Jason Ritchie Ice Arena. Existing topography across the project site is relatively flat with little to no grade variation across the athletic fields. The approximate location of the site in relation to the surrounding area is presented on the *Topographic Map* (Figure 1), within the Appendix.

Based on information provided by the Client, the project will consist of converting the existing grass covered soccer and softball fields to synthetic turf. Development of the project will also consist of constructing new stormwater management facilities.

3.0 SITE GEOLOGY

According to information provided by the Massachusetts Geologic Survey, the project site is underlain by the Partridge Formation (geologic symbol Ops). The project site within its geologic setting is presented on the *Geologic Map* (Figure 2) found within the Appendix.

The Partridge Formation consists predominantly of sulfidic mica schist with or without garnet, staurolite, kyanite, sillimanite, chlorite (retrograde zone), plagioclase; sulfidic feldspathic schist; calc-silicate rock; and amphibolites composed of various combinations of plagioclase, hornblende, garnet, epidote, anthophyllite, and cummingtonite.

4.0 SUBSURFACE EXPLORATION PROGRAM

To evaluate subsurface conditions, a total of 6 test borings; 2 test borings across the soccer field and 4 test borings across the softball field, were completed on January 5, 2022. Supervision and monitoring of the subsurface exploration were provided by a representative of Kleinfelder, who field located the test locations utilizing a hand-held GPS unit based on drawings and information provided by the Client. The approximate test locations, referenced as B-1 through B-6, are shown on the *Exploration Plan* (Figure 3) within the Appendix.

The test borings were advanced using a Diedrich D-150 drill rig equipped with hollow-stem augers. Split-spoon samples were taken at suitable intervals throughout the entire depth of the borings and the Standard Penetration Test (SPT) values were recorded for each sample obtained. The SPT values, which are a measure of the density or consistency, are the number of blows required to drive a 2-inch (outer-diameter), split-barrel sampler 2 feet using a 140-pound weight dropped 30 inches. The number of blows required to advance the sampler over the 12-inch interval from 6 to 18 inches is considered the "N" value.

Data pertaining to the test boring operation was documented in the field and is presented in detail on the *Test Boring Profiles* (Figure 4) and *Test Boring Logs* presented within the Appendix. The *Test Boring Profiles* depict cross-sections of the subsurface conditions encountered within each test boring conducted, including soil types, depths of individual strata and recorded “N” values. The *Test Boring Logs* contain general information about the subsurface program and specific data regarding each test boring,

including sample depths, hammer blows per 6 inches of penetration, infiltration testing depths and visual classifications of the subsurface materials encountered.

Additional information relating to the graphic symbols used within the *Test Boring Logs* is depicted on the *Graphics Key* (Figure 5) presented within the Appendix.

5.0 LABORATORY TESTING

Soil samples retrieved from the site were visually reviewed and classified by Kleinfelder. Representative samples were subjected to laboratory analyses to verify visual classifications and aid in establishing engineering parameters in accordance with the following schedule:

- Natural Moisture Content (ASTM D2216)
- Sieve Analysis (ASTM D422)
- Atterberg Limits Determination (ASTM D4318)

Unified Soil Classification System (USCS) Group Symbols and ASTM Group Names have been assigned to the soils analyzed. The results of these analyses are presented within the tables below and graphical depictions of the particle gradation are presented within the Appendix.

STANDARD CLASSIFICATION RESULTS

Location	Depth (feet)	Soil Type	% Gravel	% Sand	% Fines	LL	PL	PI	Natural Moisture Content	USCS Group Symbol	ASTM Group Name
B-2	2 - 6	Stratum I	23.1	63.3	13.6	Non-plastic			16.2%	SM	Silty SAND with Gravel
B-6	2 - 4		7.4	76.5	16.1				12.8%		Silty SAND

LL-Liquid Limit; PL-Plastic Limit; PI-Plasticity Index

6.0 DESCRIPTION OF SUBSURFACE CONDITIONS

A general description of the conditions encountered at the site is as follows:

6.1 SOIL

Surficial Materials

The test locations were covered by approximately 6 to 10 inches of topsoil; however, topsoil thickness may differ in unexplored areas of the project site.

Stratum I – Gray to brown Silty SAND with varying amounts of Gravel

Stratum I was encountered within each test boring completed and extended to their termination depths ranging from approximately 3.5 to 8 feet below existing site grades. The “N” values recorded within this soil ranged from 4 blows per foot to 67 blows over 10-inches and shows Stratum I to range from very loose to very dense.

Laboratory testing conducted on representative samples of Stratum I show this soil to be moderately graded and non-plastic with natural moisture contents of 12.8% and 16.2%. According to the USCS, the Stratum I soil consists of Silty SAND (SM) and Silty SAND with Gravel (SM).

6.2 BEDROCK

The bedrock surface was encountered within test borings B-3 through B-6 at depths ranging from approximately 3.5 to 7.5 feet below existing site grades. The bedrock surface was defined as the depth at which the auger of the drilling equipment could no longer advance.

6.3 GROUNDWATER/SOIL MOTTLING

Neither groundwater nor soil mottling (indicating a seasonal high-water table and/or poorly draining soils) was encountered within the test borings completed. These observations were made at the time of the field operation and the groundwater table elevations will vary with daily, seasonal and climatological variations, as well as anthropogenic activities.

7.0 GEOTECHNICAL RECOMMENDATIONS

Our geotechnical recommendations are provided in the following sections.

7.1 STRUCTURAL FILL

Our recommendations regarding suitable imported fill and the reuse of on-site soils as structural fill are provided below.

Imported Fill

- free of organic matter, ash, cinders, trash, or other unsuitable or deleterious materials
- particle size distribution that is well-graded, per USCS guidelines
- Liquid Limit (LL) less than 30 and Plasticity Index (PI) less than 10
- less than 15 percent by weight rock fragments larger than 3" with no particle size exceeding 6", less than 30 percent by weight larger than the 3/4" and less than 30 percent smaller than the no. 200 sieve

Alternate soils proposed for use which differ from those specified above should be evaluated by the Kleinfelder regarding their suitability prior to placement at the site.

Reuse of On-Site Materials

Stratum I – This soil was found to be moderately graded, non-plastic and predominantly comprised of Silty SAND with varying amounts of Gravel. Based on this information, this soil is considered to be suitable for reuse as structural fill.

Our analysis of the suitability of the on-site soil for use as structural fill is based on data collected from the test locations completed at the site. Soil suitability should be confirmed in the field by Kleinfelder during construction.

7.2 STORMWATER INFILTRATION ANALYSIS

Infiltration testing was completed within test locations B-1, B-3 and B-5, utilizing the Falling Head Test in accordance with ASTM D5126-90. Each test boring extended a minimum of 2 feet below the test elevation in order to review for the presence of limiting zones (i.e. bedrock, groundwater and/or soil mottling). The results of the infiltration testing completed are presented within the table below.

INFILTRATION TEST RESULTS			
Test Location	**Approximate Test Depth (ft)**	**Limiting Zone Depth (ft)**	**Infiltration Rate (in/hr)***
B-1	1.0	Not Encountered at 8.0	0.0
B-3	1.5	Bedrock at 3.5	0.0
B-5	1.5	Bedrock at 4.0	0.0
*Infiltration rates are field rates and not factored			

Based on the results of our field exploration and engineering analysis of the data obtained, we offer the following comments regarding the infiltration of stormwater at the project site:

- Infiltration testing was conducted within the moderately graded, non-plastic naturally occurring soils of Stratum I.
- Bedrock was encountered within test locations B-3 and B-5 at depths of approximately 3.5 and 4 feet, respectively, below existing site grades.
- The unfactored field infiltration rates were found to be zero (no movement) inches per hour.

7.3 GENERAL FIELD CONSIDERATIONS

It is our understanding that the fields will be covered with synthetic turf. The following are general recommendations regarding preparation of the subgrade. Guidance from the manufacturer of the selected products should be consulted before installation.

- A permeable aggregate base layer with a 12-inch minimum thickness should be placed between the bottom of the artificial turf and top of geosynthetic. Field drains are to be place in this layer. The aggregate base should be compacted to 95% of the modified proctor (ASTM D1557). The top surface of the aggregate should be crowned in the field area to allow for drainage. Beneath the turf field, the top 1 inch of the permeable aggregate base should be a finish stone (screenings).
- Under the turf field the subgrade and subbase should be separated by a woven geotextile or equivalent.
- Perimeter drains should be constructed around the limits of the field and appropriately sloped.
- Water collected in the field aggregate base will need to be collected in drains arranged in a pattern under the field and feeding into the perimeter drains Spacing between drains should be based upon the horizontal permeability of 10^{-2} cm/sec. The collector drains can either be geocomposite strip drains or flat pipe drains sized based on the hydraulic demands.

8.0 CONSTRUCTION CONSIDERATIONS

Based on the results of our geotechnical exploration and our experience with similar project sites, we have developed the following site-specific recommendations for construction of the proposed site improvements.

8.1 SITE PREPARATION

At the outset of the project, all surficial materials should be stripped from all structural areas. Structural areas are defined as those areas to be covered by asphalt, concrete pavements or synthetic turf. Unstable or deleterious materials, if encountered, should also be removed in their entirety.

Topsoil will not be suitable for use as structural fill during construction. Any topsoil encountered may be stockpiled on site for future use in landscaped areas or as general fill material in non-structural portions of the site (i.e. landscaping berms, curbed islands, etc.).

8.2 PROOF-ROLLING

Following removal of the surficial materials, required excavation to reach proposed subgrade elevations and prior to the placement of structural fill, structural areas should be compacted using a steel-drum, vibratory roller, having a minimum static weight of 10 tons. A minimum of 5 overlapping passes of the roller should be completed across the entirety of the fields and other structural areas.

Following the compaction procedures, proof-rolling should be performed using a loaded, tandem-axle dump truck under the direction of Kleinfelder. Proof-rolling and compaction procedures are necessary to compact and verify the integrity of the upper zones of the soils and allow for a uniform distribution of loads. Loose or unstable areas encountered during proof-rolling and compaction should be compacted in place or removed and replaced with structural fill placed in accordance with the recommendations provided in this report.

In areas of the site where a cut or removal of soil is necessary to achieve the required soil subgrade elevation, proof-rolling of the surface may be waived until the proposed subgrade elevation is achieved.

8.3 EXCAVATION CONSIDERATIONS

Final site grades were unknown at the time of this writing; however, it is anticipated development of the project site will take place within the naturally occurring soils of Stratum I. These soils may be removed using conventional earth moving equipment and techniques, however; based on the slow advancement of the drilling equipment, deeper portions of Stratum I may be difficult to excavate and require the use of larger equipment and/or hydraulic or pneumatic “hammering” equipment for removal. In confined excavations, such as utility/drain trenches, etc., removal of highly weathered rock material may necessitate the use of pneumatic or hydraulic hammers. The ease of excavation will be governed by the subsurface conditions encountered and type of excavation equipment used, along with the Contractor’s willingness to utilize the equipment to its full potential. Bulk bedrock removal is not anticipated to be required.

All excavations should be adequately sloped, benched, or supported to minimize collapse and protect personnel. All excavations should be completed in accordance with OSHA requirements.

8.4 COMPACTION & PLACEMENT REQUIREMENTS

Structural fill should be placed in lifts not exceeding 8 inches in loose thickness where heavy compaction equipment can be utilized and 6 inches in loose thickness where hand-operated equipment is necessary. Only hand-operated tampers and rollers should be used immediately behind below-grade and retaining walls during backfilling unless permission is granted by the Structural Engineer to utilize heavy compaction equipment.

The optimum lift thickness and number of repetitive passes with compaction equipment necessary to achieve the required percentage compaction values should be determined in the field with test passes of the chosen compaction equipment. New structural fill should be placed at or deviate nominally from (±2%) the optimum moisture content as determined in accordance with ASTM D698 or ASTM D1557 and compacted to the minimum percentages of maximum dry density as indicated below.

COMPACTION CRITERIA		
Fill Area	**Percent of Maximum Dry Density per Standard Proctor (ASTM D698)**	**Percent of Maximum Dry Density per Modified Proctor (ASTM D1557)**
Athletic Fields, Pavement Areas	98	95
Non-Structural Areas, Green Areas	92	90

8.5 WET WEATHER CONSTRUCTION

Construction during extended wet weather periods could create the need to over-excavate exposed soils if they become disturbed and cannot be recompacted due to elevated moisture content and/or weather conditions. The need for over-excavation should be confirmed through continuous observation and testing by Kleinfelder. Selective drying and re-compaction of unsuitable subgrades may be accomplished by scarifying or windrowing surficial material during extended periods of dry and warm weather. Otherwise, the use of imported material could become necessary at an additional cost. The need for subgrade over-excavation and/or stabilization will be dependent, in part, on the subgrade protection effort exercised by the contractor. Similar subgrade stability problems may develop after completion of subgrade preparation due to weather and construction traffic effects, requiring stabilization prior to floor slab and pavement construction.

8.6 CONSTRUCTION DEWATERING

Groundwater or perched water may be encountered during construction. The construction contract documents should include a dewatering specification that requires the Contractor to provide an adequate dewatering system capable of maintaining the groundwater table a minimum of 2 feet below subgrade elevations during earthwork, , and backfilling operations. The specifications should also require that the dewatering system be designed such that adjacent structures will not be impacted.

9.0 CONSTRUCTION QUALITY CONTROL

At the time of this report, Kleinfelder is the Geotechnical Engineer of Record for this project. Regardless of the thoroughness of a geotechnical engineering exploration, there is always a possibility that conditions between the test locations and below the depths explored may be different from those encountered, that conditions are not as anticipated by the designers, or that the construction process has altered the subsurface conditions. We should be retained to provide inspection and materials testing and observation services during construction to ensure continuation of geotechnical interpretation and to verify that the recommendations prepared for geotechnical aspects of site development are adhered to during construction.

If an outside firm is selected to provide inspection and/or construction materials testing and observation services for this project, the engaged firm should prepare a letter indicating their intent to assume the responsibility as Geotechnical Engineer of Record. The selected firm should also provide a written acknowledgement of their concurrence with the recommendations presented in our report or revised recommendations concerning the geotechnical aspects of the proposed development. Additional testing and consulting services recommended for this project are summarized below:

- **Review of Final Project Plans and Specifications**: As finalized project documents were not available at the time of this report, we recommend that Kleinfelder be engaged to review the final project plans and specifications to ensure that our recommendations are appropriately incorporated into the project documents.

- **Special Inspections/Fill Placement and Compaction**: An experienced and appropriately-certified soils engineering technician should witness any required filling and wall backfilling

operations and should perform sufficient in place density tests to verify that the specified degree of compaction is achieved. The technician should also evaluate borrow materials used and determine if their existing moisture contents are suitable.

10.0 LIMITATIONS

This work was performed in a manner consistent with that level of care and skill ordinarily exercised by other members of Kleinfelder's profession practicing in the same locality, under similar conditions and at the date the services are provided. Our conclusions, opinions, and recommendations are based on a limited number of observations and data. It is possible that conditions could vary between or beyond the data evaluated. Kleinfelder makes no other representation, guarantee, or warranty, express or implied, regarding the services, communication (oral or written), report, opinion, or instrument of service provided. This report may be used only by the Client and the registered design professional in responsible charge and only for the purposes stated for this specific engagement within a reasonable time from its issuance, but in no event later than 2 years from the date of the report.

Kleinfelder offers various levels of investigative and engineering services to suit the varying needs of our clients. Although risk can never be eliminated, more detailed and extensive studies yield more information, which may help understand and manage the level of risk. Since detailed study and analysis involves greater expense, our clients participate in determining levels of service, which provide information for their purposes at acceptable levels of risk. Client and key members of the design team should discuss the issues addressed in this report with Kleinfelder, so that the issues are understood and applied in a manner consistent with the Client's budget, tolerance of risk and expectations for future performance and maintenance.

This report, and any future addenda or reports regarding this site, may be made available to bidders to supply them with only the data contained in the report regarding subsurface conditions and laboratory test results at the point and time noted. Bidders may not rely on interpretations, opinion, recommendations, or conclusions contained in the report. Further, Kleinfelder assumes no liability for interpolation of data between the specific testing locations discussed herein. Because of the limited nature of any subsurface study, the contractor may encounter conditions during construction which differ from those presented in this report. In such event, the contractor should promptly notify the owner so that Kleinfelder's geotechnical engineer can be contacted to confirm those conditions. We recommend the contractor describe the nature and extent of the differing conditions in writing and that the construction contract include provisions for dealing with differing conditions. Contingency funds should be reserved for potential problems during earthwork operations.

The work performed was based on project information provided by the Client. If there are any changes in the field to the plans and specifications, the Client must obtain written approval from Kleinfelder's engineer that such changes do not affect our recommendations. Failure to do so will vitiate Kleinfelder's recommendations.

11.0 CLOSING

We thank you for the opportunity to work on this project with you. Should you have any questions or require any additional information, please do not hesitate to contact us.

KLEINFELDER
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APPENDIX

FIGURE 1 – TOPOGRAPHIC MAP

FIGURE 2 – GEOLOGIC MAP

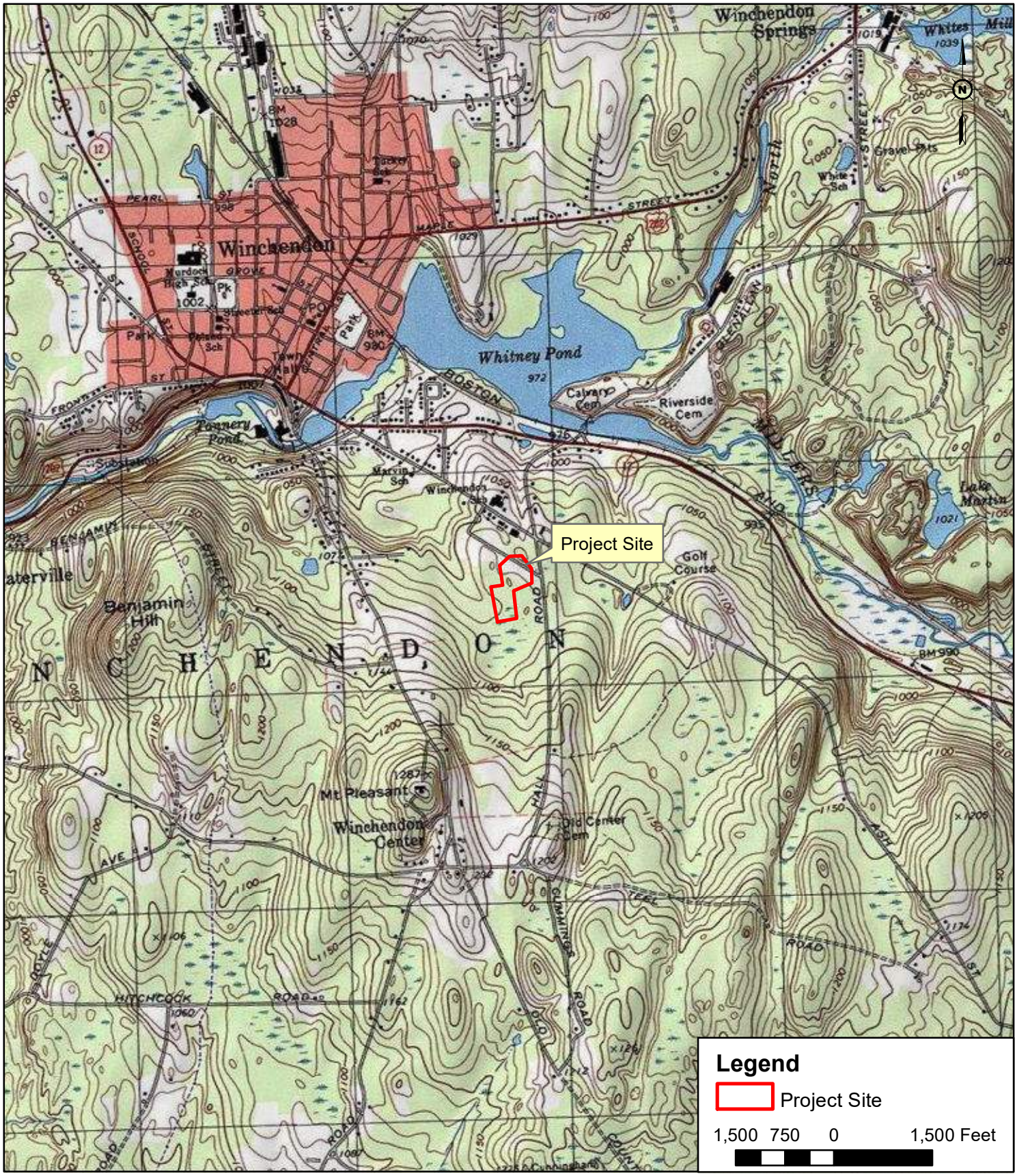
FIGURE 3 – EXPLORATION PLAN

FIGURE 4 – TEST BORING PROFILES

FIGURE 5 – GRAPHICS KEY

LABORATORY TEST RESULTS

TEST BORING LOGS



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SCALE: AS SHOWN	DRAWING NUMBER: FIGURE 1
DRAWN BY: C. WEEMS	CHECKED BY: M. OWEN
APPROVED BY: B. STEGMAN	DATE: 1-19-2022

TOPOGRAPHIC MAP

PREPARED FOR

WINCHENDON SCHOOL ATHLETIC IMPROVEMENTS

WINCHENDON WORCHESTER COUNTY MASSACHUSETTS

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PH (717) 458-0800
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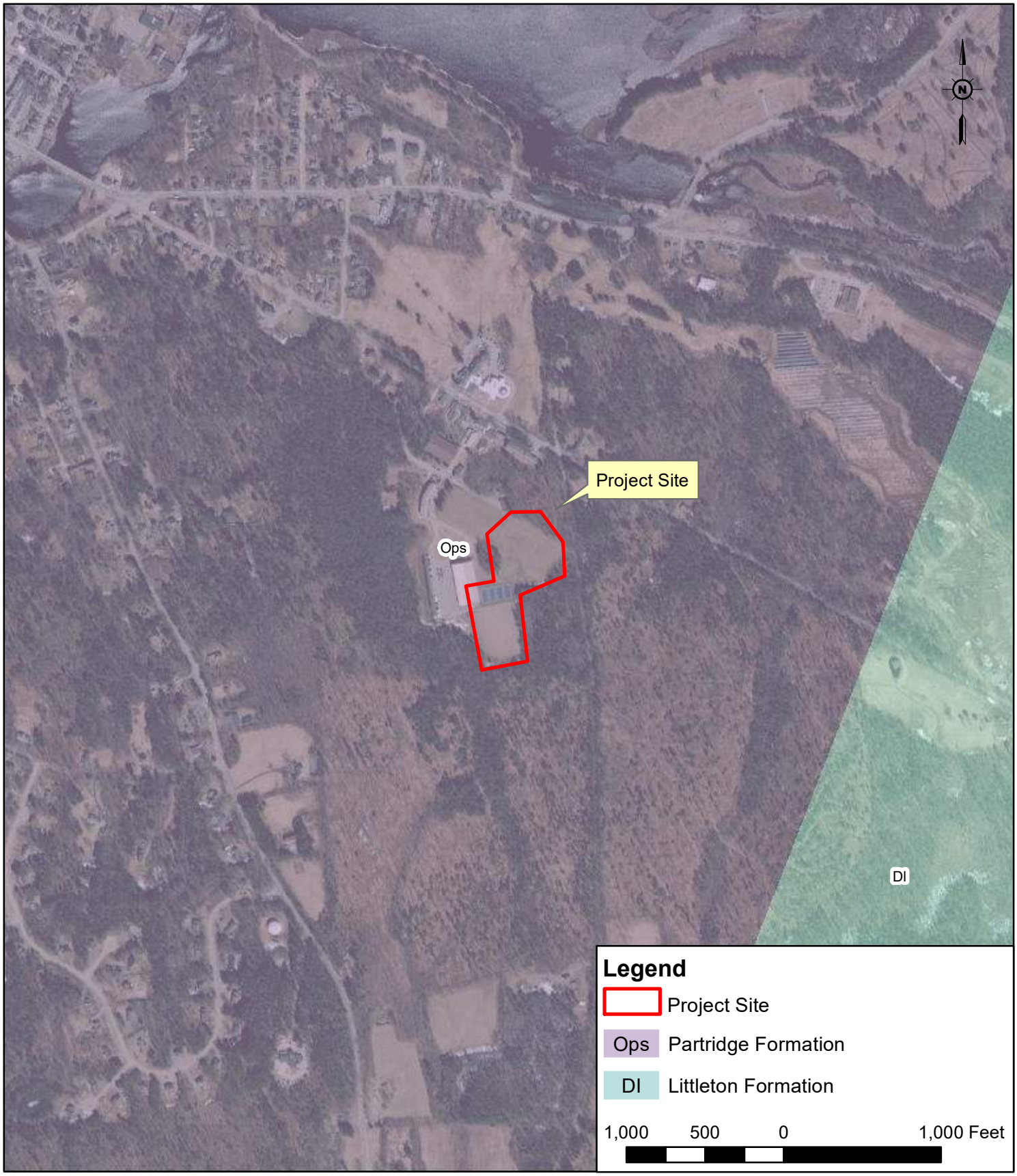

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SCALE: AS SHOWN	DRAWING NUMBER: FIGURE 2
DRAWN BY: C. WEEMS	CHECKED BY: M. OWEN
APPROVED BY: B. STEGMAN	DATE: 1-19-2022

GEOLOGIC MAP

PREPARED FOR

WINCHENDON SCHOOL ATHLETIC IMPROVEMENTS

WINCHENDON WORCHESTER COUNTY MASSACHUSETTS

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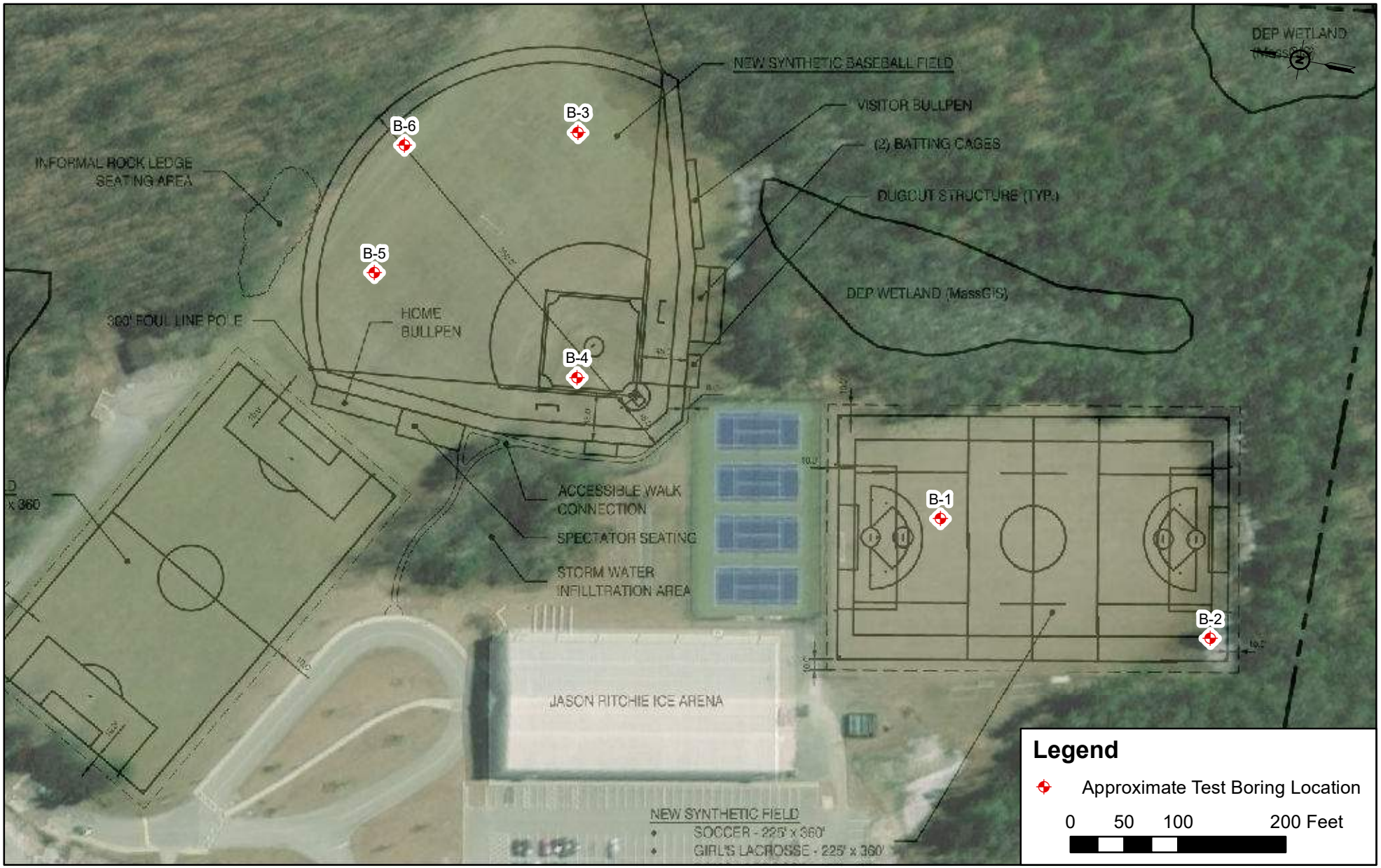

*Source - Synthetic Field Improvements, dated August 5, 2021

SCALE: AS SHOWN	DRAWING NUMBER: FIGURE 3
DRAWN BY: B. MOSSER	CHECKED BY: M. OWEN
APPROVED BY: B. STEGMAN	DATE: 11-22-2021

EXPLORATION PLAN

PREPARED FOR

WINCHENDON SCHOOL ATHLETIC IMPROVEMENTS

WINCHENDON WORCHESTER COUNTY MASSACHUSETTS

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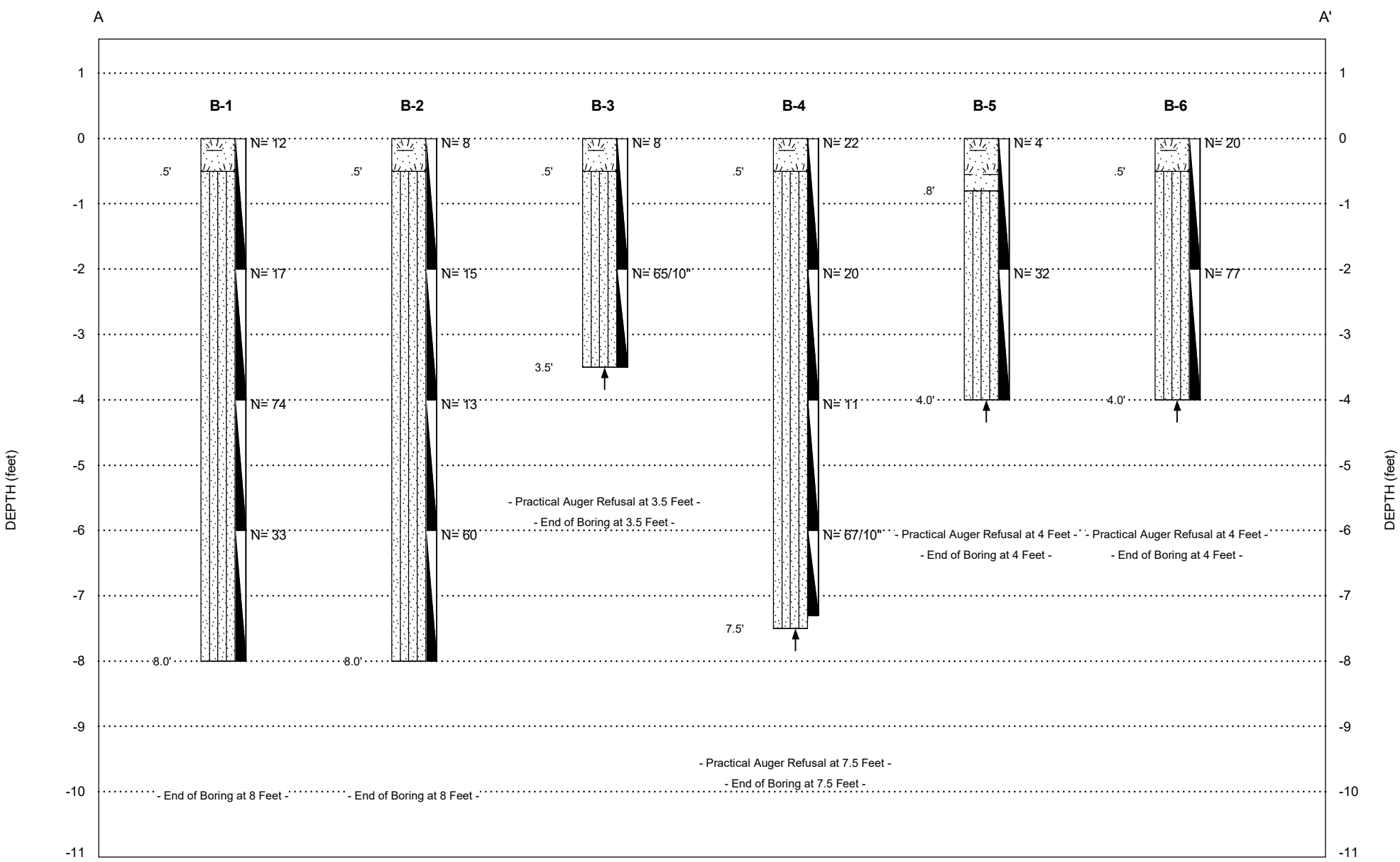

NOTE:
REFER TO INDIVIDUAL LOGS FOR DETAILED INFORMATION AND THE GRAPHIC LEGEND KEYS FOR GRAPHICAL SYMBOL INFORMATION.

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PROJECT NO.: 20224029.001A
DRAWN BY: CW
CHECKED BY: MO
DATE: 1/19/2022

TEST BORING PROFILES

Winchendon School Athletic Improvements
Winchendon
Worcester County, Massachusetts

FIGURE
4

SAMPLE/SAMPLER TYPE GRAPHICS

STANDARD PENETRATION SPLIT SPOON SAMPLER (2 in. (50.8 mm.) outer diameter and 1-3/8 in. (34.9 mm.) inner diameter)

GROUND WATER GRAPHICS

- WATER LEVEL (level where first observed)
- WATER LEVEL (level after exploration completion)
- WATER LEVEL (additional levels after exploration)
- OBSERVED SEEPAGE

NOTES

- The report and graphics key are an integral part of these logs. All data and interpretations in this log are subject to the explanations and limitations stated in the report.
- Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual or differ from those shown.
- No warranty is provided as to the continuity of soil or rock conditions between individual sample locations.
- Logs represent general soil or rock conditions observed at the point of exploration on the date indicated.
- In general, Unified Soil Classification System designations presented on the logs were based on visual classification in the field and were modified where appropriate based on gradation and index property testing.
- Fine grained soils that plot within the hatched area on the Plasticity Chart, and coarse grained soils with between 5% and 12% passing the No. 200 sieve require dual USCS symbols, ie., GW-GM, GP-GM, GW-GC, GP-GC, GC-GM, SW-SM, SP-SM, SW-SC, SP-SC, SC-SM.
- If sampler is not able to be driven at least 6 inches then 50/X indicates number of blows required to drive the identified sampler X inches with a 140 pound hammer falling 30 inches.

ABBREVIATIONS
WOH - Weight of Hammer
WOR - Weight of Rod

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487)

COARSE GRAINED SOILS (More than half of material is larger than the #200 sieve)	**GRAVELS** (More than half of coarse fraction is larger than the #4 sieve)	CLEAN GRAVEL WITH <5% FINES	Cu≥4 and 1≤Cc≤3		**GW**	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
			Cu<4 and/ or 1>Cc>3		**GP**	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
		GRAVELS WITH 5% TO 12% FINES	Cu≥4 and 1≤Cc≤3		**GW-GM**	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
					GW-GC	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
			Cu<4 and/ or 1>Cc>3		**GP-GM**	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
					GP-GC	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
		GRAVELS WITH > 12% FINES			**GM**	SILTY GRAVELS, GRAVEL-SILT-SAND MIXTURES
					GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
					GC-GM	CLAYEY GRAVELS, GRAVEL-SAND-CLAY-SILT MIXTURES
	SANDS (Half or more of coarse fraction is smaller than the #4 sieve)	CLEAN SANDS WITH <5% FINES	Cu≥6 and 1≤Cc≤3		**SW**	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
			Cu<6 and/ or 1>Cc>3		**SP**	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
		SANDS WITH 5% TO 12% FINES	Cu≥6 and 1≤Cc≤3		**SW-SM**	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
					SW-SC	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
			Cu<6 and/ or 1>Cc>3		**SP-SM**	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
					SP-SC	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
		SANDS WITH > 12% FINES			**SM**	SILTY SANDS, SAND-GRAVEL-SILT MIXTURES
					SC	CLAYEY SANDS, SAND-GRAVEL-CLAY MIXTURES
					SC-SM	CLAYEY SANDS, SAND-SILT-CLAY MIXTURES

FINE GRAINED SOILS (Half or more of material is smaller than the #200 sieve)	SILTS AND CLAYS (Liquid Limit less than 50)	**ML**	INORGANIC SILTS AND VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, SILTS WITH SLIGHT PLASTICITY
		CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		CL-ML	INORGANIC CLAYS-SILTS OF LOW PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		OL	ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS (Liquid Limit 50 or greater)	**MH**	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILT
		CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
		OH	ORGANIC CLAYS & ORGANIC SILTS OF MEDIUM-TO-HIGH PLASTICITY

NOTE: USE MATERIAL DESCRIPTION ON THE LOG TO DEFINE A GRAPHIC THAT MAY NOT BE PROVIDED ON THIS LEGEND.

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PROJECT NO.: 20224029.001A
DRAWN BY: CW
CHECKED BY: MO
DATE: 1/19/2022

GRAPHICS KEY

Winchendon School Athletic Improvements
Winchendon
Worcester County, Massachusetts

FIGURE 5

KLEINFELDER
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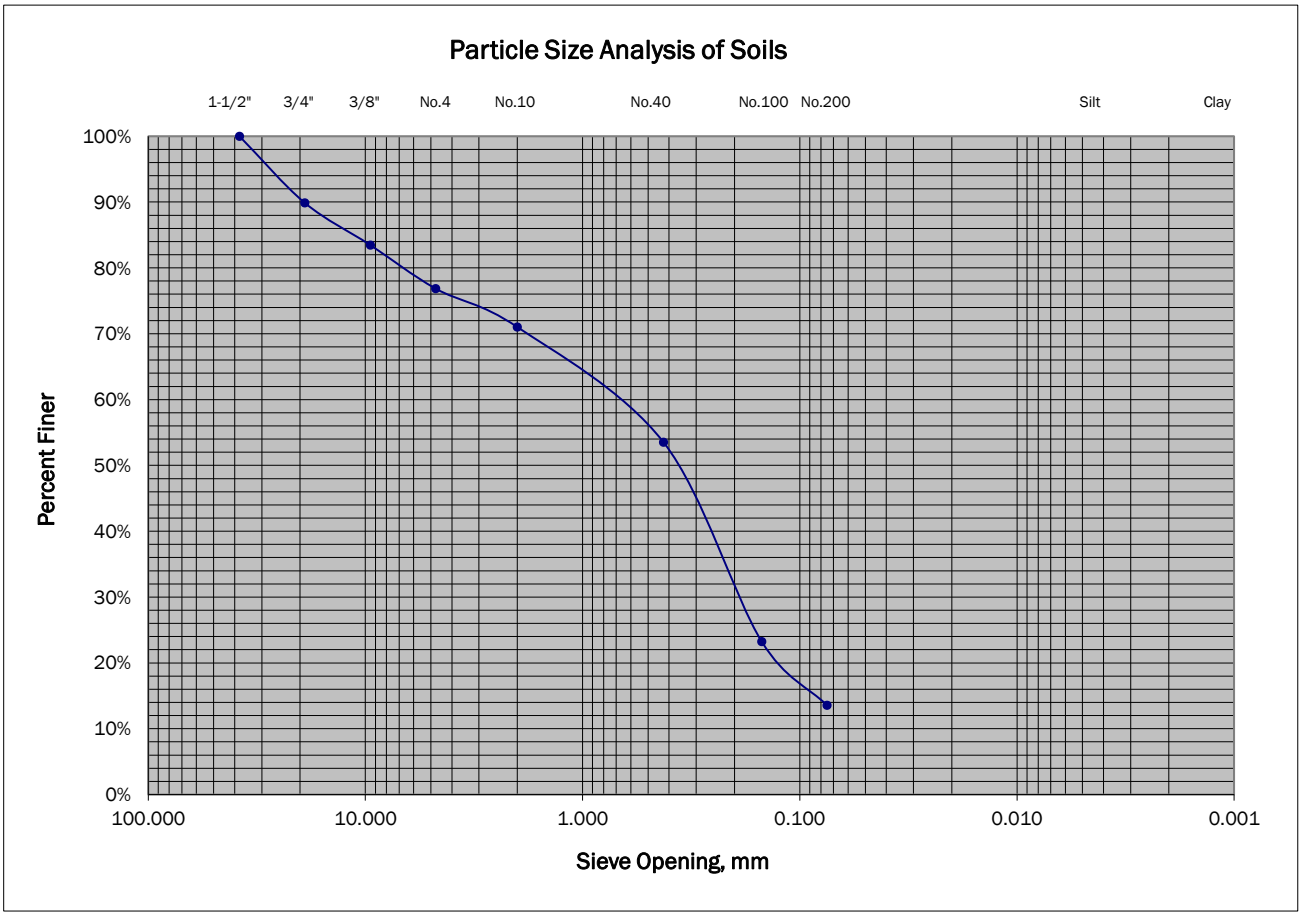
Soil Classification Report

Per ASTM Designations D 2487 and D 2488



As-Received Moisture 16.2%							
USCS Classification: Silty SAND with Gravel (SM)							
Gravel: 23.1%	**Coarse:** 10.1%			**Fine:** 13.0%			
Sand: 63.3%	**Coarse:** 5.8%	**Medium:** 17.5%		**Fine:** 40.0%			
Fines: 13.6%	**Silt:**		**Clay:**				
Gravel Description: Subangular to Subrounded							
Sand Description: Subangular to Subrounded							
Consistency: N/A		**Dry Strength:** N/A					
Dilatancy: N/A		**Toughness:** N/A					
Structure: N/A		**Cementation:** N/A					

Particle Size Distribution

	US Standard Sieve Size	Opening (mm)	%Finer
Coarse GRAVEL Fine	1-1/2"	38.0	100.0%
	3/4"	19.0	89.9%
	3/8"	9.50	83.5%
	No. 4	4.75	76.9%
Coarse SAND	No. 10	2.00	71.0%
Medium SAND	No. 40	0.425	53.5%
	No. 100	0.150	23.2%
Fine SAND	No. 200	0.075	13.6%
Hydrometer Analysis	Silt Size	0.005	
	Clay Size	0.001	

D_{60}:	D_{30}:	D_{10}:	Cu:	Cc:

Boring: B-2			**Atterberg Limits**	**LL:** NP	**PL:** NP **PI:** NP
Sample: S-2/S-3	**Depth:** 2' - 6'		**Description:**	Brown Silty SAND with Gravel	
Project: Winchendon School Athletic Improvements			**Remarks:**	Stratum I	
Client: The Winchendon School					
Kleinfelder Project Number: 20224029.001A			**Report Date:**	January 18, 2022	

KLEINFELDER
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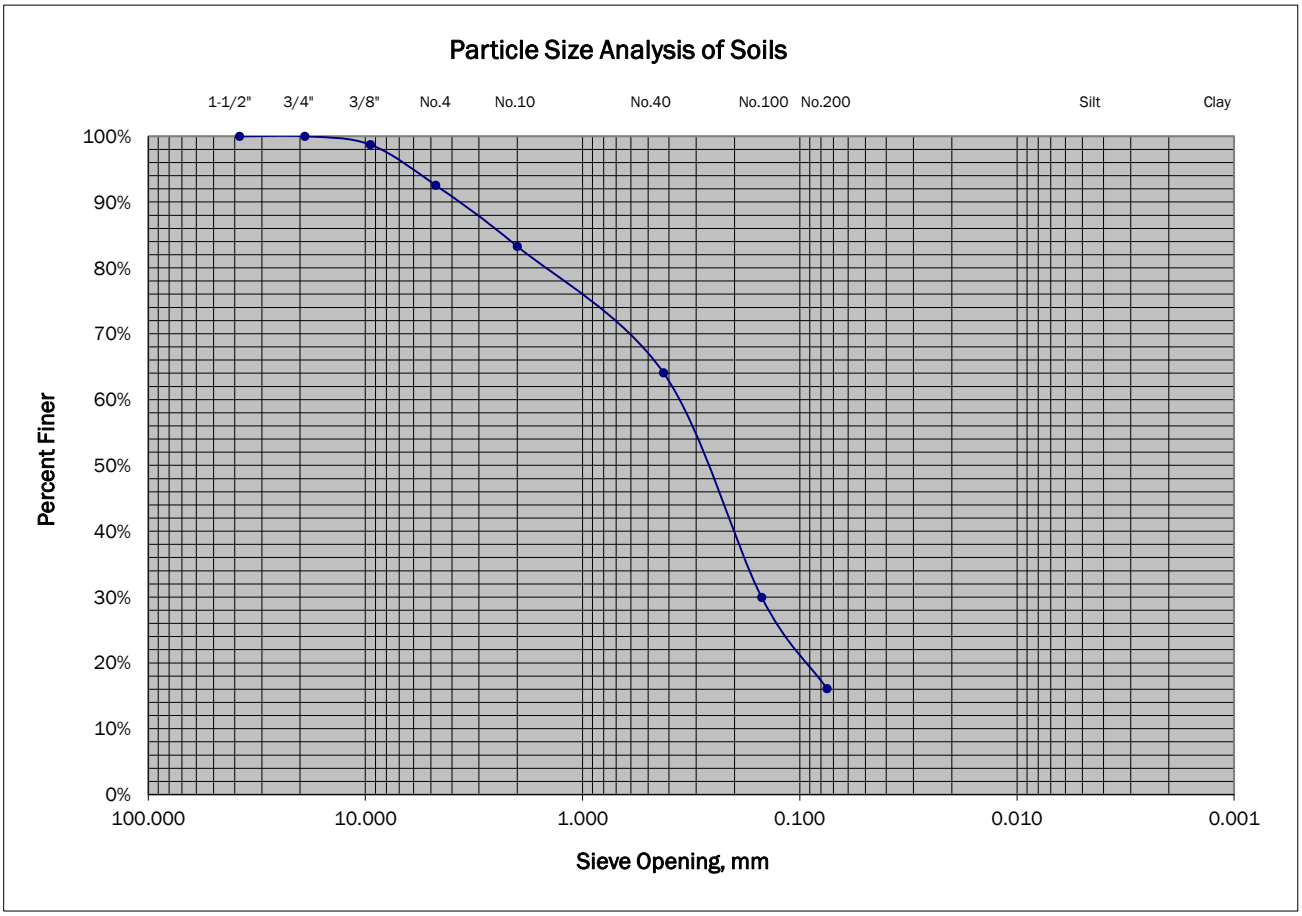
Soil Classification Report

Per ASTM Designations D 2487 and D 2488



As-Received Moisture 12.8%								
USCS Classification: Silty SAND (SM)								
Gravel: 7.4%	**Coarse:** 0.0%			**Fine:** 7.4%				
Sand: 76.5%	**Coarse:** 9.3%	**Medium:** 19.2%		**Fine:** 48.0%				
Fines: 16.1%	**Silt:**		**Clay:**					
Gravel Description: Subangular to Subrounded								
Sand Description: Subangular to Subrounded								
Consistency: N/A		**Dry Strength:** N/A						
Dilatancy: N/A		**Toughness:** N/A						
Structure: N/A		**Cementation:** N/A						
Boring: B-6								
Sample: S-2	**Depth:** 2' - 4'							
Project: Winchendon School Athletic Improvements								
Client: The Winchendon School								
Kleinfelder Project Number: 20224029.001A								

Particle Size Distribution

US Standard Sieve Size			Opening (mm)	%Finer
GRAVEL	Coarse	1-1/2"	38.0	100.0%
		3/4"	19.0	100.0%
	Fine	3/8"	9.50	98.7%
		No. 4	4.75	92.6%
SAND	Coarse	No. 10	2.00	83.3%
	Medium	No. 40	0.425	64.1%
		No. 100	0.150	30.0%
	Fine	No. 200	0.075	16.1%
Hydrometer Analysis		Silt Size	0.005	
		Clay Size	0.001	

D_{60}:	D_{30}:	D_{10}:	Cu:	Cc:

Atterberg Limits **LL:** NP **PL:** NP **PI:** NP

Description: Brown Silty SAND

Remarks: Stratum I

Report Date: January 18, 2022

BORING LOG B-1

Date Begin - End:	1/05/2022	**Drilling Company:**	Seaboard Drilling		
Logged By:	D. Torres	**Drill Crew:**	D. Feeley		
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	Diedrich D-150	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**			
Weather:	30, Rain/Sleet	**Exploration Diameter:**	6-inch in. O.D.		

FIELD EXPLORATION | LABORATORY RESULTS

Surface Condition: Grass

Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Uncorrected N-VALUE (blows/ft) ▲ Water Content Plot (%) 10 20 30 40	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Additional Tests/ Remarks
		Topsoil: 6" dark brown organic soil	S-1		BC=5 5 7 11	12	18"				
		Stratum I -0.5 **Silty SAND with Gravel (SM)**: brown and gray, moist to wet, medium dense to very dense	S-2		BC=16 10 7 12	17	12"				Infiltration Test conducted at 1' Rate = 0.0"/hr
5			S-3		BC=26 33 41 25	74	20"				
		-8.0	S-4		BC=22 17 16 24	33	20"				

The boring was terminated at approximately 8 ft. below ground surface. The boring was backfilled with auger cuttings on January 05, 2022.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.

GENERAL NOTES:
Test location depicted on the Exploration Plan (Figure 3) within the Appendix

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.: 20224029.001A
DRAWN BY: BM
CHECKED BY: MO
DATE: 1/19/2022

BORING LOG B-1

Winchendon School Athletic Improvements
Winchendon
Worcester County, Massachusetts

Date Begin - End:	1/05/2022	**Drilling Company:**	Seaboard Drilling	**BORING LOG B-2**	
Logged By:	D. Torres	**Drill Crew:**	D. Feeley		
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	Diedrich D-150	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**			
Weather:	30, Rain/Sleet	**Exploration Diameter:**	6-inch in. O.D.		

FIELD EXPLORATION | LABORATORY RESULTS

Surface Condition: Grass

Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Uncorrected N-VALUE (blows/ft) / Water Content Plot (%) (10 20 30 40)	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Additional Tests/ Remarks
		Topsoil: 6" dark brown organic soil	S-1		BC=5 5 3 4	8	14"				
		Stratum I -0.5 **Silty SAND with Gravel (SM)**: brown and gray, moist to wet, loose to very dense	S-2		BC=9 8 7 6	16.2 15	10"	SM	16.2		**Passing #200=** 14 **Atterberg Limits=** Liquid Limits: NP Plasticity Index: NP
			S-3		BC=5 5 8 45	13	12"				
5			S-4		BC=22 42 18 50/5"	60	8"				
		-8.0									

The boring was terminated at approximately 8 ft. below ground surface. The boring was backfilled with auger cuttings on January 05, 2022.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.

GENERAL NOTES:
Test location depicted on the Exploration Plan (Figure 3) within the Appendix

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.: 20224029.001A
DRAWN BY: BM
CHECKED BY: MO
DATE: 1/19/2022

BORING LOG B-2

Winchendon School Athletic Improvements
Winchendon
Worcester County, Massachusetts

Date Begin - End:	1/05/2022	**Drilling Company:**	Seaboard Drilling	**BORING LOG B-3**	
Logged By:	D. Torres	**Drill Crew:**	D Feeley		
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	Diedrich D-150	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**			
Weather:	30, Rain/Sleet	**Exploration Diameter:**	6-inch in. O.D.		

FIELD EXPLORATION | LABORATORY RESULTS

Surface Condition: Grass

Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Uncorrected N-VALUE (blows/ft) ▲ Water Content Plot (%) 10 20 30 40	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Additional Tests/ Remarks
		Topsoil: 6" dark brown organic soil	S-1		BC=2 2 6 8	8	20"				
		Stratum I -0.5 **Silty SAND with Gravel (SM)**: brown and gray, moist, loose to very dense	S-2		BC=7 15 50/4"	50/4"	12"				Infiltration Test conducted at 1.5' Rate = 0.0"/hr
		-3.5									

The boring was terminated because of practical auger refusal (▲) at approximately 3.5 ft. below ground surface on bedrock. The boring was backfilled with auger cuttings on January 05, 2022.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.

GENERAL NOTES:
Test location depicted on the Exploration Plan (Figure 3) within the Appendix

5

KLEINFELDER
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PROJECT NO.:	20224029.001A
DRAWN BY:	BM
CHECKED BY:	MO
DATE:	1/19/2022

BORING LOG B-3

Winchendon School Athletic Improvements
Winchendon
Worcester County, Massachusetts

BORING LOG B-4

Date Begin - End:	1/05/2022	**Drilling Company:**	Seaboard Drilling		
Logged By:	D. Torres	**Drill Crew:**	D. Feeley		
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	Diedrich D-150	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**			
Weather:	30, Rain/Sleet	**Exploration Diameter:**	6-inch in. O.D.		

FIELD EXPLORATION | LABORATORY RESULTS

Surface Condition: Grass

Depth (feet)	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)
0	**Topsoil**: 6" dark brown organic soil	S-1		BC=3 5 17 13	12"
-0.5	**Stratum I** **Silty SAND with Gravel (SM)**: brown and gray, moist, medium dense to very dense	S-2		BC=10 10 10 30	6"
		S-3		BC=10 7 4 6	NR
5		S-4		BC=10 17 50/4"	10"
-7.5	The boring was terminated because of practical auger refusal ( ) at approximately 7.5 ft. below ground surface on bedrock. The boring was backfilled with auger cuttings on January 05, 2022.				

● Uncorrected N-VALUE (blows/ft)
▲ Water Content Plot (%)
10 20 30 40

22
20
11
50/4"

USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Additional Tests/ Remarks

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.

GENERAL NOTES:
Test location depicted on the Exploration Plan (Figure 3) within the Appendix

KLEINFELDER
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PROJECT NO.: 20224029.001A
DRAWN BY: BM
CHECKED BY: MO
DATE: 1/19/2022

BORING LOG B-4

Winchendon School Athletic Improvements
Winchendon
Worcester County, Massachusetts

Date Begin - End: 1/05/2022 **Drilling Company:** Seaboard Drilling **BORING LOG B-5**

Logged By: D. Torres **Drill Crew:** D. Feeley

Hor.-Vert. Datum: Not Available **Drilling Equipment:** Diedrich D-150 **Hammer Type - Drop:** 140 lb. Auto - 30 in.

Plunge: -90 degrees **Drilling Method:**

Weather: 30, Rain/Sleet **Exploration Diameter:** 6-inch in. O.D.

Depth (feet)	Graphical Log	Surface Condition: Grass / Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Uncorrected N-VALUE (blows/ft) ▲ Water Content Plot (%) 10 20 30 40	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Additional Tests/ Remarks
		Topsoil: 10" dark brown organic soil	S-1		BC=1 2 2 2	4	16"				
		Stratum I -0.8 **Silty SAND (SM)**: gray to brown, moist, very loose to dense	S-2		BC=11 17 15 50/4"	32	18"				Infiltration Test conducted at 1.5' Rate = 0.0"/hr
5		-4.0									

The boring was terminated because of practical auger refusal ( ) at approximately 4 ft. below ground surface on bedrock. The boring was backfilled with auger cuttings on January 05, 2022.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.

GENERAL NOTES:
Test location depicted on the Exploration Plan (Figure 3) within the Appendix

KLEINFELDER
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PROJECT NO.: 20224029.001A

DRAWN BY: BM

CHECKED BY: MO

DATE: 1/19/2022

BORING LOG B-5

Winchendon School Athletic Improvements
Winchendon
Worcester County, Massachusetts

Date Begin - End:	1/05/2022	**Drilling Company:**	Seaboard Drilling	**BORING LOG B-6**	
Logged By:	D. Torres	**Drill Crew:**	D. Feeley		
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	Diedrich D-150	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**			
Weather:	30, Rain/Sleet	**Exploration Diameter:**	6-inch in. O.D.		

Depth (feet)	Graphical Log	Surface Condition: Grass Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	● Uncorrected N-VALUE (blows/ft) ▲ Water Content Plot (%) 10 20 30 40	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Additional Tests/ Remarks
		Topsoil: 6" dark brown organic soil	S-1		BC=2 4 16 10	20	10"				
		Stratum I -0.5 **Silty SAND (SM)**: gray to brown, moist, medium dense to very dense	S-2		BC=24 37 40 50/5"	12.8 77	12"	SM	12.8		**Passing #200=** 16 **Atterberg Limits=** Liquid Limits: NP Plasticity Index: NP
		-4.0									
5											

The boring was terminated because of practical auger refusal ( ) at approximately 4 ft. below ground surface on bedrock. The boring was backfilled with auger cuttings on January 05, 2022.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.

GENERAL NOTES:
Test location depicted on the Exploration Plan (Figure 3) within the Appendix

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.:	20224029.001A
DRAWN BY:	BM
CHECKED BY:	MO
DATE:	1/19/2022

BORING LOG B-6

Winchendon School Athletic Improvements
Winchendon
Worcester County, Massachusetts

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Worcester County, Massachusetts, Northwestern Part

March 1, 2022

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

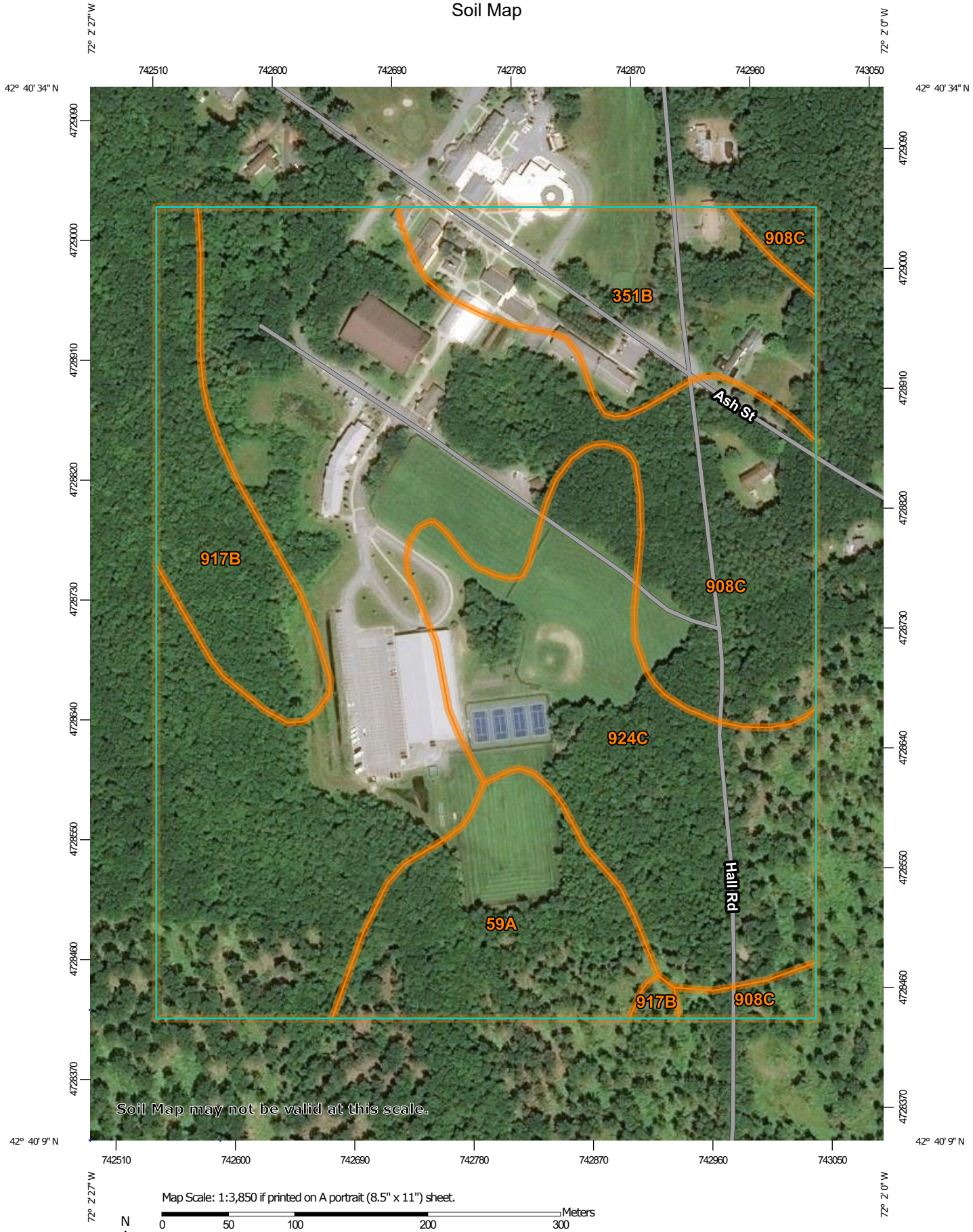
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:3,850 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N 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 1:25,000.

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

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

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

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

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

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

Soil Survey Area: Worcester County, Massachusetts, Northwestern Part
Survey Area Data: Version 15, Sep 3, 2021

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

Date(s) aerial images were photographed: May 18, 2019—Jul 9, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND

MAP INFORMATION

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
59A	Bucksport and Wonsqueak mucks, 0 to 2 percent slopes	7.3	9.7%
351B	Becket fine sandy loam, 3 to 8 percent slopes	8.3	11.1%
908C	Becket-Skerry association, 0 to 15 percent slopes, extremely stony	38.7	51.5%
917B	Pillsbury-Peacham association, 0 to 8 percent slopes, extremely stony	5.7	7.6%
924C	Tunbridge-Lyman-Berkshire association, 3 to 15 percent slopes, extremely stony	15.1	20.1%
Totals for Area of Interest		**75.2**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not

mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Worcester County, Massachusetts, Northwestern Part

59A—Bucksport and Wonsqueak mucks, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2ty70
Elevation: 0 to 1,770 feet
Mean annual precipitation: 31 to 95 inches
Mean annual air temperature: 27 to 52 degrees F
Frost-free period: 90 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Bucksport and similar soils: 48 percent
Wonsqueak and similar soils: 41 percent
Minor components: 11 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bucksport

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Mountainbase, interfluve, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Herbaceous organic material and/or woody organic material

Typical profile

Oa1 - 0 to 12 inches: muck
Oa2 - 12 to 25 inches: muck
Oa3 - 25 to 45 inches: muck
Oa4 - 45 to 65 inches: muck

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Available water supply, 0 to 60 inches: Very high (about 21.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Ecological site: F143XY302ME - Mucky Swamp
Hydric soil rating: Yes

Description of Wonsqueak

Setting

Landform: Mountains, hills

Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Mountainbase, interfluve, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Herbaceous organic material over loamy till

Typical profile

Oa1 - 0 to 8 inches: muck
Oa2 - 8 to 32 inches: muck
2Cg - 32 to 65 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Very high (about 18.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Ecological site: F143XY302ME - Mucky Swamp
Hydric soil rating: Yes

Minor Components

Peacham, very stony

Percent of map unit: 6 percent
Landform: Mountains, hills
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Mountainbase, interfluve, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Brayton, very stony

Percent of map unit: 2 percent
Landform: Mountains, hills
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Mountainbase, interfluve, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Telos, very stony

Percent of map unit: 2 percent
Landform: Mountains, hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Mountainbase, interfluve, base slope
Down-slope shape: Linear
Across-slope shape: Concave

Hydric soil rating: No

Croghan

Percent of map unit: 1 percent
Landform: Outwash plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

351B—Becket fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2w9pk
Elevation: 230 to 1,380 feet
Mean annual precipitation: 31 to 65 inches
Mean annual air temperature: 36 to 52 degrees F
Frost-free period: 90 to 160 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Becket and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Becket

Setting

Landform: Hills, mountains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Mountainbase, interfluve, nose slope, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy lodgment till derived from granite and gneiss and/or schist over sandy lodgment till derived from granite and gneiss and/or schist

Typical profile

Ap - 0 to 7 inches: fine sandy loam
Bs1 - 7 to 14 inches: fine sandy loam
Bs2 - 14 to 24 inches: gravelly sandy loam
BC - 24 to 33 inches: gravelly sandy loam
Cd - 33 to 65 inches: gravelly loamy sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 39 inches to densic material
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.01 to 1.42 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: F144BY501ME - Loamy Slope (Northern Hardwoods)
Hydric soil rating: No

Minor Components

Skerry

Percent of map unit: 6 percent
Landform: Mountains, hills
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Mountainbase, interfluve, nose slope, side slope
Microfeatures of landform position: Closed depressions, closed depressions
Down-slope shape: Convex, concave
Across-slope shape: Linear, concave
Hydric soil rating: No

Pillsbury

Percent of map unit: 4 percent
Landform: Mountains, hills
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Mountainbase, interfluve, nose slope, side slope
Microfeatures of landform position: Closed depressions, closed depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Tunbridge

Percent of map unit: 3 percent
Landform: Hills, mountains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Mountainbase, interfluve, nose slope, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Monadnock

Percent of map unit: 2 percent
Landform: Hills, mountains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Mountainbase, interfluve, nose slope, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

908C—Becket-Skerry association, 0 to 15 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2x9ny
Elevation: 820 to 1,280 feet
Mean annual precipitation: 36 to 65 inches
Mean annual air temperature: 36 to 52 degrees F
Frost-free period: 90 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Becket, extremely stony, and similar soils: 45 percent
Skerry, extremely stony, and similar soils: 35 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Becket, Extremely Stony

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Mountainbase, mountainflank, interfluve, nose slope, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy lodgment till derived from granite and gneiss and/or schist over sandy lodgment till derived from granite and gneiss and/or schist

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
E - 2 to 4 inches: fine sandy loam
Bhs - 4 to 5 inches: fine sandy loam
Bs1 - 5 to 7 inches: fine sandy loam
Bs2 - 7 to 14 inches: fine sandy loam
Bs3 - 14 to 24 inches: gravelly sandy loam
BC - 24 to 33 inches: gravelly sandy loam
Cd - 33 to 65 inches: gravelly loamy sand

Properties and qualities

Slope: 0 to 15 percent
Surface area covered with cobbles, stones or boulders: 6.0 percent
Depth to restrictive feature: 21 to 43 inches to densic material
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.01 to 1.42 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Hydric soil rating: No

Description of Skerry, Extremely Stony

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Mountainbase, mountainflank, interfluve, nose slope, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loamy lodgment till derived from granite and gneiss and/or schist over sandy lodgment till derived from granite and gneiss and/or schist

Typical profile

Oa - 0 to 2 inches: highly decomposed plant material
E - 2 to 4 inches: fine sandy loam
Bhs - 4 to 6 inches: fine sandy loam
Bs1 - 6 to 20 inches: gravelly fine sandy loam
Bs2 - 20 to 25 inches: gravelly fine sandy loam
Cd1 - 25 to 34 inches: gravelly loamy sand
Cd2 - 34 to 65 inches: gravelly loamy sand

Properties and qualities

Slope: 0 to 15 percent
Surface area covered with cobbles, stones or boulders: 6.0 percent
Depth to restrictive feature: 21 to 43 inches to densic material
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.01 to 1.42 in/hr)
Depth to water table: About 19 to 34 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Pillsbury, extremely stony

Percent of map unit: 6 percent
Landform: Mountains, hills
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Mountainbase, mountainflank, interfluve, nose slope, side slope

Microfeatures of landform position: Closed depressions, open depressions, open depressions, closed depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Monadnock, extremely stony

Percent of map unit: 5 percent
Landform: Hills, mountains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Mountainbase, mountainflank, interfluve, nose slope, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Berkshire, extremely stony

Percent of map unit: 5 percent
Landform: Mountains, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Mountainbase, mountainflank, interfluve, nose slope, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Tunbridge, extremely stony

Percent of map unit: 4 percent
Landform: Mountains, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Mountainbase, mountainflank, interfluve, nose slope, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

917B—Pillsbury-Peacham association, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 9c0q
Elevation: 0 to 2,100 feet
Mean annual precipitation: 39 to 55 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 120 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Pillsbury and similar soils: 45 percent

Peacham and similar soils: 35 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pillsbury

Setting

Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Friable coarse-loamy eolian deposits over dense coarse-loamy lodgment till derived from granite and gneiss

Typical profile

A - 0 to 4 inches: gravelly fine sandy loam
Bg - 4 to 14 inches: gravelly fine sandy loam
Bw - 14 to 24 inches: gravelly fine sandy loam
Cd - 24 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 15 to 35 inches to densic material
Drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 0 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C/D
Ecological site: F144BY301ME - Loamy Till Swamp
Hydric soil rating: Yes

Description of Peacham

Setting

Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Highly-decomposed herbaceous organic material over dense coarse-loamy lodgment till derived from granite and gneiss

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
Oa - 2 to 11 inches: highly decomposed plant material
Bg - 11 to 14 inches: fine sandy loam
Cd - 14 to 18 inches: fine sandy loam

Cd - 18 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 0 to 3 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 6 to 18 inches to densic material
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Available water supply, 0 to 60 inches: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: F144BY301ME - Loamy Till Swamp
Hydric soil rating: Yes

Minor Components

Peru

Percent of map unit: 10 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Wonsqueak

Percent of map unit: 6 percent
Landform: Bogs
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Chocorua

Percent of map unit: 4 percent
Landform: Bogs
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

924C—Tunbridge-Lyman-Berkshire association, 3 to 15 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2w9q4
Elevation: 850 to 1,310 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 36 to 55 degrees F
Frost-free period: 90 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Tunbridge, extremely stony, and similar soils: 26 percent
Lyman, extremely stony, and similar soils: 25 percent
Berkshire, extremely stony, and similar soils: 24 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tunbridge, Extremely Stony

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Mountainbase, mountaintop, mountainflank, side slope, crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy supraglacial till derived from granite and gneiss and/or mica schist and/or phyllite

Typical profile

Oe - 0 to 3 inches: moderately decomposed plant material
Oa - 3 to 5 inches: highly decomposed plant material
E - 5 to 8 inches: fine sandy loam
Bhs - 8 to 11 inches: fine sandy loam
Bs - 11 to 26 inches: fine sandy loam
BC - 26 to 28 inches: fine sandy loam
R - 28 to 38 inches: bedrock

Properties and qualities

Slope: 3 to 15 percent
Surface area covered with cobbles, stones or boulders: 7.0 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None

Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Hydric soil rating: No

Description of Lyman, Extremely Stony

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Mountainbase, mountaintop, mountainflank, side slope, crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy supraglacial till derived from granite and gneiss and/or mica schist and/or phyllite

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 3 inches: loam
E - 3 to 5 inches: fine sandy loam
Bhs - 5 to 7 inches: loam
Bs1 - 7 to 11 inches: loam
Bs2 - 11 to 18 inches: channery loam
R - 18 to 28 inches: bedrock

Properties and qualities

Slope: 3 to 15 percent
Surface area covered with cobbles, stones or boulders: 7.0 percent
Depth to restrictive feature: 11 to 24 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Hydric soil rating: No

Description of Berkshire, Extremely Stony

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Mountainbase, mountaintop, mountainflank, side slope, crest
Down-slope shape: Convex
Across-slope shape: Convex

Parent material: Loamy supraglacial meltout till derived from granite and gneiss and/or mica schist and/or phyllite

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 4 inches: fine sandy loam
E - 4 to 5 inches: fine sandy loam
Bs1 - 5 to 7 inches: fine sandy loam
Bs2 - 7 to 13 inches: fine sandy loam
Bs3 - 13 to 21 inches: fine sandy loam
BC1 - 21 to 28 inches: fine sandy loam
BC2 - 28 to 33 inches: fine sandy loam
C - 33 to 65 inches: fine sandy loam

Properties and qualities

Slope: 3 to 15 percent
Surface area covered with cobbles, stones or boulders: 7.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 10.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Becket, extremely stony

Percent of map unit: 10 percent
Landform: Mountains, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Mountainbase, mountaintop, mountainflank, side slope, crest
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Skerry, extremely stony

Percent of map unit: 10 percent
Landform: Mountains, hills
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Mountainbase, mountaintop, mountainflank, side slope, base slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Pillsbury, extremely stony

Percent of map unit: 3 percent

Landform: Hills, mountains
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Mountainbase, mountaintop, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Peacham, extremely stony

Percent of map unit: 2 percent
Landform: Hills, mountains
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Mountainbase, mountaintop, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

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NOAA Atlas 14, Volume 10, Version 3
Location name: Winchendon, Massachusetts, USA*
Latitude: 42.6745°, Longitude: -72.0376°
Elevation: 1062.91 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.308** (0.250-0.381)	**0.367** (0.298-0.454)	**0.463** (0.375-0.575)	**0.542** (0.435-0.677)	**0.651** (0.502-0.853)	**0.734** (0.552-0.983)	**0.820** (0.593-1.14)	**0.914** (0.623-1.31)	**1.05** (0.681-1.56)	**1.15** (0.728-1.76)
10-min	**0.436** (0.355-0.539)	**0.519** (0.422-0.643)	**0.655** (0.530-0.814)	**0.768** (0.616-0.960)	**0.923** (0.711-1.21)	**1.04** (0.782-1.39)	**1.16** (0.841-1.62)	**1.30** (0.883-1.86)	**1.48** (0.965-2.21)	**1.63** (1.03-2.49)
15-min	**0.513** (0.417-0.634)	**0.611** (0.496-0.756)	**0.771** (0.623-0.957)	**0.904** (0.725-1.13)	**1.09** (0.837-1.42)	**1.22** (0.921-1.64)	**1.37** (0.989-1.90)	**1.52** (1.04-2.19)	**1.74** (1.14-2.60)	**1.92** (1.21-2.93)
30-min	**0.711** (0.578-0.879)	**0.843** (0.685-1.04)	**1.06** (0.856-1.32)	**1.24** (0.994-1.55)	**1.48** (1.14-1.94)	**1.67** (1.26-2.24)	**1.86** (1.35-2.60)	**2.08** (1.42-2.98)	**2.38** (1.55-3.55)	**2.62** (1.66-4.00)
60-min	**0.909** (0.739-1.12)	**1.08** (0.873-1.33)	**1.35** (1.09-1.67)	**1.57** (1.26-1.96)	**1.88** (1.45-2.47)	**2.12** (1.59-2.84)	**2.36** (1.71-3.29)	**2.63** (1.79-3.77)	**3.01** (1.96-4.50)	**3.33** (2.10-5.07)
2-hr	**1.13** (0.927-1.39)	**1.36** (1.11-1.67)	**1.72** (1.40-2.13)	**2.03** (1.64-2.52)	**2.44** (1.90-3.19)	**2.76** (2.09-3.69)	**3.09** (2.26-4.31)	**3.48** (2.38-4.96)	**4.05** (2.64-6.00)	**4.53** (2.87-6.86)
3-hr	**1.29** (1.06-1.57)	**1.55** (1.27-1.90)	**1.98** (1.62-2.43)	**2.34** (1.89-2.89)	**2.83** (2.21-3.68)	**3.19** (2.43-4.26)	**3.58** (2.64-5.01)	**4.05** (2.78-5.76)	**4.75** (3.11-7.02)	**5.35** (3.40-8.08)
6-hr	**1.60** (1.32-1.94)	**1.93** (1.60-2.35)	**2.49** (2.04-3.03)	**2.94** (2.40-3.62)	**3.57** (2.81-4.63)	**4.04** (3.10-5.37)	**4.54** (3.37-6.33)	**5.16** (3.55-7.29)	**6.10** (4.00-8.96)	**6.91** (4.41-10.4)
12-hr	**1.98** (1.65-2.39)	**2.40** (1.99-2.90)	**3.08** (2.55-3.73)	**3.65** (2.99-4.45)	**4.43** (3.50-5.70)	**5.00** (3.86-6.62)	**5.63** (4.20-7.80)	**6.40** (4.42-8.98)	**7.58** (4.99-11.1)	**8.60** (5.50-12.8)
24-hr	**2.37** (1.98-2.84)	**2.87** (2.40-3.45)	**3.69** (3.08-4.45)	**4.38** (3.62-5.31)	**5.32** (4.22-6.80)	**6.01** (4.66-7.89)	**6.76** (5.07-9.30)	**7.69** (5.33-10.7)	**9.10** (6.01-13.2)	**10.3** (6.62-15.3)
2-day	**2.73** (2.30-3.25)	**3.32** (2.80-3.96)	**4.29** (3.60-5.14)	**5.10** (4.24-6.14)	**6.21** (4.96-7.88)	**7.03** (5.48-9.16)	**7.91** (5.96-10.8)	**8.99** (6.26-12.5)	**10.6** (7.05-15.3)	**12.0** (7.75-17.7)
3-day	**2.98** (2.53-3.54)	**3.63** (3.07-4.31)	**4.69** (3.95-5.59)	**5.57** (4.65-6.68)	**6.78** (5.44-8.58)	**7.68** (6.00-9.97)	**8.65** (6.52-11.7)	**9.82** (6.85-13.5)	**11.6** (7.70-16.6)	**13.1** (8.46-19.2)
4-day	**3.21** (2.73-3.80)	**3.90** (3.30-4.62)	**5.02** (4.24-5.97)	**5.95** (4.98-7.12)	**7.23** (5.81-9.12)	**8.18** (6.41-10.6)	**9.21** (6.95-12.5)	**10.4** (7.30-14.4)	**12.3** (8.19-17.6)	**13.9** (8.98-20.3)
7-day	**3.87** (3.30-4.55)	**4.62** (3.93-5.43)	**5.84** (4.95-6.90)	**6.86** (5.77-8.15)	**8.26** (6.66-10.3)	**9.30** (7.30-11.9)	**10.4** (7.88-14.0)	**11.7** (8.23-16.0)	**13.7** (9.15-19.5)	**15.4** (9.96-22.3)
10-day	**4.52** (3.87-5.29)	**5.29** (4.53-6.21)	**6.56** (5.59-7.73)	**7.62** (6.43-9.03)	**9.07** (7.34-11.3)	**10.2** (7.99-12.9)	**11.3** (8.55-15.0)	**12.6** (8.90-17.2)	**14.6** (9.76-20.6)	**16.2** (10.5-23.5)
20-day	**6.52** (5.62-7.59)	**7.33** (6.31-8.54)	**8.65** (7.41-10.1)	**9.74** (8.28-11.5)	**11.3** (9.14-13.8)	**12.4** (9.78-15.6)	**13.6** (10.2-17.7)	**14.8** (10.5-20.0)	**16.5** (11.1-23.1)	**17.7** (11.5-25.5)
30-day	**8.19** (7.08-9.48)	**9.02** (7.79-10.5)	**10.4** (8.92-12.1)	**11.5** (9.82-13.5)	**13.1** (10.6-15.9)	**14.3** (11.3-17.7)	**15.5** (11.6-19.9)	**16.6** (11.8-22.3)	**18.0** (12.2-25.2)	**19.1** (12.4-27.3)
45-day	**10.2** (8.90-11.8)	**11.1** (9.65-12.8)	**12.6** (10.8-14.6)	**13.8** (11.8-16.1)	**15.4** (12.6-18.6)	**16.7** (13.2-20.6)	**17.9** (13.5-22.8)	**19.0** (13.6-25.4)	**20.3** (13.8-28.2)	**21.2** (13.8-30.2)
60-day	**11.9** (10.4-13.7)	**12.9** (11.2-14.8)	**14.4** (12.5-16.7)	**15.7** (13.5-18.2)	**17.4** (14.3-21.0)	**18.8** (14.9-23.1)	**20.1** (15.1-25.5)	**21.2** (15.2-28.2)	**22.5** (15.3-31.2)	**23.3** (15.4-33.1)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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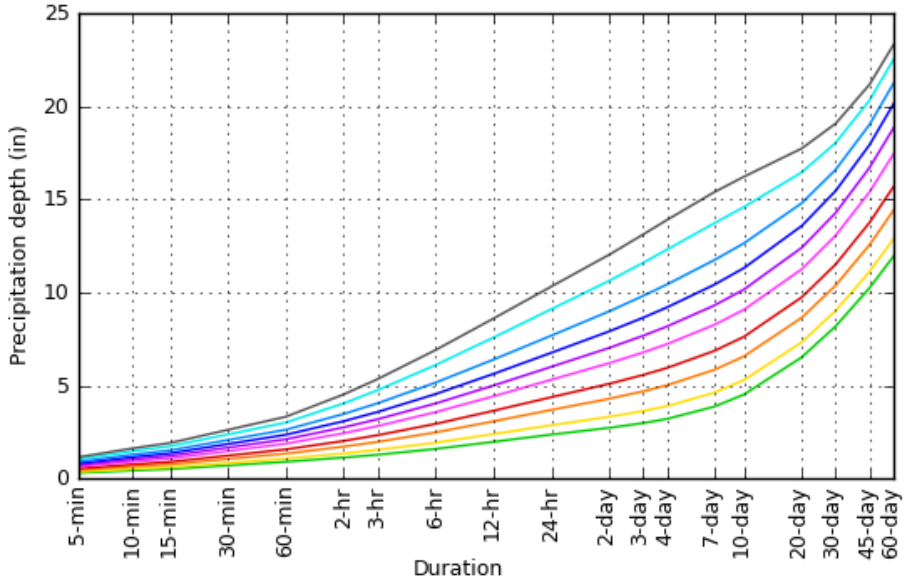
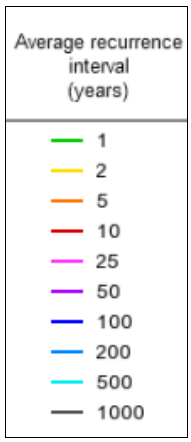
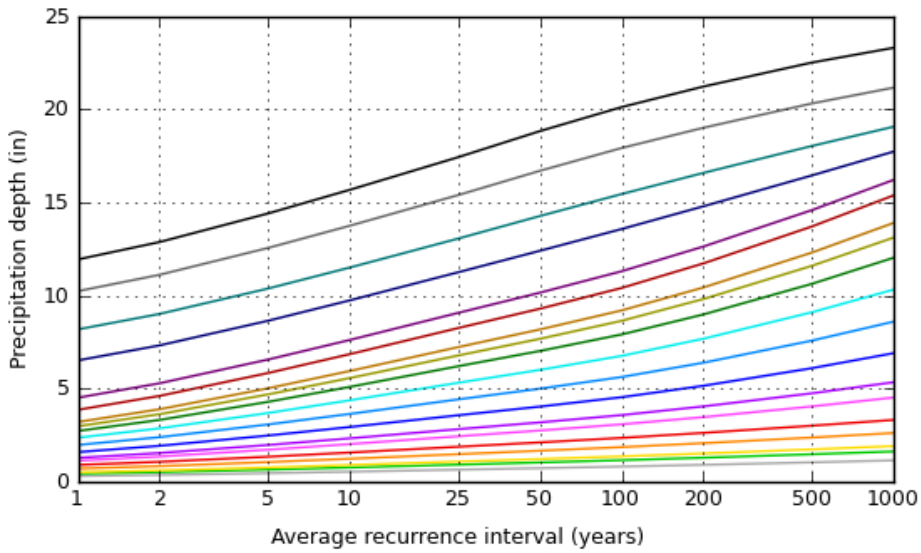
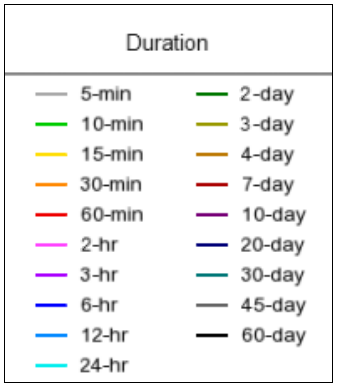
PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 42.6745°, Longitude: -72.0376°









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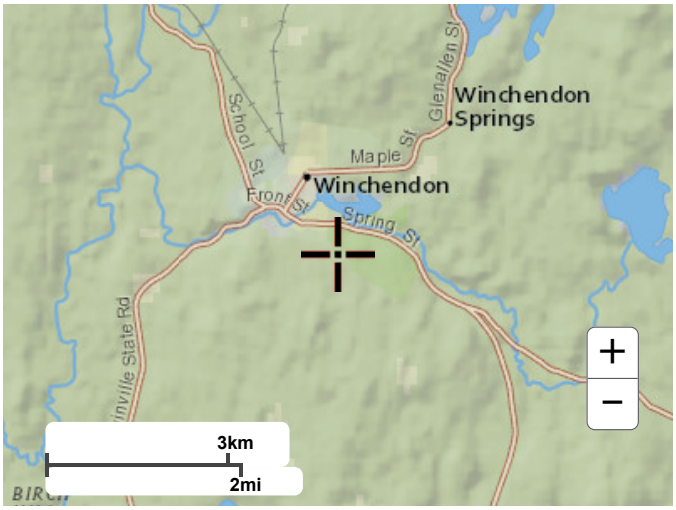
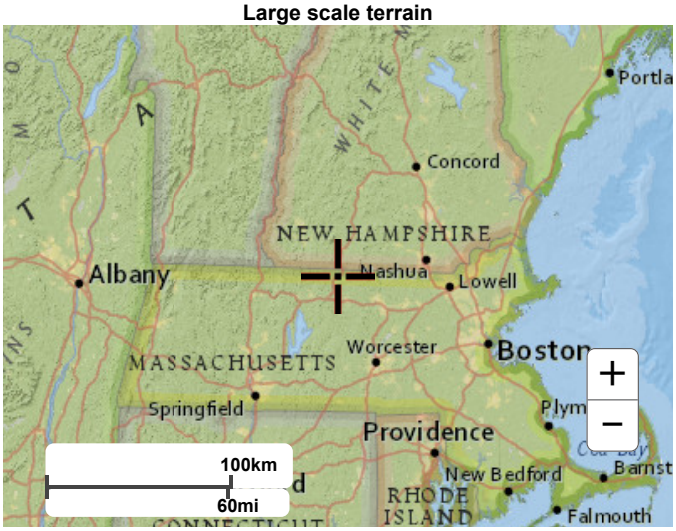
Maps & aerials

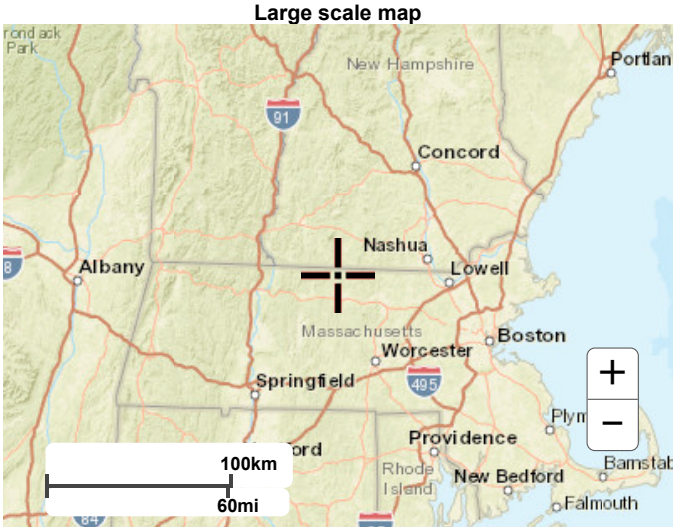
Small scale terrain



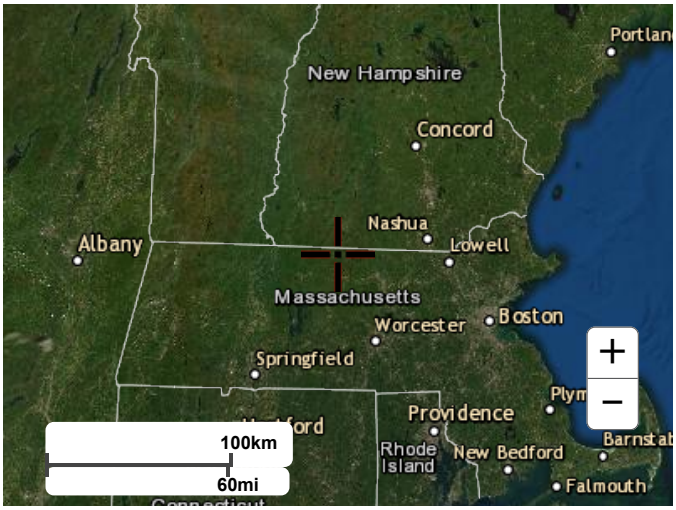
Large scale terrain



Large scale map



Large scale aerial



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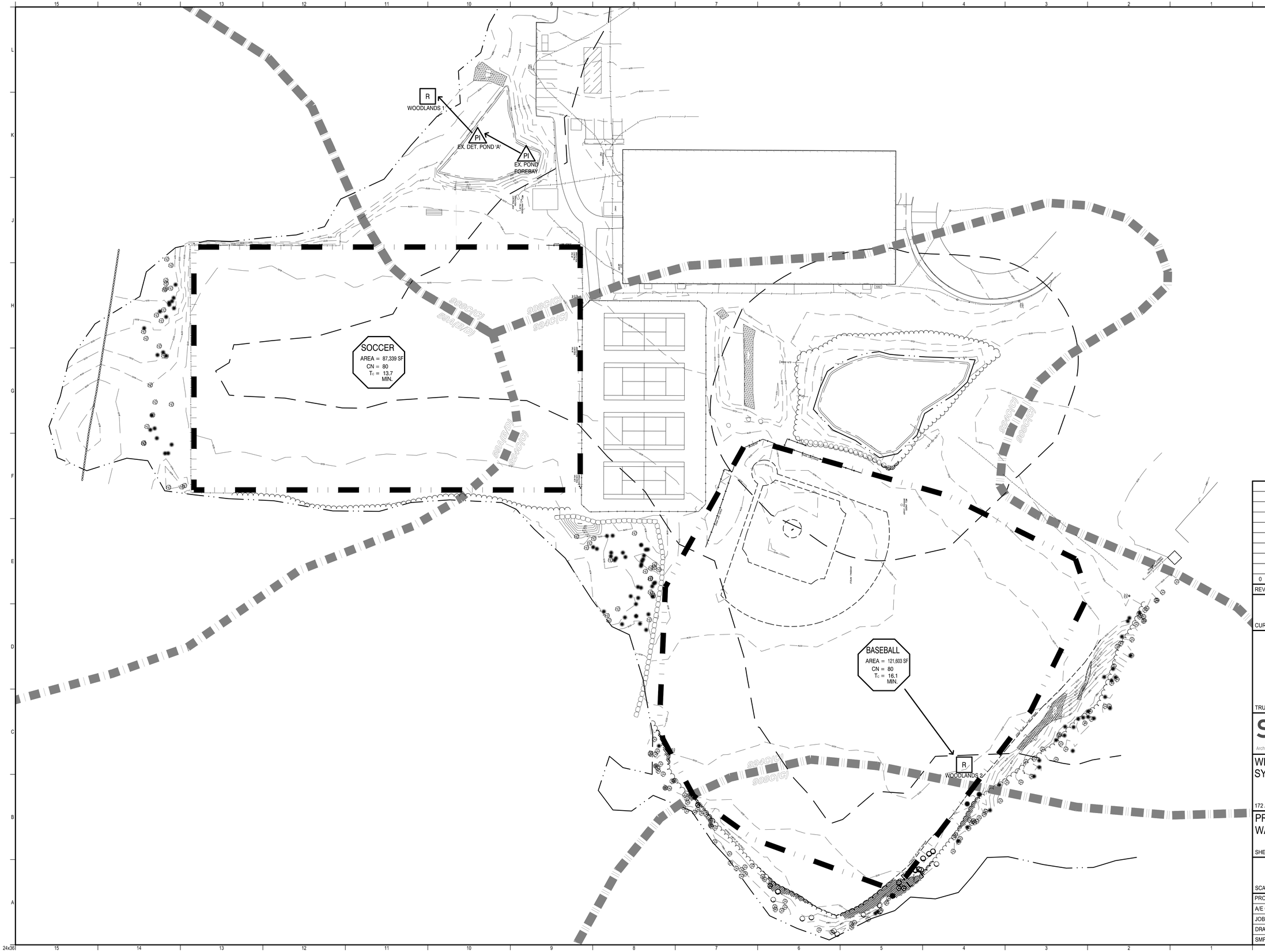
Disclaimer

Pre-Development Conditions Analysis — Appendix B

CONTENTS:



REV	DESCRIPTION	DATE
0	ISSUED FOR PERMITTING	4-5-22

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4-5-22
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PRE-DEVELOPMENT
WATERSHED PLAN

SHEET TITLE:

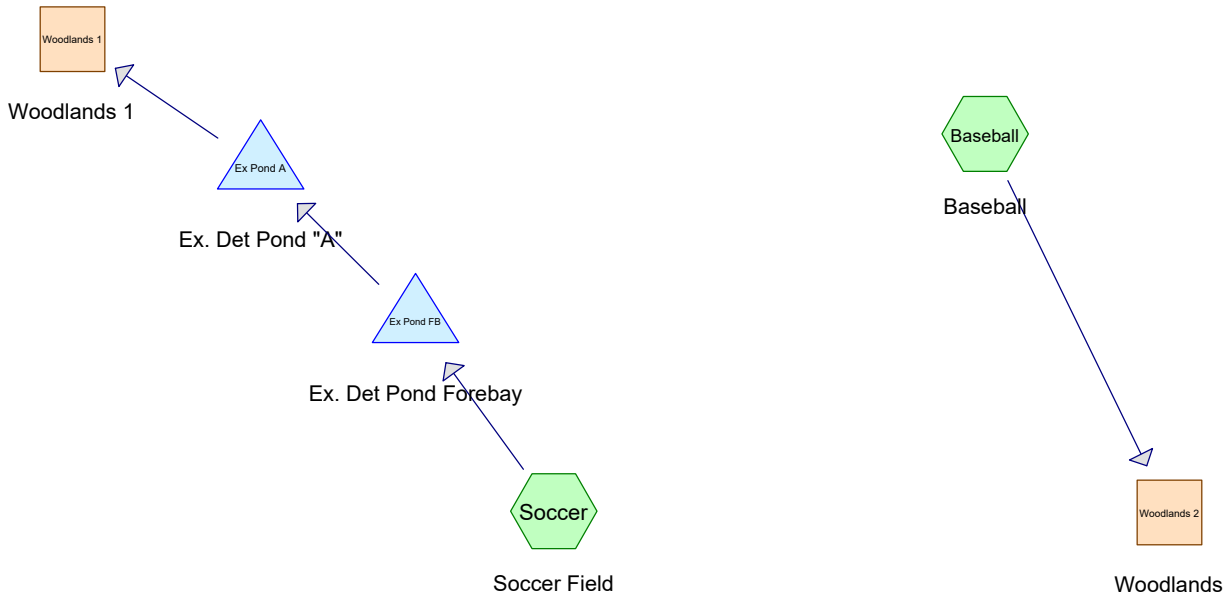
0 20' 40' 80' 120'

SCALE: 1" = 40'

PROJECT MANAGER:	KDC	PROJECT NO:	21193
A/E OF RECORD:	MAF		
JOB CAPTAIN:	WSM		C-120
DRAWN BY:	WSM		
SMRT FILE:	C-120-21193	SHEET No.	

NOT FOR CONSTRUCTION

24x36



Subcat Reach Pond Link

Routing Diagram for 21193 Ex Cond 1
Prepared by SMRT, Printed 4/6/2022

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2 year event	Type III 24-hr		Default	24.00	1	2.87	2
2	10 year event	Type III 24-hr		Default	24.00	1	4.38	2
3	25 year event	Type III 24-hr		Default	24.00	1	5.32	2
4	100 year event	Type III 24-hr		Default	24.00	1	6.76	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
4.797	80	>75% Grass cover, Good, HSG D (Baseball, Soccer)
4.797	**80**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
4.797	HSG D	Baseball, Soccer
0.000	Other	
4.797		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	4.797	0.000	4.797	>75% Grass cover, Good	Baseball , Soccer
0.000	**0.000**	**0.000**	**4.797**	**0.000**	**4.797**	**TOTAL AREA**	

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

Subcatchment Baseball: Baseball Runoff Area=121,603 sf 0.00% Impervious Runoff Depth>1.06"
Flow Length=200' Slope=0.0100 '/' Tc=16.1 min CN=80 Runoff=2.69 cfs 0.246 af

Subcatchment Soccer: Soccer Field Runoff Area=87,339 sf 0.00% Impervious Runoff Depth>1.06"
Flow Length=100' Slope=0.0100 '/' Tc=13.7 min CN=80 Runoff=2.06 cfs 0.177 af

Reach Woodlands 1: Woodlands 1 Inflow=0.22 cfs 0.056 af
Outflow=0.22 cfs 0.056 af

Reach Woodlands 2: Woodlands Inflow=2.69 cfs 0.246 af
Outflow=2.69 cfs 0.246 af

Pond Ex Pond A: Ex. Det Pond "A" Peak Elev=1,070.02' Storage=2,058 cf Inflow=0.90 cfs 0.103 af
Outflow=0.22 cfs 0.056 af

Pond Ex Pond FB: Ex. Det Pond Forebay Peak Elev=1,069.54' Storage=3,418 cf Inflow=2.06 cfs 0.177 af
Outflow=0.90 cfs 0.103 af

Total Runoff Area = 4.797 ac Runoff Volume = 0.423 af Average Runoff Depth = 1.06"
100.00% Pervious = 4.797 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment Baseball: Baseball

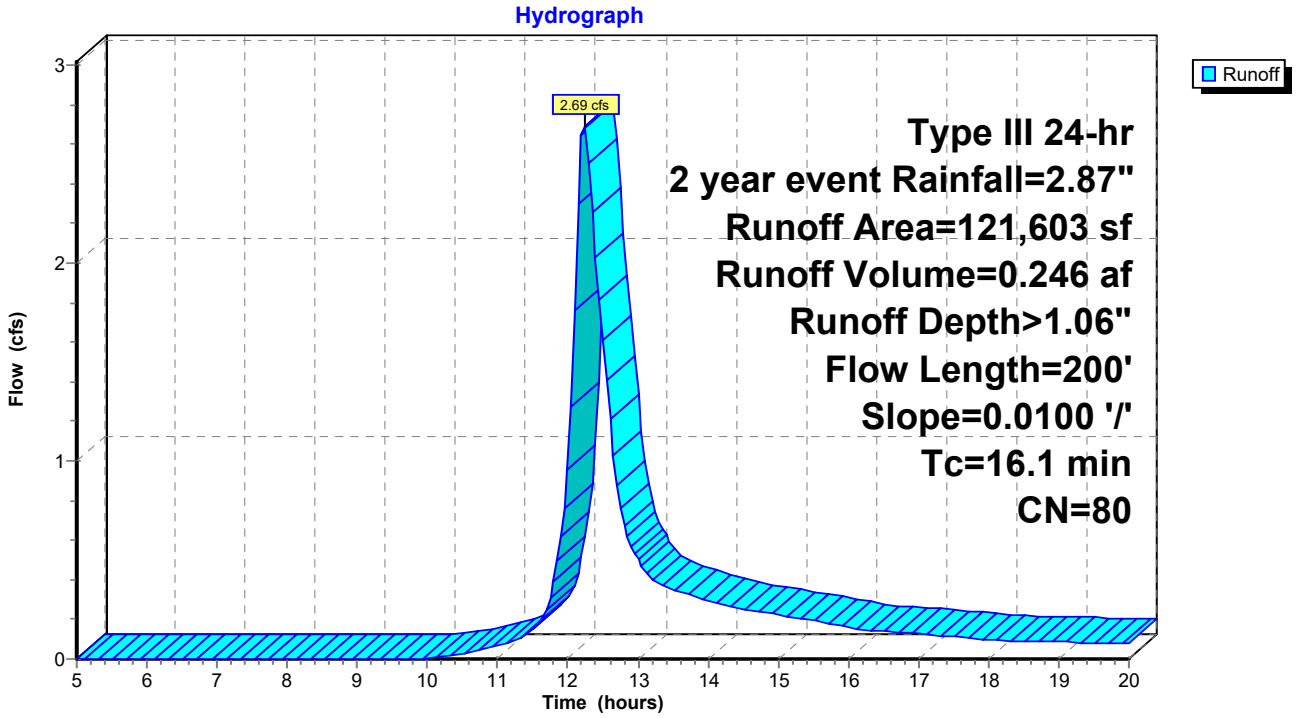
Runoff = 2.69 cfs @ 12.23 hrs, Volume= 0.246 af, Depth> 1.06"
Routed to Reach Woodlands 2 : Woodlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year event Rainfall=2.87"

Area (sf)	CN	Description
121,603	80	>75% Grass cover, Good, HSG D
121,603		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.7	100	0.0100	0.12		**Sheet Flow, Grass Field** Grass: Short n= 0.150 P2= 2.87"
2.4	100	0.0100	0.70		**Shallow Concentrated Flow, Grass Field** Short Grass Pasture Kv= 7.0 fps
16.1	200	Total			

Subcatchment Baseball: Baseball



Summary for Subcatchment Soccer: Soccer Field

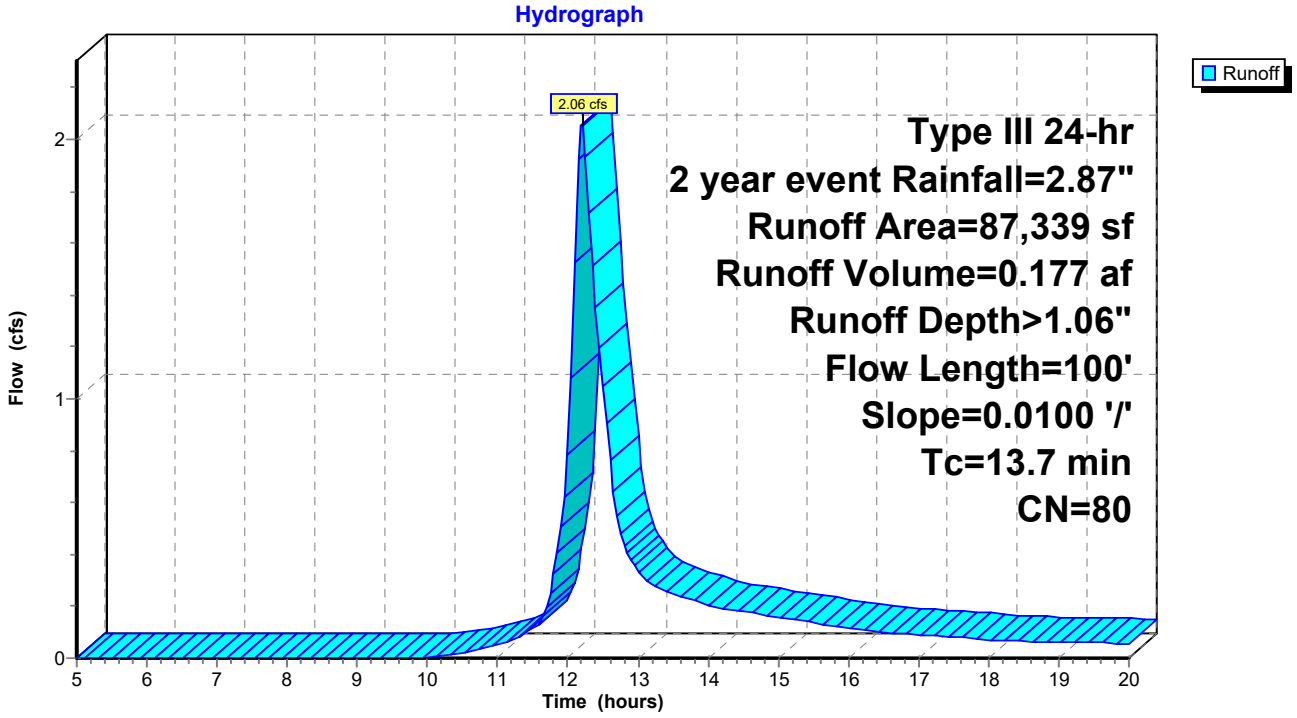
Runoff = 2.06 cfs @ 12.20 hrs, Volume= 0.177 af, Depth> 1.06"
Routed to Pond Ex Pond FB : Ex. Det Pond Forebay

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year event Rainfall=2.87"

Area (sf)	CN	Description
87,339	80	>75% Grass cover, Good, HSG D
87,339		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.7	100	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.87"

Subcatchment Soccer: Soccer Field



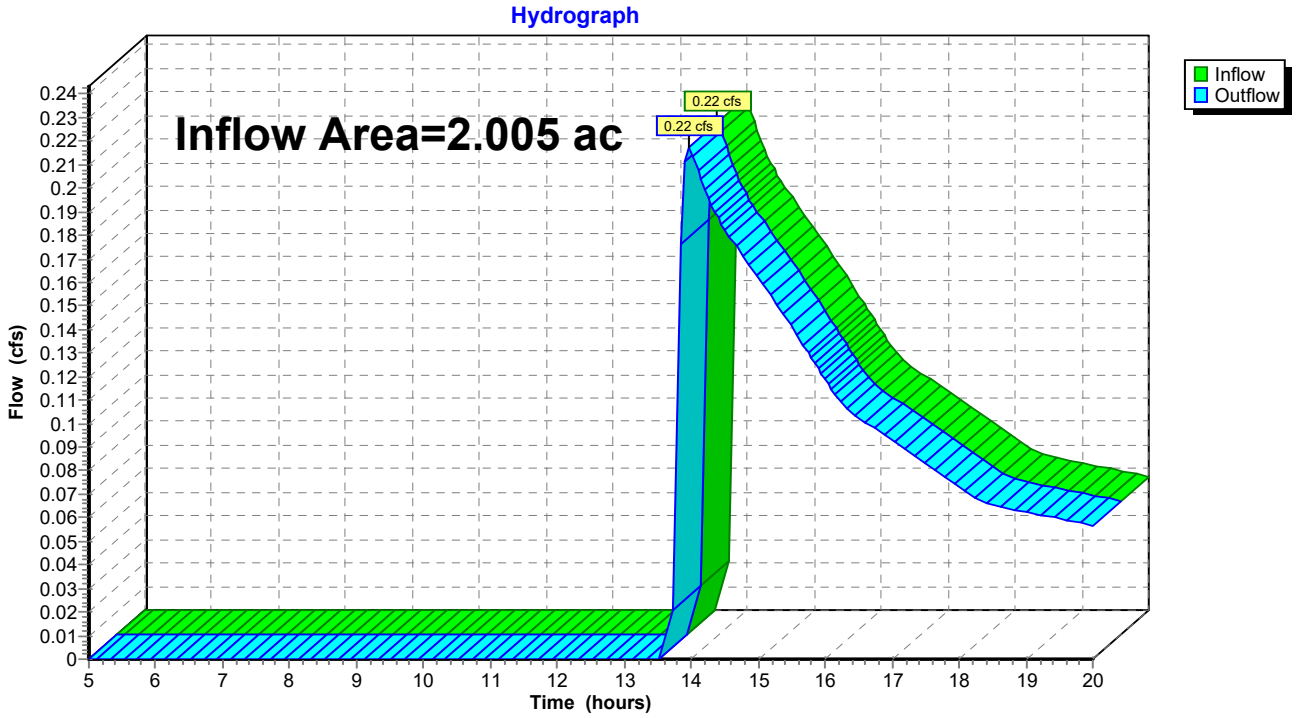
Summary for Reach Woodlands 1: Woodlands 1

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

Inflow Area = 2.005 ac, 0.00% Impervious, Inflow Depth > 0.34" for 2 year event event
Inflow = 0.22 cfs @ 13.96 hrs, Volume= 0.056 af
Outflow = 0.22 cfs @ 13.96 hrs, Volume= 0.056 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach Woodlands 1: Woodlands 1



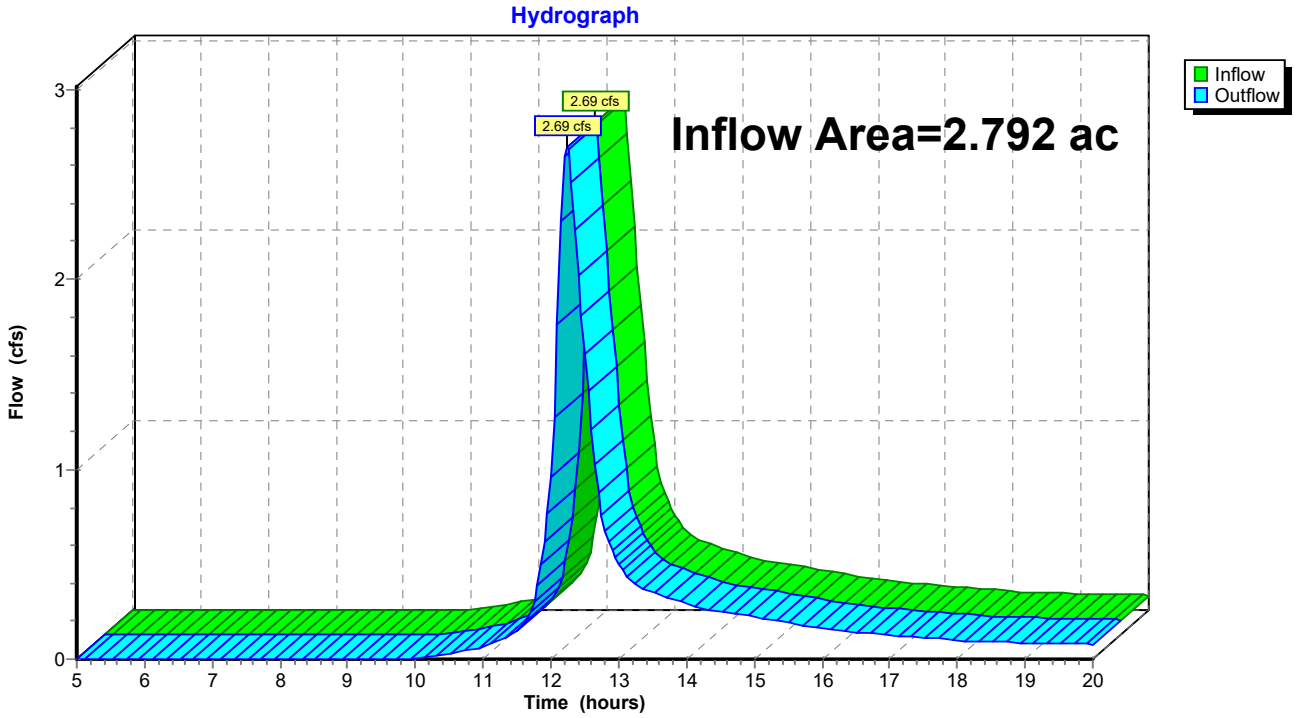
Summary for Reach Woodlands 2: Woodlands

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

Inflow Area = 2.792 ac, 0.00% Impervious, Inflow Depth > 1.06" for 2 year event event
Inflow = 2.69 cfs @ 12.23 hrs, Volume= 0.246 af
Outflow = 2.69 cfs @ 12.23 hrs, Volume= 0.246 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach Woodlands 2: Woodlands



Summary for Pond Ex Pond A: Ex. Det Pond "A"

[81] Warning: Exceeded Pond Ex Pond FB by 0.51' @ 14.05 hrs

Inflow Area = 2.005 ac, 0.00% Impervious, Inflow Depth > 0.61" for 2 year event event
Inflow = 0.90 cfs @ 12.56 hrs, Volume= 0.103 af
Outflow = 0.22 cfs @ 13.96 hrs, Volume= 0.056 af, Atten= 76%, Lag= 84.1 min
Primary = 0.22 cfs @ 13.96 hrs, Volume= 0.056 af
Routed to Reach Woodlands 1 : Woodlands 1

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,070.02' @ 13.96 hrs Surf.Area= 2,520 sf Storage= 2,058 cf

Plug-Flow detention time= 181.9 min calculated for 0.056 af (55% of inflow)
Center-of-Mass det. time= 88.7 min (970.0 - 881.3)

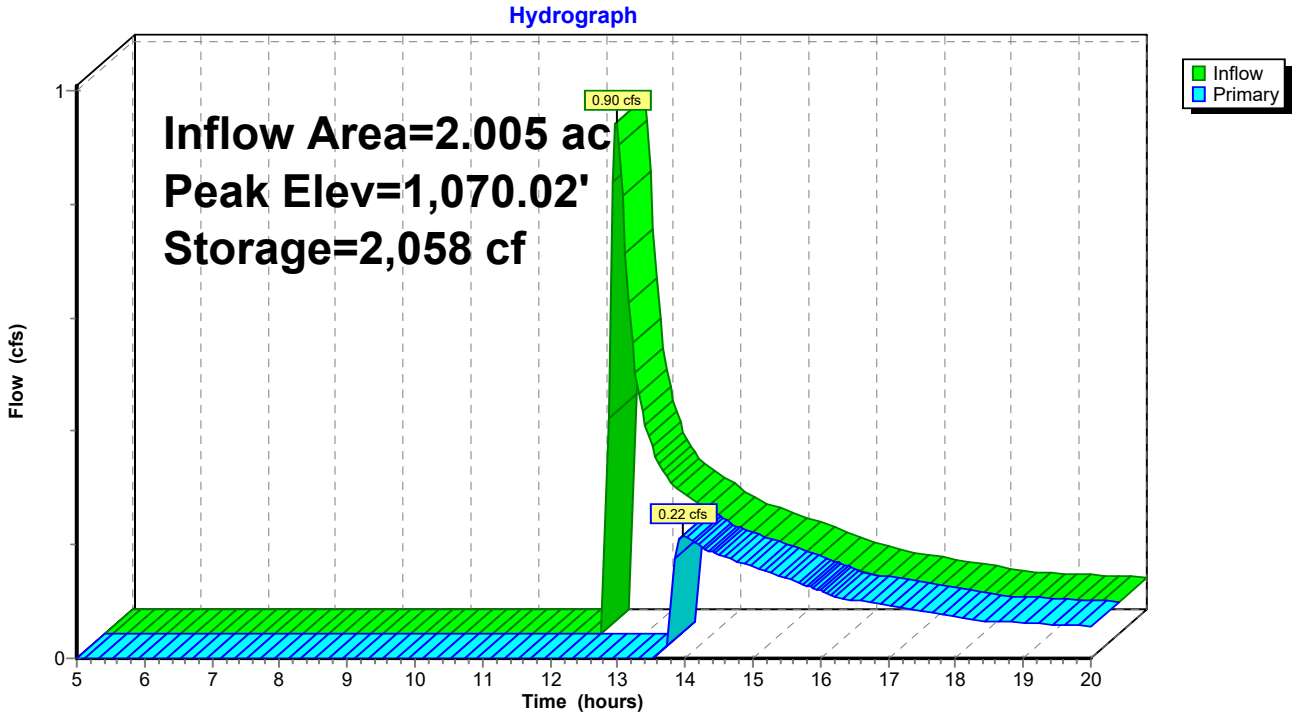
Volume	Invert	Avail.Storage	Storage Description
#1	1,068.99'	56,758 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,068.99	1	0	0
1,069.00	1,500	8	8
1,071.00	3,500	5,000	5,008
1,072.00	100,000	51,750	56,758

Device	Routing	Invert	Outlet Devices
#1	Primary	1,070.00'	**25.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.19 cfs @ 13.96 hrs HW=1,070.02' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.19 cfs @ 0.38 fps)

Pond Ex Pond A: Ex. Det Pond "A"



Summary for Pond Ex Pond FB: Ex. Det Pond Forebay

Inflow Area = 2.005 ac, 0.00% Impervious, Inflow Depth > 1.06" for 2 year event event
Inflow = 2.06 cfs @ 12.20 hrs, Volume= 0.177 af
Outflow = 0.90 cfs @ 12.56 hrs, Volume= 0.103 af, Atten= 56%, Lag= 21.7 min
Primary = 0.90 cfs @ 12.56 hrs, Volume= 0.103 af
Routed to Pond Ex Pond A : Ex. Det Pond "A"

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,069.54' @ 12.56 hrs Surf.Area= 9,180 sf Storage= 3,418 cf

Plug-Flow detention time= 147.5 min calculated for 0.103 af (58% of inflow)
Center-of-Mass det. time= 67.2 min (881.3 - 814.1)

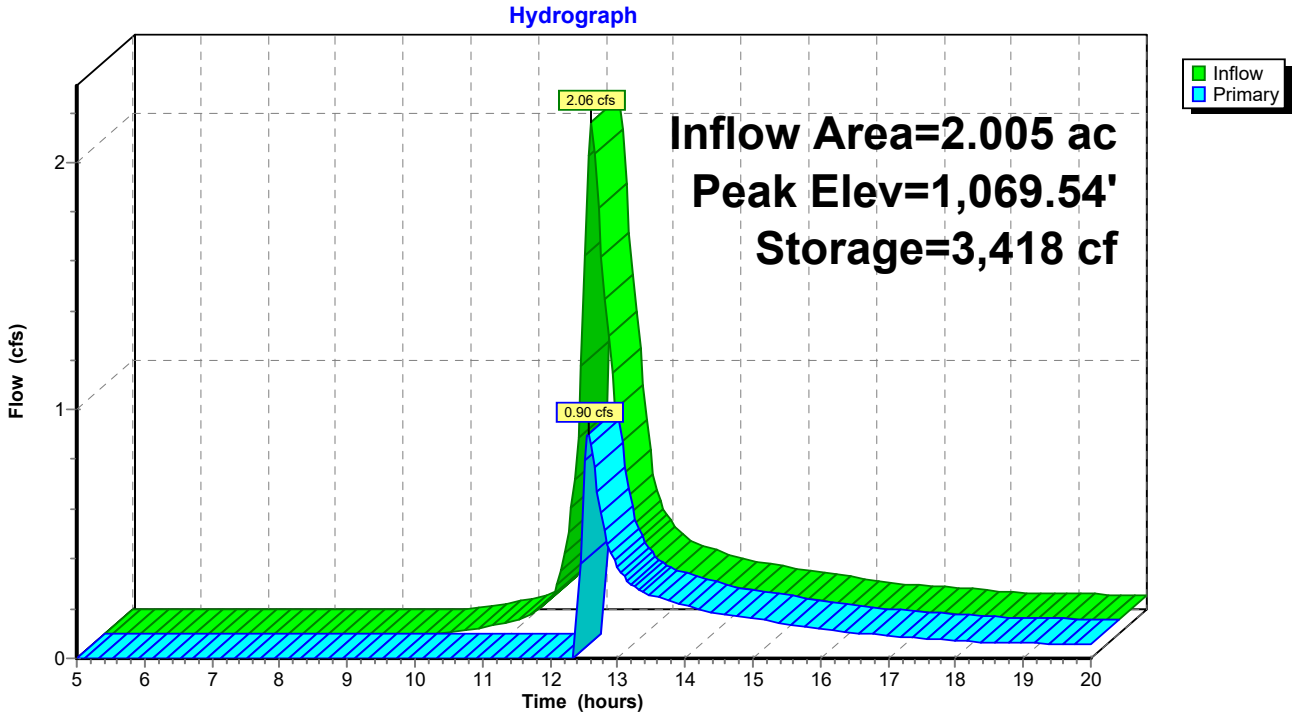
Volume	Invert	Avail.Storage	Storage Description
#1	1,067.99'	28,784 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,067.99	0	0	0
1,068.00	2,000	10	10
1,069.50	2,274	3,206	3,215
1,070.00	100,000	25,569	28,784

Device	Routing	Invert	Outlet Devices
#1	Primary	1,069.50'	**50.0' long x 20.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.88 cfs @ 12.56 hrs HW=1,069.53' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 0.88 cfs @ 0.50 fps)

Pond Ex Pond FB: Ex. Det Pond Forebay



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

Subcatchment Baseball: Baseball Runoff Area=121,603 sf 0.00% Impervious Runoff Depth>2.19"
Flow Length=200' Slope=0.0100 '/' Tc=16.1 min CN=80 Runoff=5.67 cfs 0.510 af

Subcatchment Soccer: Soccer Field Runoff Area=87,339 sf 0.00% Impervious Runoff Depth>2.19"
Flow Length=100' Slope=0.0100 '/' Tc=13.7 min CN=80 Runoff=4.31 cfs 0.366 af

Reach Woodlands 1: Woodlands 1 Inflow=3.89 cfs 0.245 af
Outflow=3.89 cfs 0.245 af

Reach Woodlands 2: Woodlands Inflow=5.67 cfs 0.510 af
Outflow=5.67 cfs 0.510 af

Pond Ex Pond A: Ex. Det Pond "A" Peak Elev=1,070.14' Storage=2,373 cf Inflow=3.66 cfs 0.292 af
Outflow=3.89 cfs 0.245 af

Pond Ex Pond FB: Ex. Det Pond Forebay Peak Elev=1,069.59' Storage=4,221 cf Inflow=4.31 cfs 0.366 af
Outflow=3.66 cfs 0.292 af

Total Runoff Area = 4.797 ac Runoff Volume = 0.876 af Average Runoff Depth = 2.19"
100.00% Pervious = 4.797 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment Baseball: Baseball

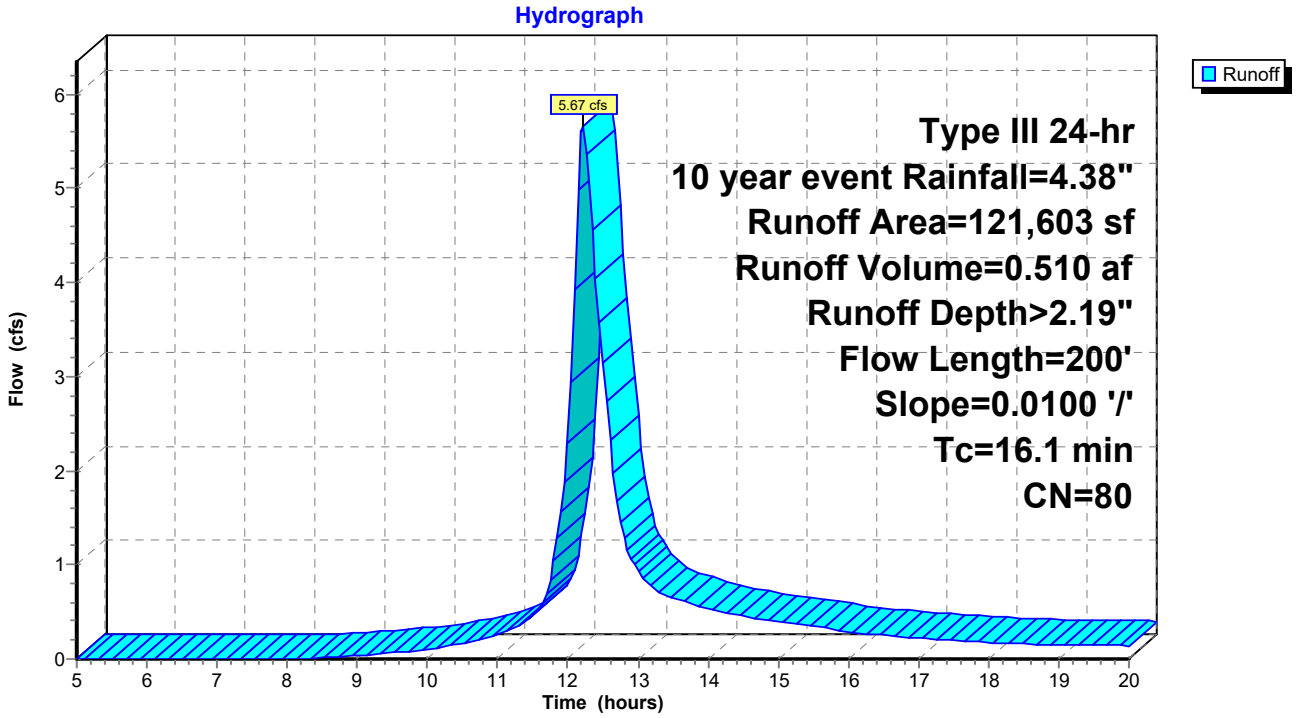
Runoff = 5.67 cfs @ 12.22 hrs, Volume= 0.510 af, Depth> 2.19"
Routed to Reach Woodlands 2 : Woodlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year event Rainfall=4.38"

Area (sf)	CN	Description
121,603	80	>75% Grass cover, Good, HSG D
121,603		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.7	100	0.0100	0.12		**Sheet Flow, Grass Field** Grass: Short n= 0.150 P2= 2.87"
2.4	100	0.0100	0.70		**Shallow Concentrated Flow, Grass Field** Short Grass Pasture Kv= 7.0 fps
16.1	200	Total			

Subcatchment Baseball: Baseball



Summary for Subcatchment Soccer: Soccer Field

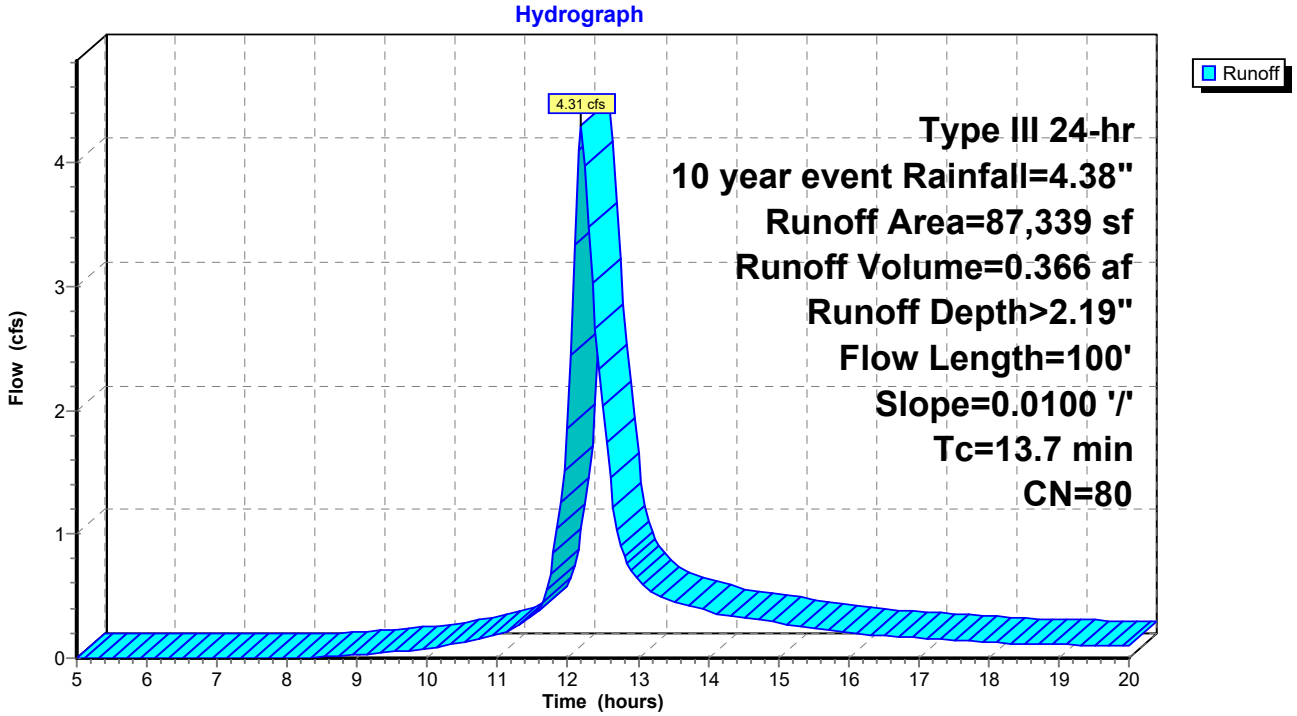
Runoff = 4.31 cfs @ 12.19 hrs, Volume= 0.366 af, Depth> 2.19"
Routed to Pond Ex Pond FB : Ex. Det Pond Forebay

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year event Rainfall=4.38"

Area (sf)	CN	Description
87,339	80	>75% Grass cover, Good, HSG D
87,339		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.7	100	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.87"

Subcatchment Soccer: Soccer Field



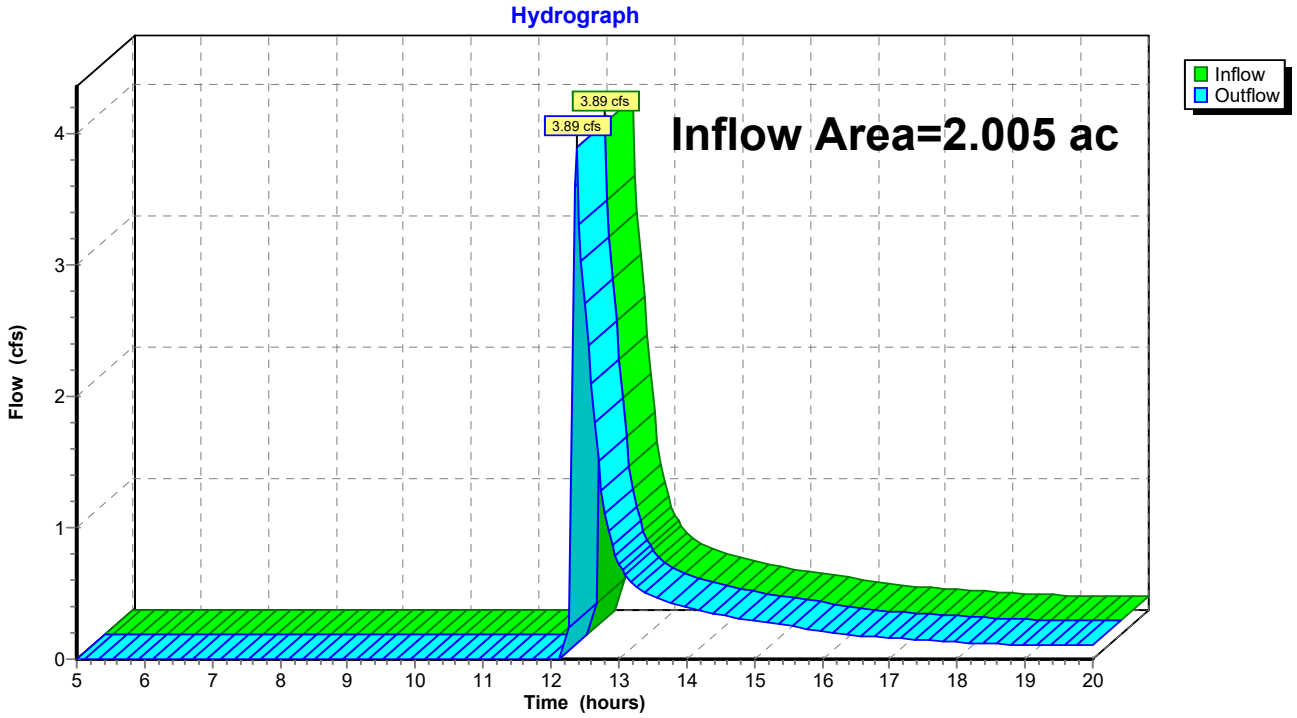
Summary for Reach Woodlands 1: Woodlands 1

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

Inflow Area = 2.005 ac, 0.00% Impervious, Inflow Depth > 1.47" for 10 year event event
Inflow = 3.89 cfs @ 12.37 hrs, Volume= 0.245 af
Outflow = 3.89 cfs @ 12.37 hrs, Volume= 0.245 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach Woodlands 1: Woodlands 1



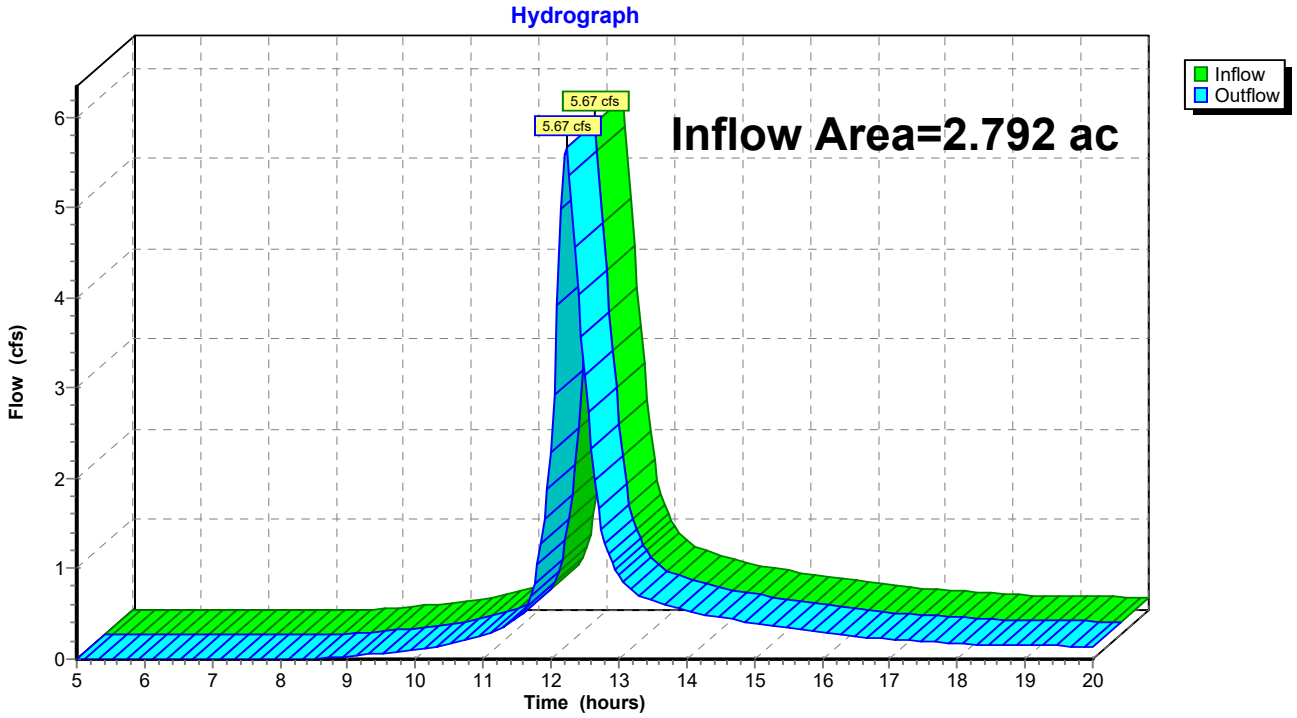
Summary for Reach Woodlands 2: Woodlands

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

Inflow Area = 2.792 ac, 0.00% Impervious, Inflow Depth > 2.19" for 10 year event event
Inflow = 5.67 cfs @ 12.22 hrs, Volume= 0.510 af
Outflow = 5.67 cfs @ 12.22 hrs, Volume= 0.510 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach Woodlands 2: Woodlands



Summary for Pond Ex Pond A: Ex. Det Pond "A"

[88] Warning: Qout>Qin may require smaller dt or Finer Routing
[81] Warning: Exceeded Pond Ex Pond FB by 0.55' @ 12.35 hrs

Inflow Area = 2.005 ac, 0.00% Impervious, Inflow Depth > 1.75" for 10 year event event
Inflow = 3.66 cfs @ 12.29 hrs, Volume= 0.292 af
Outflow = 3.89 cfs @ 12.37 hrs, Volume= 0.245 af, Atten= 0%, Lag= 5.0 min
Primary = 3.89 cfs @ 12.37 hrs, Volume= 0.245 af
Routed to Reach Woodlands 1 : Woodlands 1

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,070.14' @ 12.35 hrs Surf.Area= 2,642 sf Storage= 2,373 cf

Plug-Flow detention time= 64.0 min calculated for 0.244 af (84% of inflow)
Center-of-Mass det. time= 20.1 min (849.3 - 829.2)

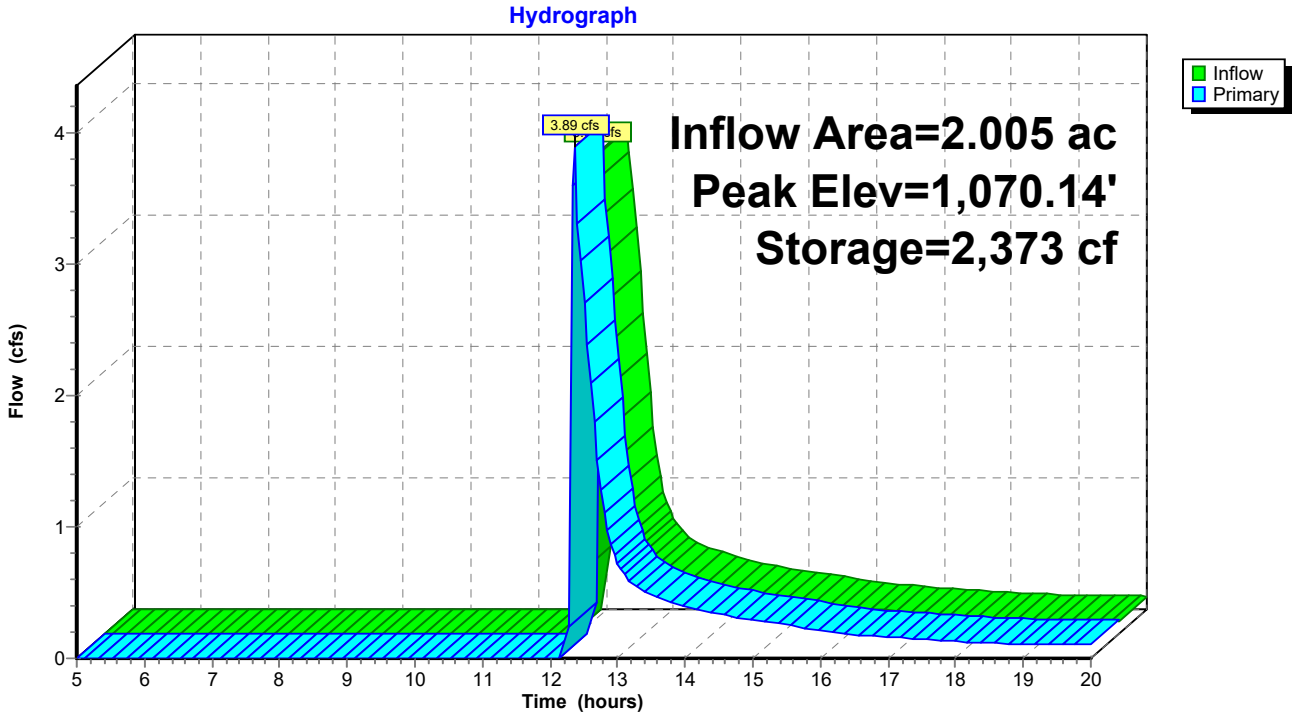
Volume	Invert	Avail.Storage	Storage Description
#1	1,068.99'	56,758 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,068.99	1	0	0
1,069.00	1,500	8	8
1,071.00	3,500	5,000	5,008
1,072.00	100,000	51,750	56,758

Device	Routing	Invert	Outlet Devices
#1	Primary	1,070.00'	**25.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=3.47 cfs @ 12.37 hrs HW=1,070.14' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 3.47 cfs @ 1.00 fps)

Pond Ex Pond A: Ex. Det Pond "A"



Summary for Pond Ex Pond FB: Ex. Det Pond Forebay

Inflow Area = 2.005 ac, 0.00% Impervious, Inflow Depth > 2.19" for 10 year event event
Inflow = 4.31 cfs @ 12.19 hrs, Volume= 0.366 af
Outflow = 3.66 cfs @ 12.29 hrs, Volume= 0.292 af, Atten= 15%, Lag= 5.6 min
Primary = 3.66 cfs @ 12.29 hrs, Volume= 0.292 af
Routed to Pond Ex Pond A : Ex. Det Pond "A"

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,069.59' @ 12.29 hrs Surf.Area= 19,952 sf Storage= 4,221 cf

Plug-Flow detention time= 84.2 min calculated for 0.292 af (80% of inflow)
Center-of-Mass det. time= 31.4 min (829.2 - 797.8)

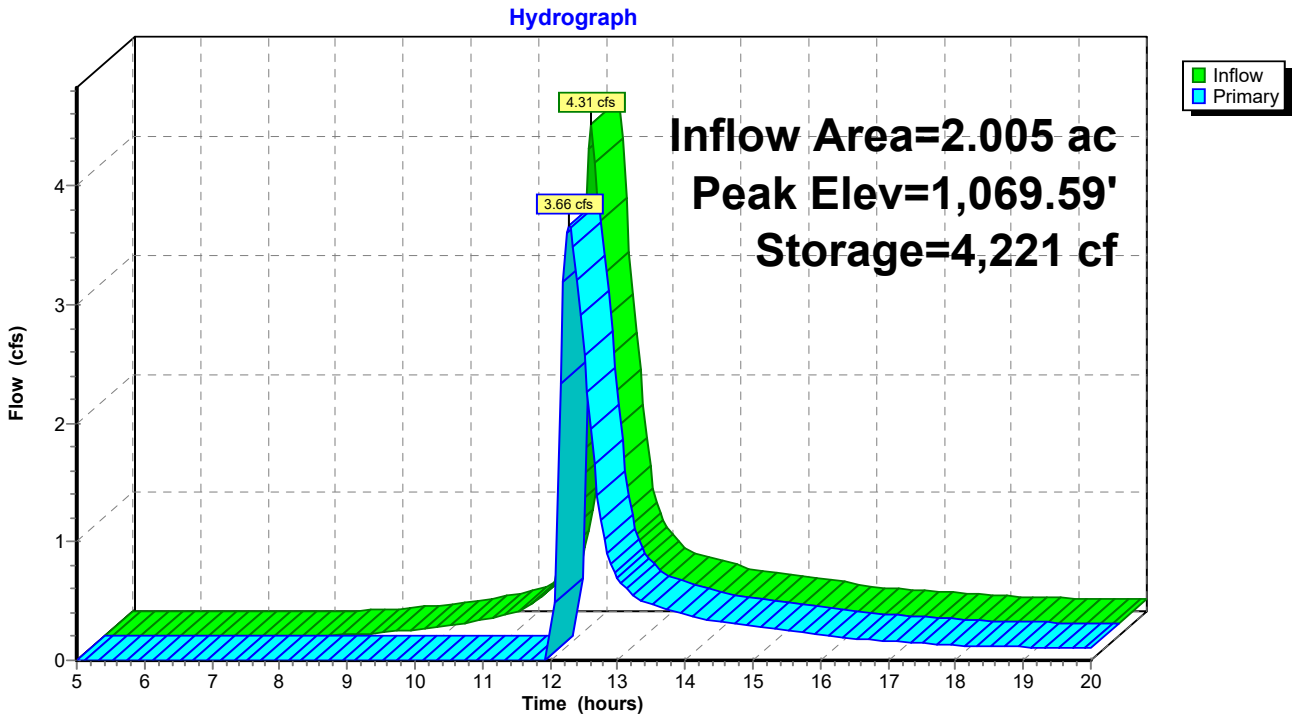
Volume	Invert	Avail.Storage	Storage Description
#1	1,067.99'	28,784 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,067.99	0	0	0
1,068.00	2,000	10	10
1,069.50	2,274	3,206	3,215
1,070.00	100,000	25,569	28,784

Device	Routing	Invert	Outlet Devices
#1	Primary	1,069.50'	**50.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=3.62 cfs @ 12.29 hrs HW=1,069.59' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 3.62 cfs @ 0.80 fps)

Pond Ex Pond FB: Ex. Det Pond Forebay



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

Subcatchment Baseball: Baseball Runoff Area=121,603 sf 0.00% Impervious Runoff Depth>2.96"
Flow Length=200' Slope=0.0100 '/' Tc=16.1 min CN=80 Runoff=7.62 cfs 0.688 af

Subcatchment Soccer: Soccer Field Runoff Area=87,339 sf 0.00% Impervious Runoff Depth>2.96"
Flow Length=100' Slope=0.0100 '/' Tc=13.7 min CN=80 Runoff=5.80 cfs 0.495 af

Reach Woodlands 1: Woodlands 1 Inflow=5.03 cfs 0.373 af
Outflow=5.03 cfs 0.373 af

Reach Woodlands 2: Woodlands Inflow=7.62 cfs 0.688 af
Outflow=7.62 cfs 0.688 af

Pond Ex Pond A: Ex. Det Pond "A" Peak Elev=1,070.18' Storage=2,467 cf Inflow=5.06 cfs 0.420 af
Outflow=5.03 cfs 0.373 af

Pond Ex Pond FB: Ex. Det Pond Forebay Peak Elev=1,069.61' Storage=4,703 cf Inflow=5.80 cfs 0.495 af
Outflow=5.06 cfs 0.420 af

Total Runoff Area = 4.797 ac Runoff Volume = 1.183 af Average Runoff Depth = 2.96"
100.00% Pervious = 4.797 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment Baseball: Baseball

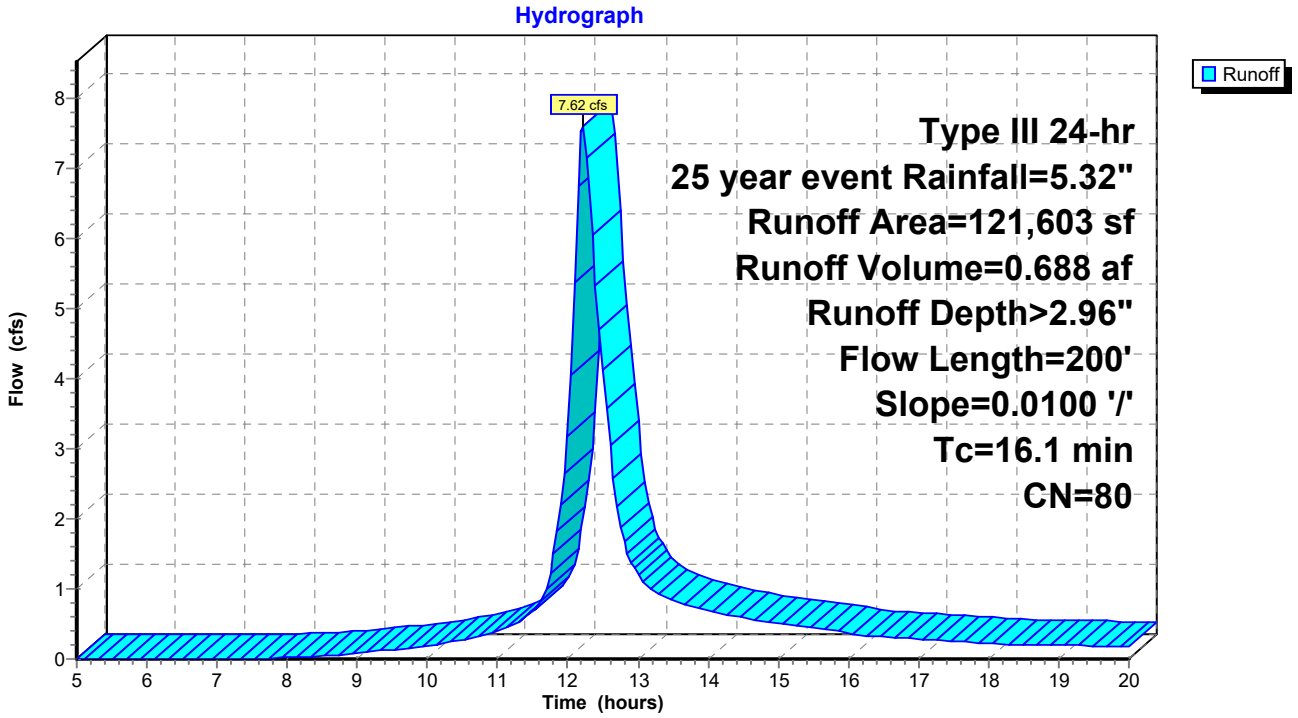
Runoff = 7.62 cfs @ 12.22 hrs, Volume= 0.688 af, Depth> 2.96"
Routed to Reach Woodlands 2 : Woodlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year event Rainfall=5.32"

Area (sf)	CN	Description
121,603	80	>75% Grass cover, Good, HSG D
121,603		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.7	100	0.0100	0.12		**Sheet Flow, Grass Field** Grass: Short n= 0.150 P2= 2.87"
2.4	100	0.0100	0.70		**Shallow Concentrated Flow, Grass Field** Short Grass Pasture Kv= 7.0 fps
16.1	200	Total			

Subcatchment Baseball: Baseball



Summary for Subcatchment Soccer: Soccer Field

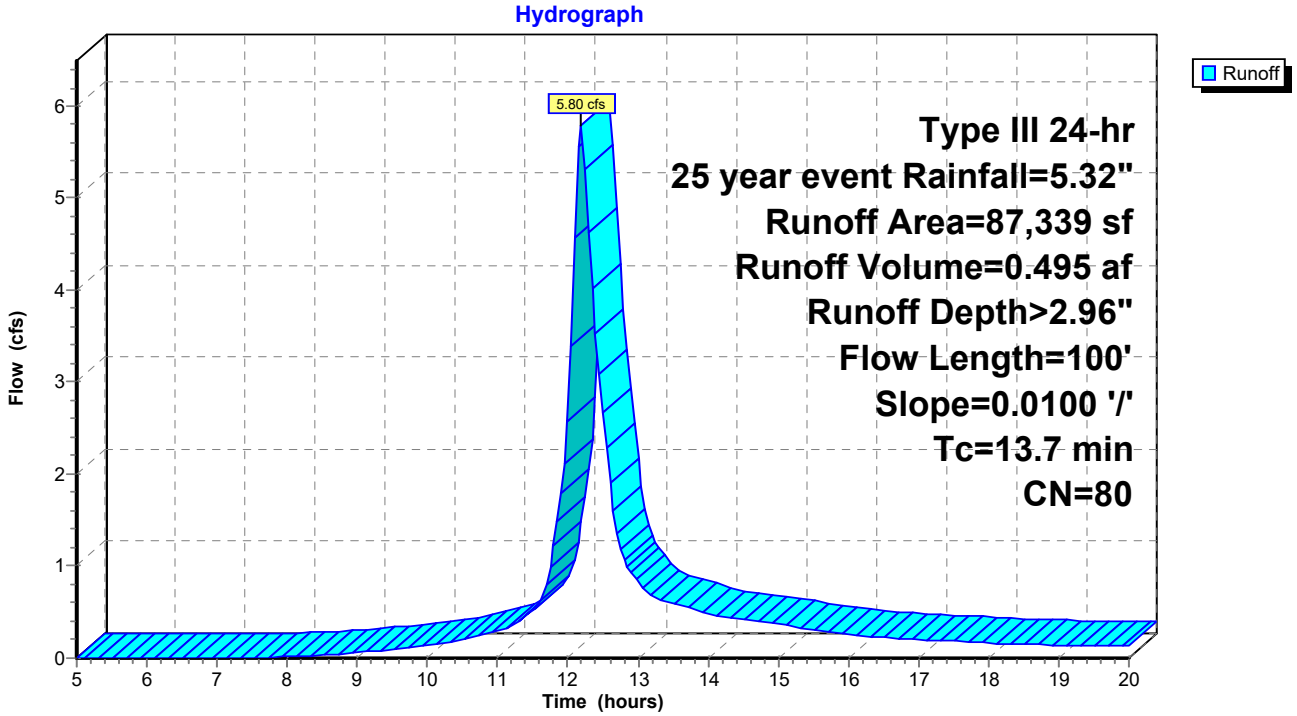
Runoff = 5.80 cfs @ 12.19 hrs, Volume= 0.495 af, Depth> 2.96"
Routed to Pond Ex Pond FB : Ex. Det Pond Forebay

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year event Rainfall=5.32"

Area (sf)	CN	Description
87,339	80	>75% Grass cover, Good, HSG D
87,339		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.7	100	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.87"

Subcatchment Soccer: Soccer Field



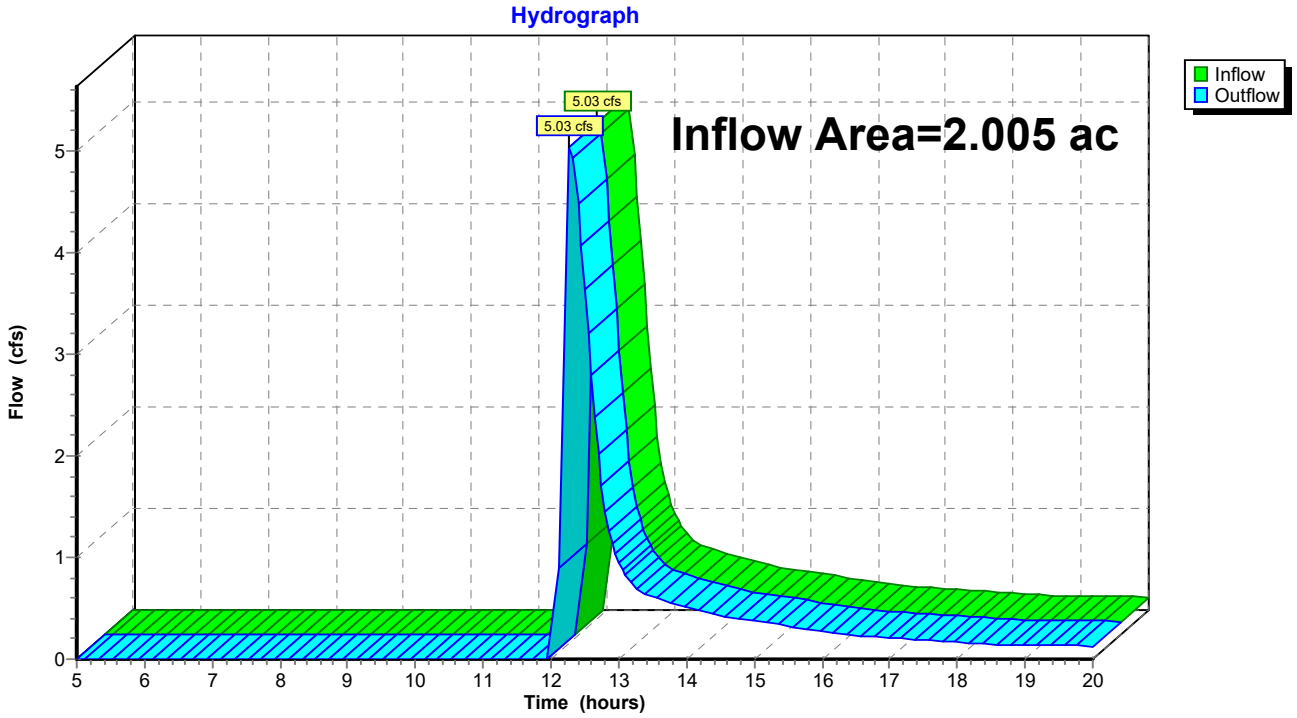
Summary for Reach Woodlands 1: Woodlands 1

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

Inflow Area = 2.005 ac, 0.00% Impervious, Inflow Depth > 2.23" for 25 year event event
Inflow = 5.03 cfs @ 12.25 hrs, Volume= 0.373 af
Outflow = 5.03 cfs @ 12.25 hrs, Volume= 0.373 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach Woodlands 1: Woodlands 1



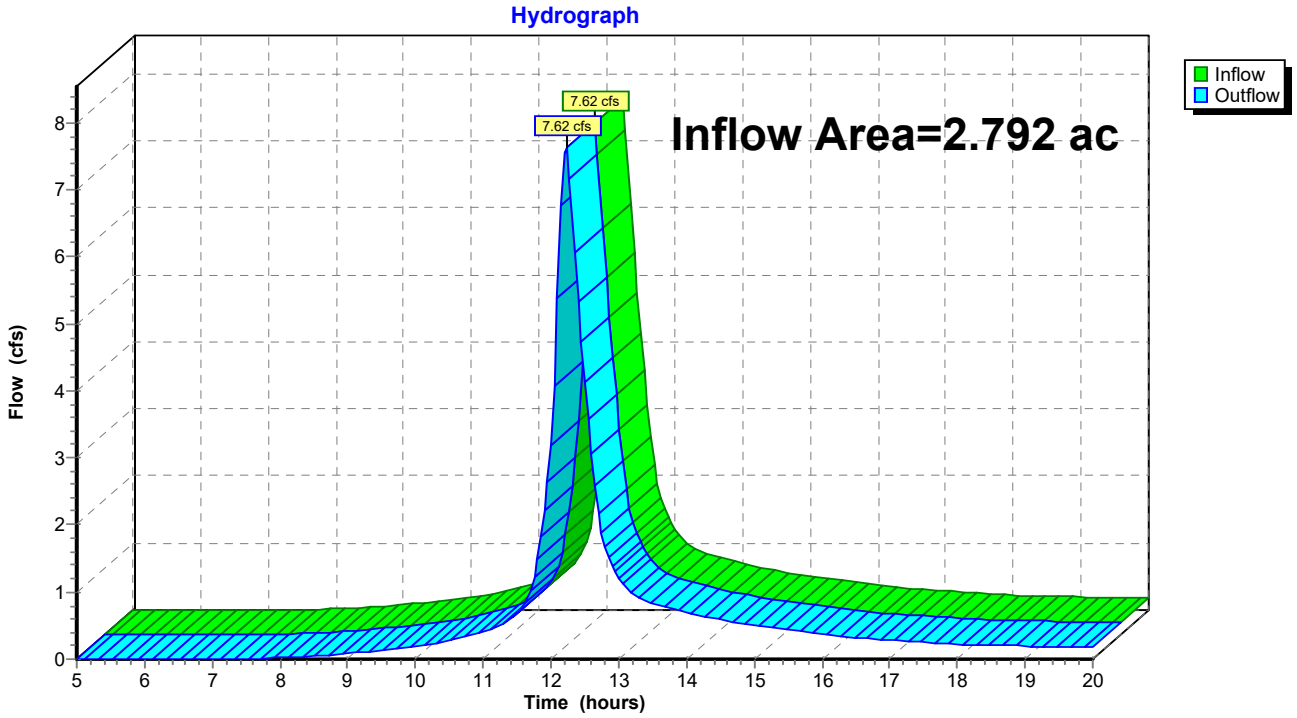
Summary for Reach Woodlands 2: Woodlands

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

Inflow Area = 2.792 ac, 0.00% Impervious, Inflow Depth > 2.96" for 25 year event event
Inflow = 7.62 cfs @ 12.22 hrs, Volume= 0.688 af
Outflow = 7.62 cfs @ 12.22 hrs, Volume= 0.688 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach Woodlands 2: Woodlands



Summary for Pond Ex Pond A: Ex. Det Pond "A"

[81] Warning: Exceeded Pond Ex Pond FB by 0.57' @ 12.25 hrs

Inflow Area = 2.005 ac, 0.00% Impervious, Inflow Depth > 2.52" for 25 year event event
Inflow = 5.06 cfs @ 12.27 hrs, Volume= 0.420 af
Outflow = 5.03 cfs @ 12.25 hrs, Volume= 0.373 af, Atten= 1%, Lag= 0.0 min
Primary = 5.03 cfs @ 12.25 hrs, Volume= 0.373 af
Routed to Reach Woodlands 1 : Woodlands 1

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,070.18' @ 12.25 hrs Surf.Area= 2,678 sf Storage= 2,467 cf

Plug-Flow detention time= 47.0 min calculated for 0.373 af (89% of inflow)
Center-of-Mass det. time= 13.3 min (831.2 - 817.8)

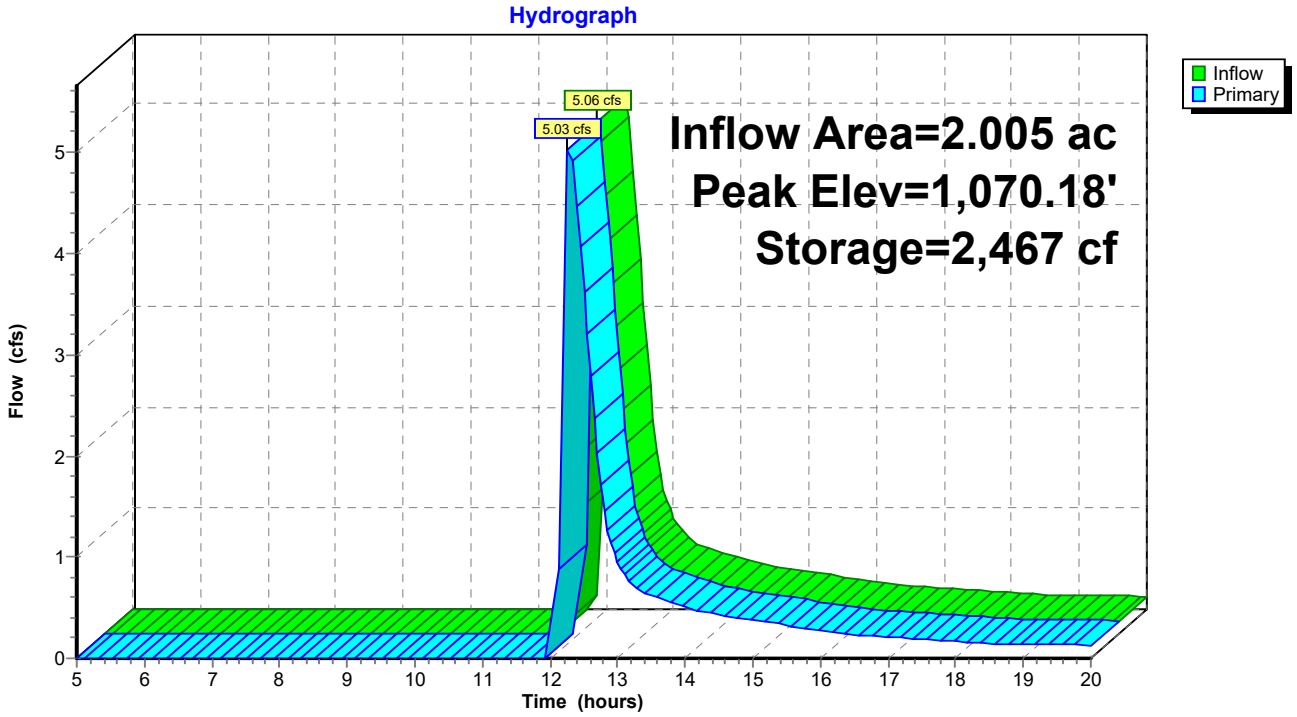
Volume	Invert	Avail.Storage	Storage Description
#1	1,068.99'	56,758 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,068.99	1	0	0
1,069.00	1,500	8	8
1,071.00	3,500	5,000	5,008
1,072.00	100,000	51,750	56,758

Device	Routing	Invert	Outlet Devices
#1	Primary	1,070.00'	**25.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=5.02 cfs @ 12.25 hrs HW=1,070.18' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 5.02 cfs @ 1.13 fps)

Pond Ex Pond A: Ex. Det Pond "A"



Summary for Pond Ex Pond FB: Ex. Det Pond Forebay

Inflow Area = 2.005 ac, 0.00% Impervious, Inflow Depth > 2.96" for 25 year event event
Inflow = 5.80 cfs @ 12.19 hrs, Volume= 0.495 af
Outflow = 5.06 cfs @ 12.27 hrs, Volume= 0.420 af, Atten= 13%, Lag= 4.9 min
Primary = 5.06 cfs @ 12.27 hrs, Volume= 0.420 af
Routed to Pond Ex Pond A : Ex. Det Pond "A"

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,069.61' @ 12.27 hrs Surf.Area= 24,224 sf Storage= 4,703 cf

Plug-Flow detention time= 69.3 min calculated for 0.419 af (85% of inflow)
Center-of-Mass det. time= 26.9 min (817.8 - 790.9)

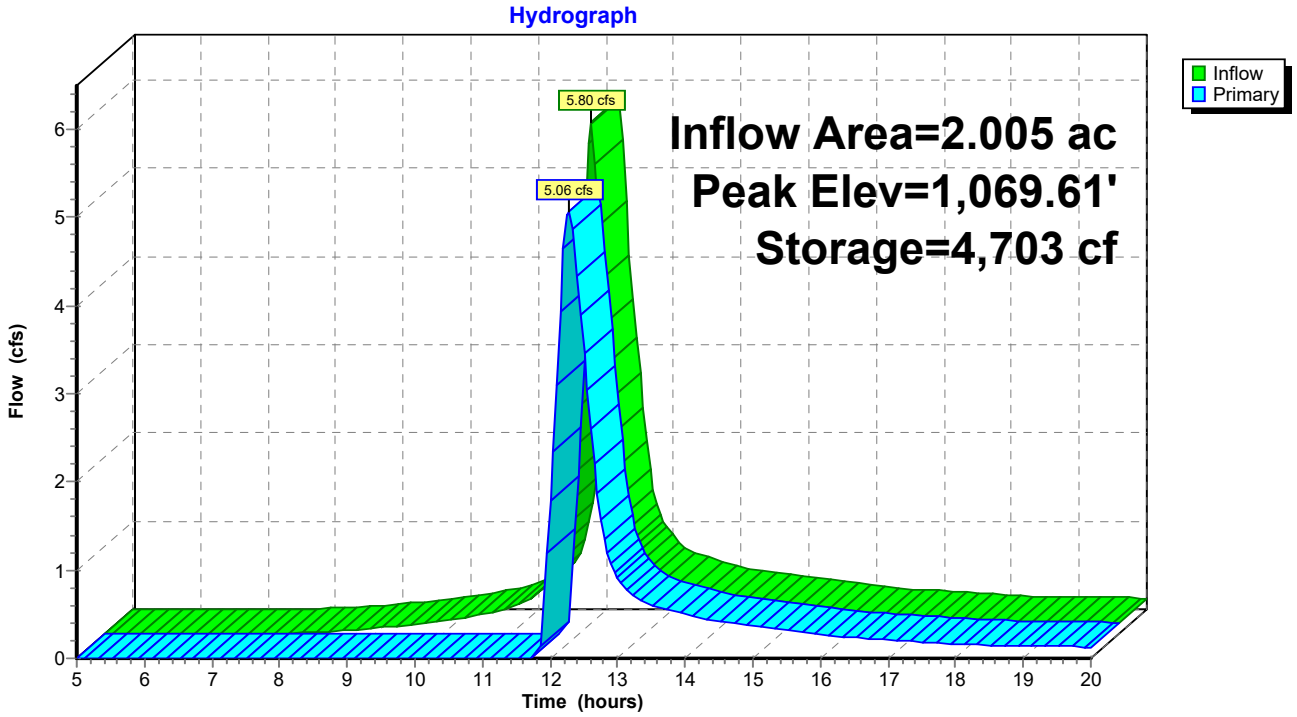
Volume	Invert	Avail.Storage	Storage Description
#1	1,067.99'	28,784 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,067.99	0	0	0
1,068.00	2,000	10	10
1,069.50	2,274	3,206	3,215
1,070.00	100,000	25,569	28,784

Device	Routing	Invert	Outlet Devices
#1	Primary	1,069.50'	**50.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=4.99 cfs @ 12.27 hrs HW=1,069.61' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 4.99 cfs @ 0.90 fps)

Pond Ex Pond FB: Ex. Det Pond Forebay



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

Subcatchment Baseball: Baseball Runoff Area=121,603 sf 0.00% Impervious Runoff Depth>4.19"
Flow Length=200' Slope=0.0100 '/' Tc=16.1 min CN=80 Runoff=10.69 cfs 0.975 af

Subcatchment Soccer: Soccer Field Runoff Area=87,339 sf 0.00% Impervious Runoff Depth>4.19"
Flow Length=100' Slope=0.0100 '/' Tc=13.7 min CN=80 Runoff=8.12 cfs 0.700 af

Reach Woodlands 1: Woodlands 1 Inflow=6.97 cfs 0.579 af
Outflow=6.97 cfs 0.579 af

Reach Woodlands 2: Woodlands Inflow=10.69 cfs 0.975 af
Outflow=10.69 cfs 0.975 af

Pond Ex Pond A: Ex. Det Pond "A" Peak Elev=1,070.22' Storage=2,584 cf Inflow=7.00 cfs 0.626 af
Outflow=6.97 cfs 0.579 af

Pond Ex Pond FB: Ex. Det Pond Forebay Peak Elev=1,069.64' Storage=5,443 cf Inflow=8.12 cfs 0.700 af
Outflow=7.00 cfs 0.626 af

Total Runoff Area = 4.797 ac Runoff Volume = 1.675 af Average Runoff Depth = 4.19"
100.00% Pervious = 4.797 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment Baseball: Baseball

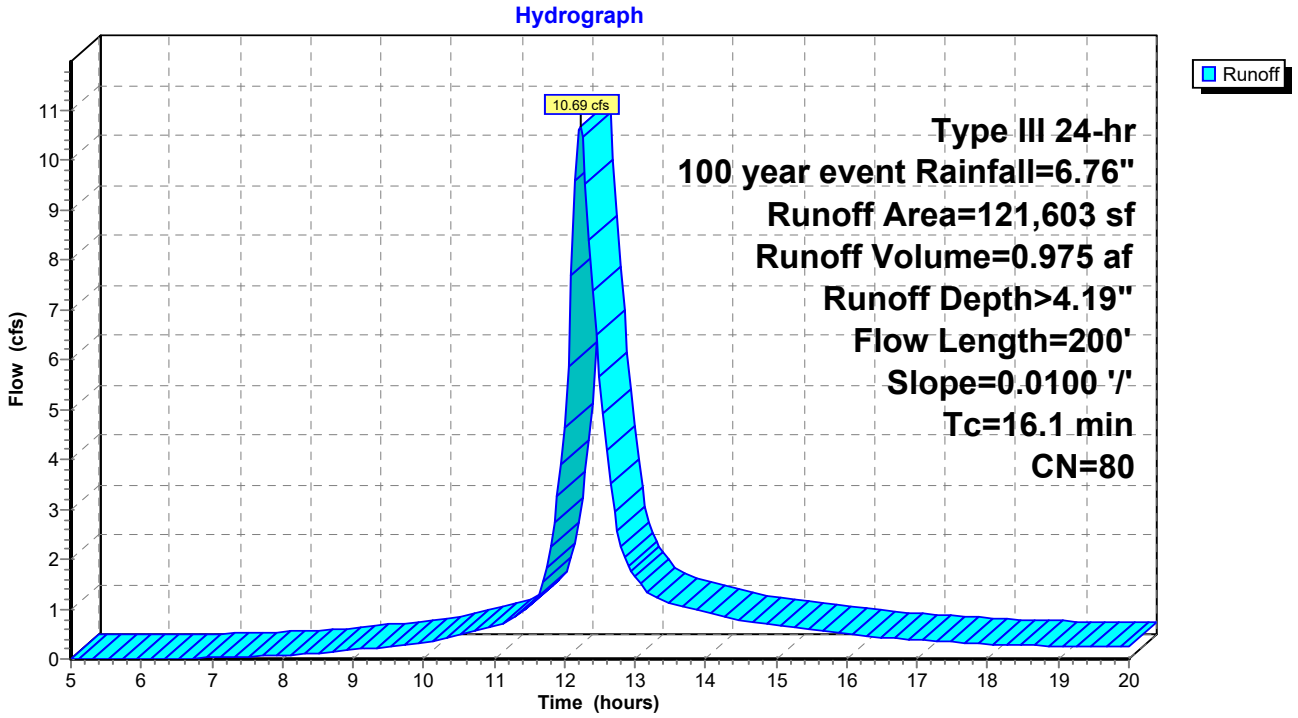
Runoff = 10.69 cfs @ 12.22 hrs, Volume= 0.975 af, Depth> 4.19"
Routed to Reach Woodlands 2 : Woodlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 year event Rainfall=6.76"

Area (sf)	CN	Description
121,603	80	>75% Grass cover, Good, HSG D
121,603		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.7	100	0.0100	0.12		**Sheet Flow, Grass Field** Grass: Short n= 0.150 P2= 2.87"
2.4	100	0.0100	0.70		**Shallow Concentrated Flow, Grass Field** Short Grass Pasture Kv= 7.0 fps
16.1	200	Total			

Subcatchment Baseball: Baseball



Summary for Subcatchment Soccer: Soccer Field

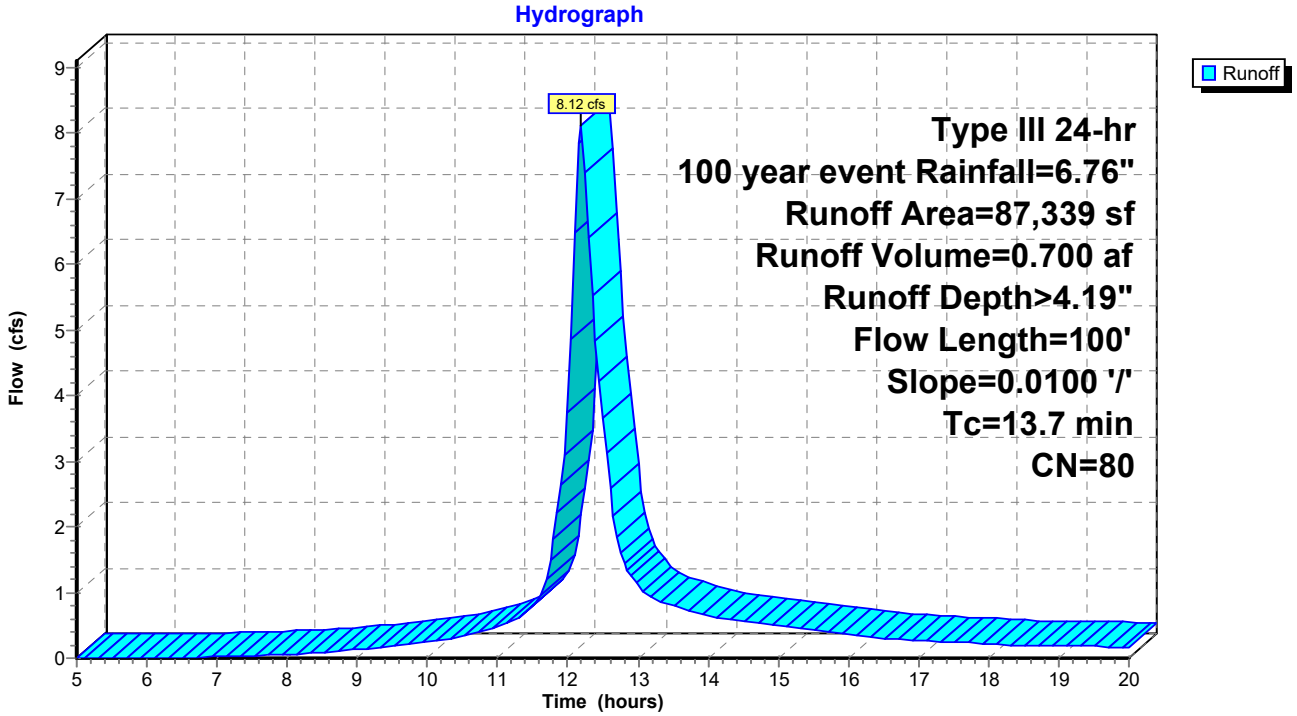
Runoff = 8.12 cfs @ 12.19 hrs, Volume= 0.700 af, Depth> 4.19"
Routed to Pond Ex Pond FB : Ex. Det Pond Forebay

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 year event Rainfall=6.76"

Area (sf)	CN	Description
87,339	80	>75% Grass cover, Good, HSG D
87,339		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.7	100	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.87"

Subcatchment Soccer: Soccer Field



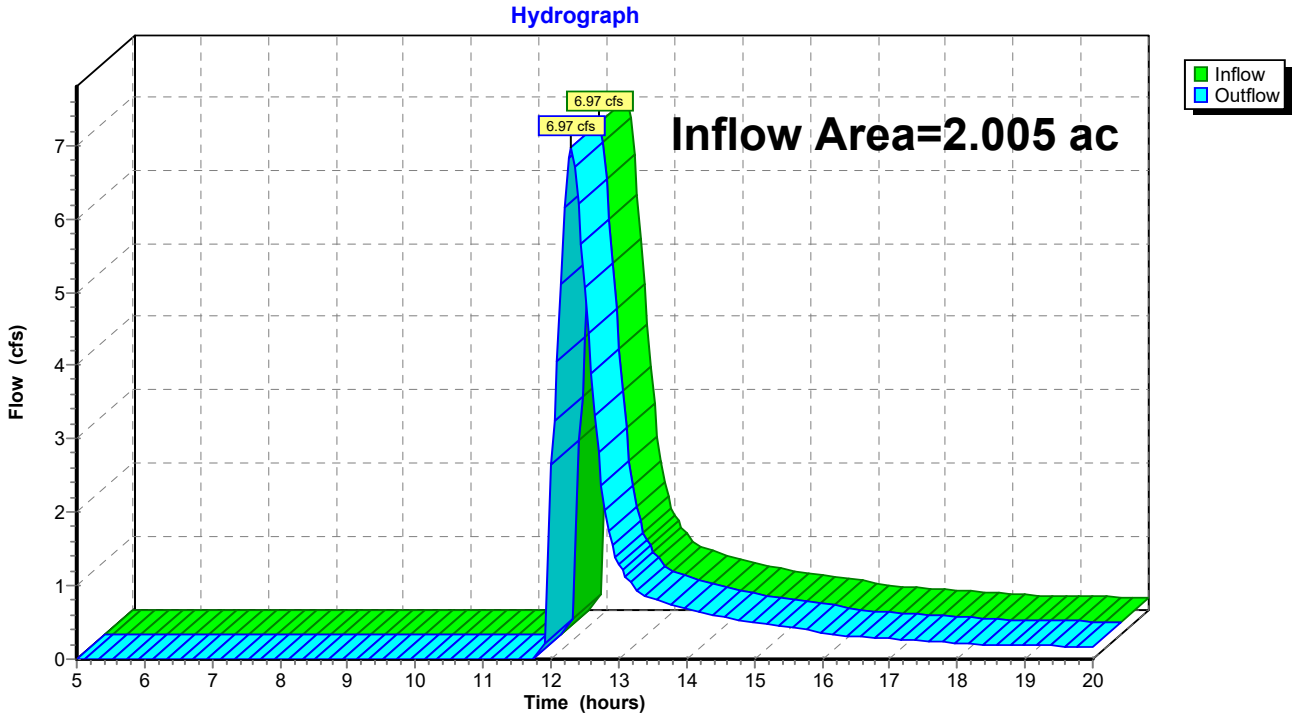
Summary for Reach Woodlands 1: Woodlands 1

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

Inflow Area = 2.005 ac, 0.00% Impervious, Inflow Depth > 3.46" for 100 year event event
Inflow = 6.97 cfs @ 12.29 hrs, Volume= 0.579 af
Outflow = 6.97 cfs @ 12.29 hrs, Volume= 0.579 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach Woodlands 1: Woodlands 1



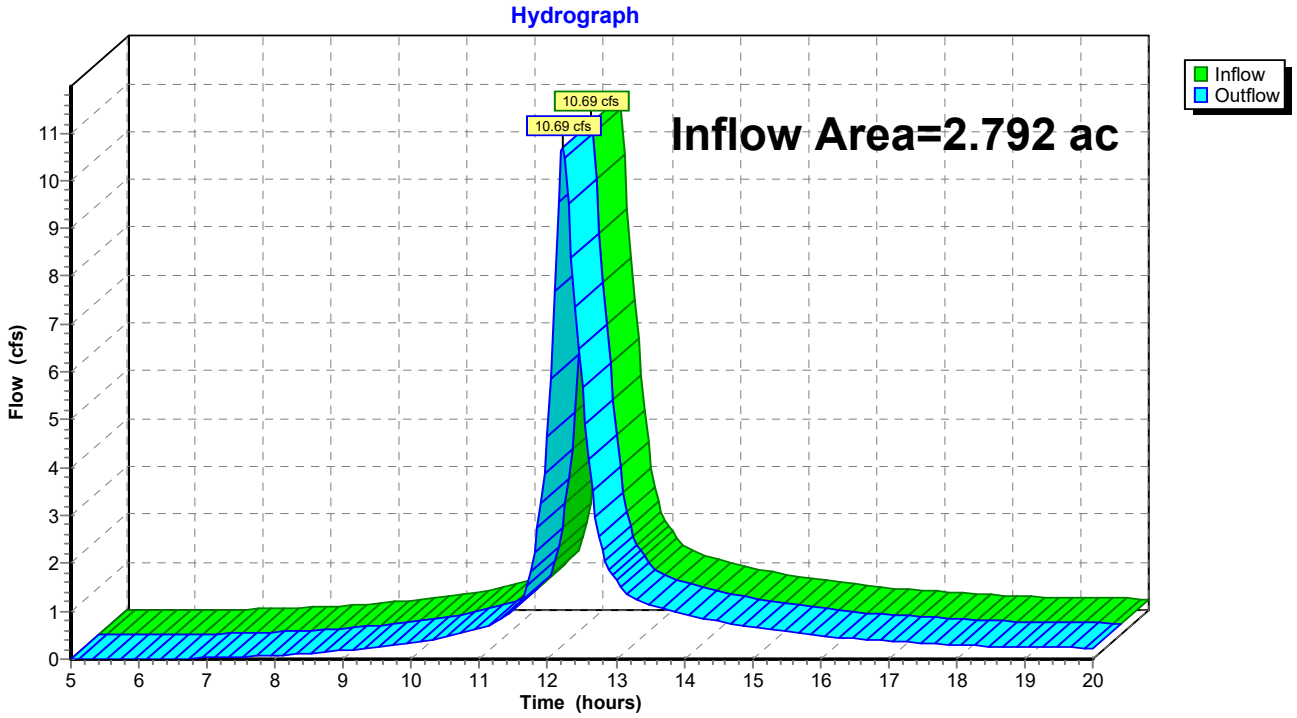
Summary for Reach Woodlands 2: Woodlands

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

Inflow Area = 2.792 ac, 0.00% Impervious, Inflow Depth > 4.19" for 100 year event event
Inflow = 10.69 cfs @ 12.22 hrs, Volume= 0.975 af
Outflow = 10.69 cfs @ 12.22 hrs, Volume= 0.975 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach Woodlands 2: Woodlands



Summary for Pond Ex Pond A: Ex. Det Pond "A"

[81] Warning: Exceeded Pond Ex Pond FB by 0.58' @ 12.30 hrs

Inflow Area = 2.005 ac, 0.00% Impervious, Inflow Depth > 3.75" for 100 year event event
Inflow = 7.00 cfs @ 12.27 hrs, Volume= 0.626 af
Outflow = 6.97 cfs @ 12.29 hrs, Volume= 0.579 af, Atten= 0%, Lag= 1.2 min
Primary = 6.97 cfs @ 12.29 hrs, Volume= 0.579 af
Routed to Reach Woodlands 1 : Woodlands 1

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,070.22' @ 12.29 hrs Surf.Area= 2,721 sf Storage= 2,584 cf

Plug-Flow detention time= 34.4 min calculated for 0.579 af (92% of inflow)
Center-of-Mass det. time= 9.7 min (816.7 - 807.0)

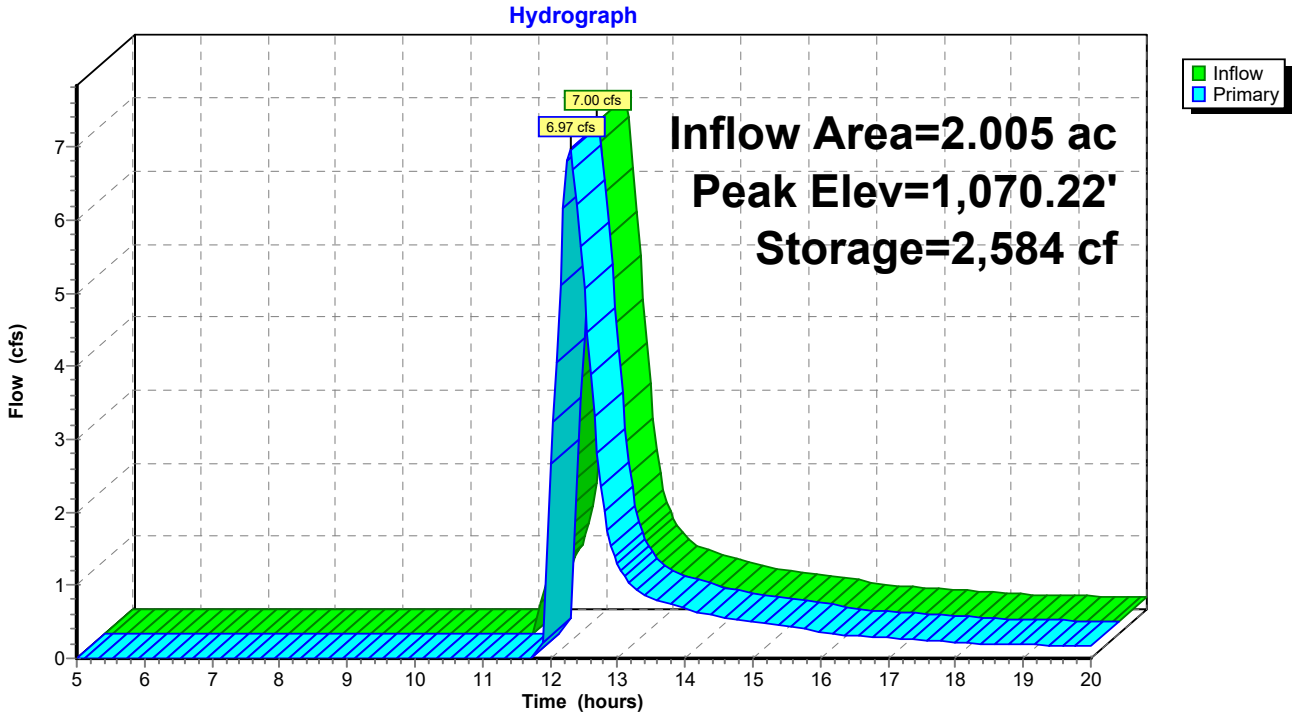
Volume	Invert	Avail.Storage	Storage Description
#1	1,068.99'	56,758 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,068.99	1	0	0
1,069.00	1,500	8	8
1,071.00	3,500	5,000	5,008
1,072.00	100,000	51,750	56,758

Device	Routing	Invert	Outlet Devices
#1	Primary	1,070.00'	**25.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=6.94 cfs @ 12.29 hrs HW=1,070.22' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 6.94 cfs @ 1.26 fps)

Pond Ex Pond A: Ex. Det Pond "A"



Summary for Pond Ex Pond FB: Ex. Det Pond Forebay

Inflow Area = 2.005 ac, 0.00% Impervious, Inflow Depth > 4.19" for 100 year event event
Inflow = 8.12 cfs @ 12.19 hrs, Volume= 0.700 af
Outflow = 7.00 cfs @ 12.27 hrs, Volume= 0.626 af, Atten= 14%, Lag= 5.1 min
Primary = 7.00 cfs @ 12.27 hrs, Volume= 0.626 af
Routed to Pond Ex Pond A : Ex. Det Pond "A"

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,069.64' @ 12.27 hrs Surf.Area= 29,598 sf Storage= 5,443 cf

Plug-Flow detention time= 57.1 min calculated for 0.624 af (89% of inflow)
Center-of-Mass det. time= 24.2 min (807.0 - 782.8)

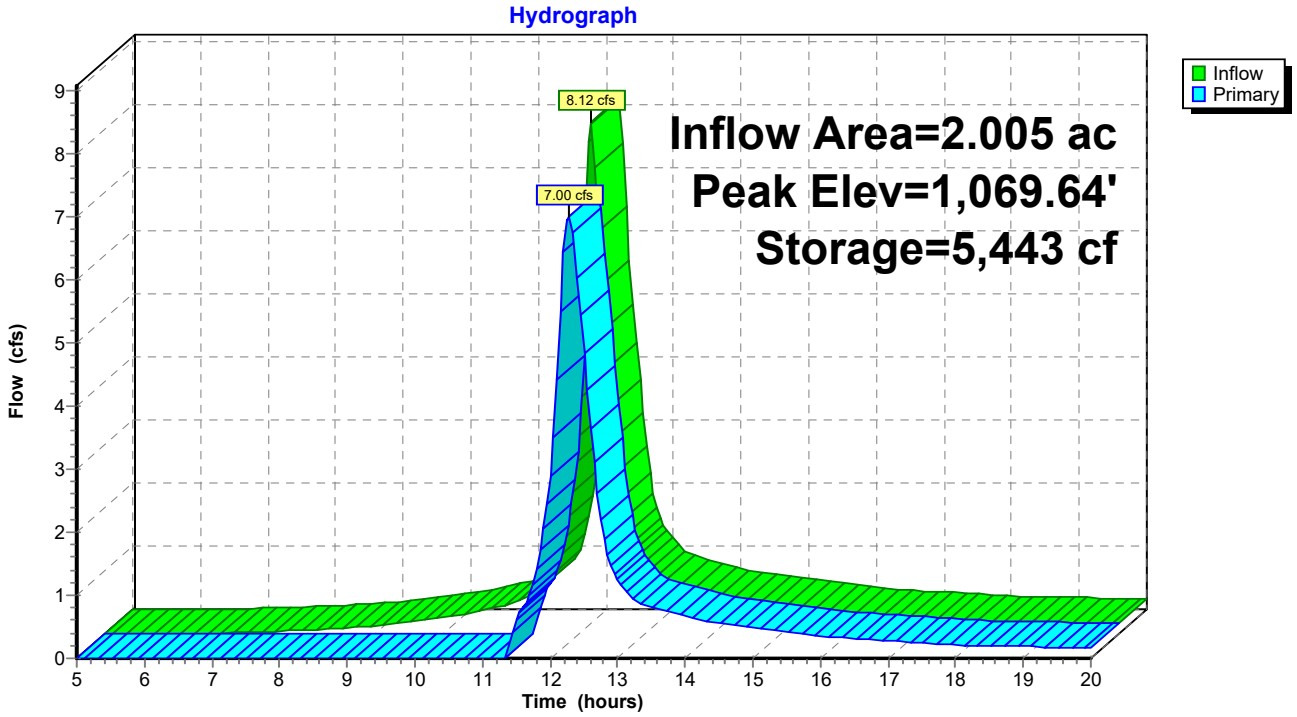
Volume	Invert	Avail.Storage	Storage Description
#1	1,067.99'	28,784 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,067.99	0	0	0
1,068.00	2,000	10	10
1,069.50	2,274	3,206	3,215
1,070.00	100,000	25,569	28,784

Device	Routing	Invert	Outlet Devices
#1	Primary	1,069.50'	**50.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

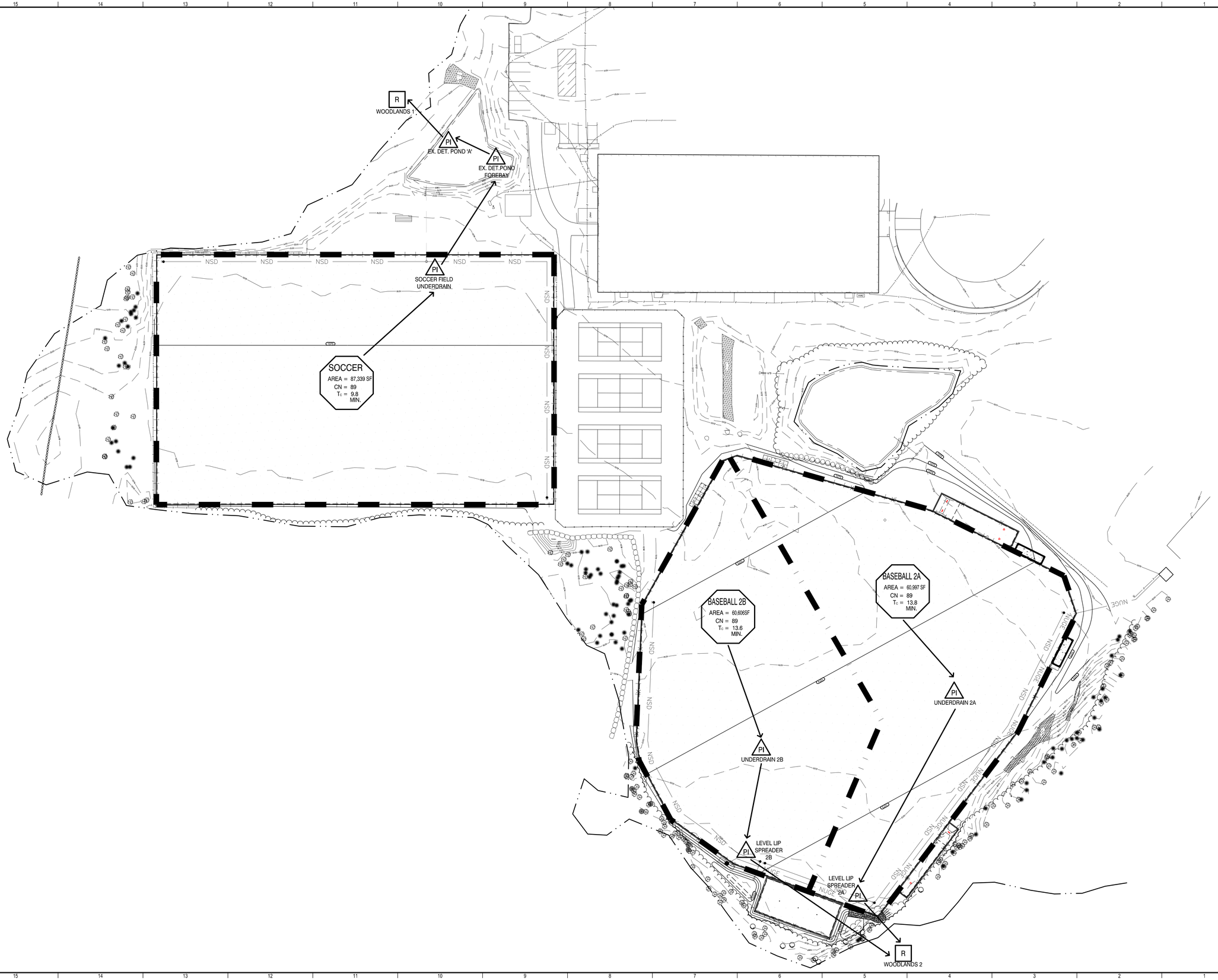
Primary OutFlow Max=6.94 cfs @ 12.27 hrs HW=1,069.64' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 6.94 cfs @ 1.00 fps)

Pond Ex Pond FB: Ex. Det Pond Forebay



Post-Development Conditions Analysis — Appendix C

CONTENTS:



REV	DESCRIPTION	DATE
0	ISSUED FOR PERMITTING	4-5-22

ISSUED FOR PERMITTING
4-5-22

CURRENT ISSUE STATUS:

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POST-DEVELOPMENT WATERSHED PLAN

SHEET TITLE:

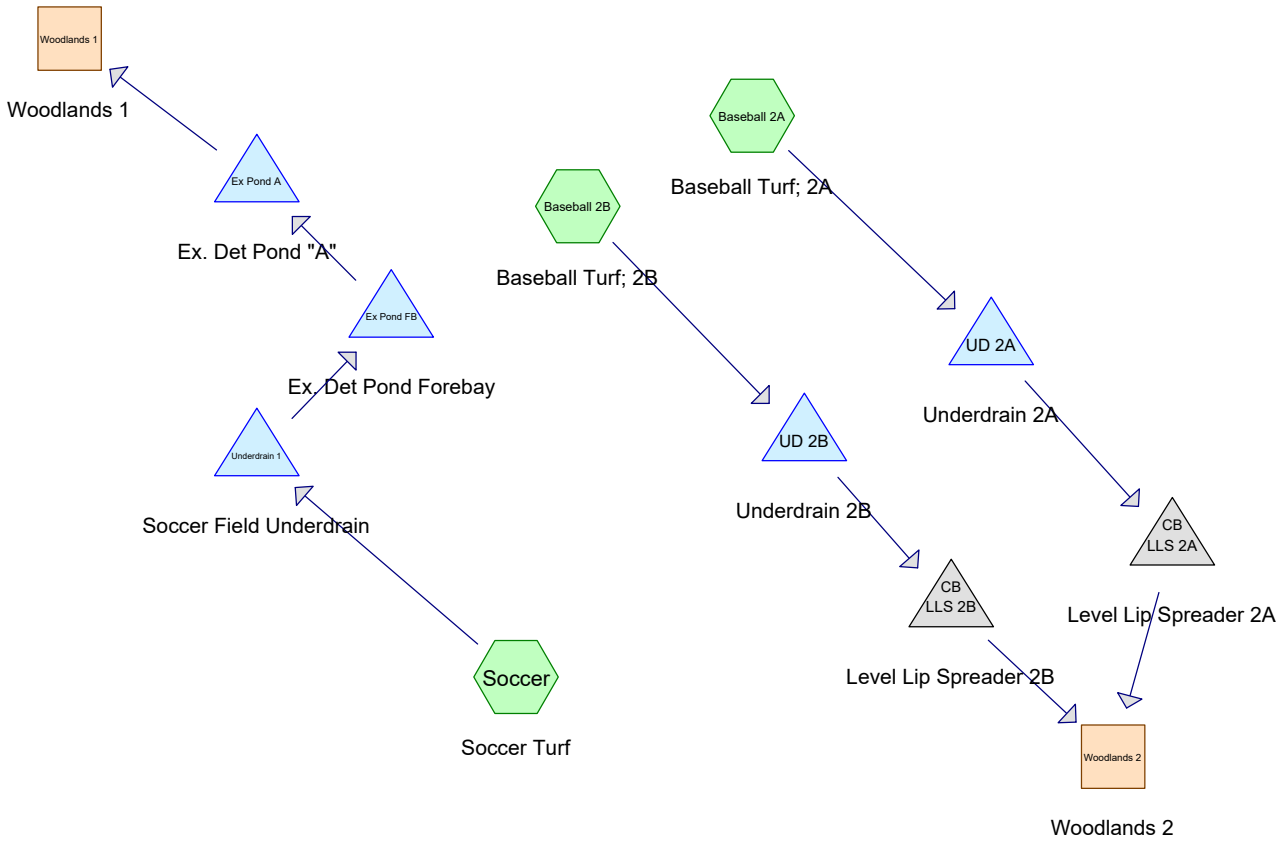
0 20' 40' 80' 120'

SCALE: 1" = 40'

PROJECT MANAGER:	KDC	PROJECT NO:	21193
A/E OF RECORD:	MAF		
JOB CAPTAIN:	WSM		
DRAWN BY:	WSM		
SMRT FILE:	C-121-21193	SHEET No.	C-121

NOT FOR CONSTRUCTION

24x36



Subcat Reach Pond Link

Routing Diagram for 21193 Prop Cond 1
Prepared by SMRT, Printed 4/6/2022
HydroCAD® 10.10-7a s/n 00729 © 2021 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2 year event	Type III 24-hr		Default	24.00	1	2.87	2
2	10 year event	Type III 24-hr		Default	24.00	1	4.38	2
3	25 year event	Type III 24-hr		Default	24.00	1	5.32	2
4	100 year event	Type III 24-hr		Default	24.00	1	6.76	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
4.797	89	<50% Grass cover, Poor, HSG D (Baseball 2A, Baseball 2B, Soccer)
4.797	**89**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
4.797	HSG D	Baseball 2A, Baseball 2B, Soccer
0.000	Other	
4.797		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	4.797	0.000	4.797	<50% Grass cover, Poor	Baseball 2A, Baseball 2B, Soccer
0.000	**0.000**	**0.000**	**4.797**	**0.000**	**4.797**	**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	Baseball 2A	0.00	0.00	240.0	0.0050	0.013	12.0	3.0	0.0
2	Baseball 2B	0.00	0.00	153.0	0.0050	0.013	12.0	3.0	0.0
3	Soccer	0.00	0.00	150.0	0.0050	0.013	12.0	3.0	0.0
4	UD 2A	1,068.00	1,067.50	30.0	0.0167	0.013	0.0	10.0	0.0
5	UD 2B	1,068.00	1,067.50	30.0	0.0167	0.013	0.0	10.0	0.0
6	Underdrain 1	1,068.50	1,068.30	75.0	0.0027	0.013	0.0	12.0	0.0

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

Subcatchment Baseball 2A: Baseball Turf; Runoff Area=60,997 sf 0.00% Impervious Runoff Depth>1.66"
Flow Length=470' Tc=22.7 min CN=89 Runoff=1.86 cfs 0.194 af

Subcatchment Baseball 2B: Baseball Turf; Runoff Area=60,606 sf 0.00% Impervious Runoff Depth>1.66"
Flow Length=428' Tc=23.1 min CN=89 Runoff=1.84 cfs 0.193 af

Subcatchment Soccer: Soccer Turf Runoff Area=87,339 sf 0.00% Impervious Runoff Depth>1.66"
Flow Length=375' Tc=21.6 min CN=89 Runoff=2.73 cfs 0.278 af

Reach Woodlands 1: Woodlands 1 Inflow=2.04 cfs 0.157 af
Outflow=2.04 cfs 0.157 af

Reach Woodlands 2: Woodlands 2 Inflow=3.69 cfs 0.386 af
Outflow=3.69 cfs 0.386 af

Pond Ex Pond A: Ex. Det Pond "A" Peak Elev=1,070.10' Storage=2,255 cf Inflow=2.43 cfs 0.204 af
Outflow=2.04 cfs 0.157 af

Pond Ex Pond FB: Ex. Det Pond Forebay Peak Elev=1,069.57' Storage=3,834 cf Inflow=2.73 cfs 0.278 af
Outflow=2.43 cfs 0.204 af

Pond LLS 2A: Level Lip Spreader 2A Peak Elev=1,070.12' Inflow=1.85 cfs 0.194 af
Outflow=1.85 cfs 0.194 af

Pond LLS 2B: Level Lip Spreader 2B Peak Elev=1,070.12' Inflow=1.84 cfs 0.193 af
Outflow=1.84 cfs 0.193 af

Pond UD 2A: Underdrain 2A Peak Elev=1,068.91' Storage=65 cf Inflow=1.86 cfs 0.194 af
10.0" Round Culvert n=0.013 L=30.0' S=0.0167 '/' Outflow=1.85 cfs 0.194 af

Pond UD 2B: Underdrain 2B Peak Elev=1,068.91' Storage=6 cf Inflow=1.84 cfs 0.193 af
10.0" Round Culvert n=0.013 L=30.0' S=0.0167 '/' Outflow=1.84 cfs 0.193 af

Pond Underdrain 1: Soccer Field Underdrain Peak Elev=1,070.02' Storage=82 cf Inflow=2.73 cfs 0.278 af
12.0" Round Culvert n=0.013 L=75.0' S=0.0027 '/' Outflow=2.73 cfs 0.278 af

Total Runoff Area = 4.797 ac Runoff Volume = 0.664 af Average Runoff Depth = 1.66"
100.00% Pervious = 4.797 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment Baseball 2A: Baseball Turf; 2A

[47] Hint: Peak is 428% of capacity of segment #3

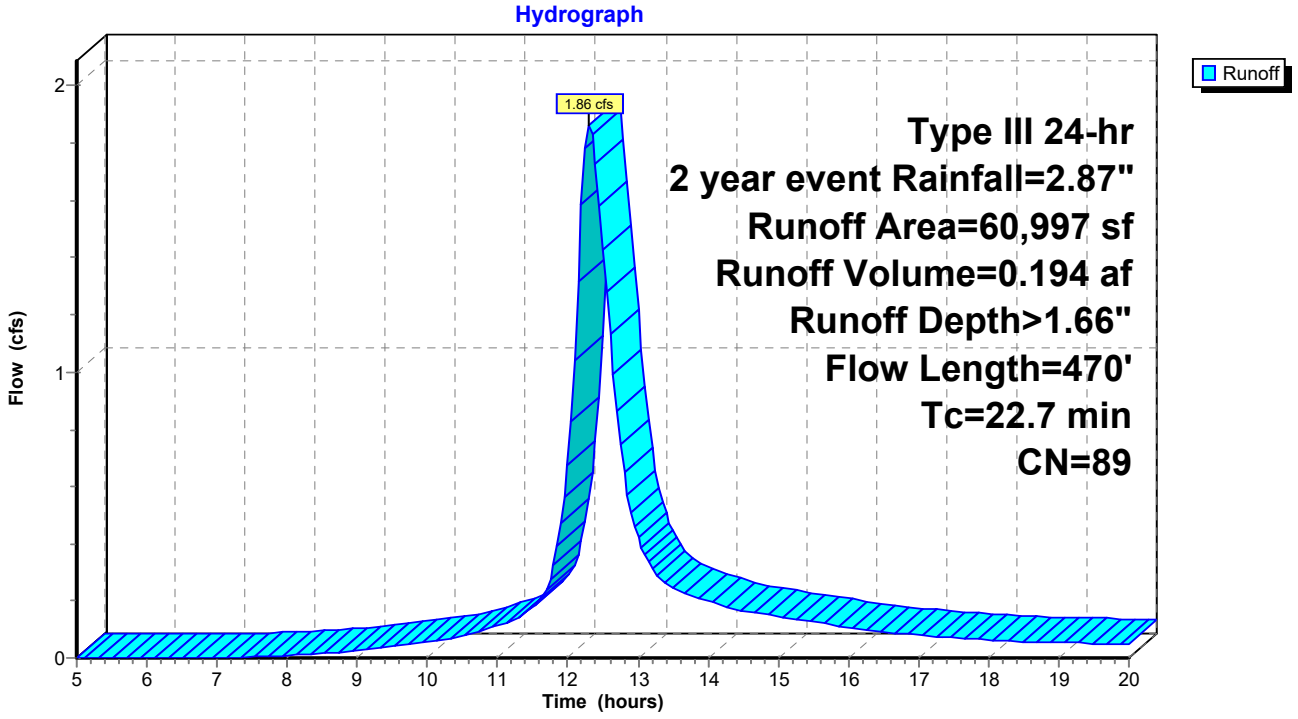
Runoff = 1.86 cfs @ 12.31 hrs, Volume= 0.194 af, Depth> 1.66"
Routed to Pond UD 2A : Underdrain 2A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year event Rainfall=2.87"

Area (sf)	CN	Description
60,997	89	<50% Grass cover, Poor, HSG D
60,997		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0075	0.10		**Sheet Flow, Turf Field** Grass: Short n= 0.150 P2= 2.38"
3.6	130	0.0075	0.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.3	240	0.0050	1.74	0.44	**Pipe Channel, Panel Drains** 12.0" x 3.0" Box Area= 0.3 sf Perim= 2.5' r= 0.10' n= 0.013 Corrugated PE, smooth interior
22.7	470	Total			

Subcatchment Baseball 2A: Baseball Turf; 2A



Summary for Subcatchment Baseball 2B: Baseball Turf; 2B

[47] Hint: Peak is 423% of capacity of segment #3

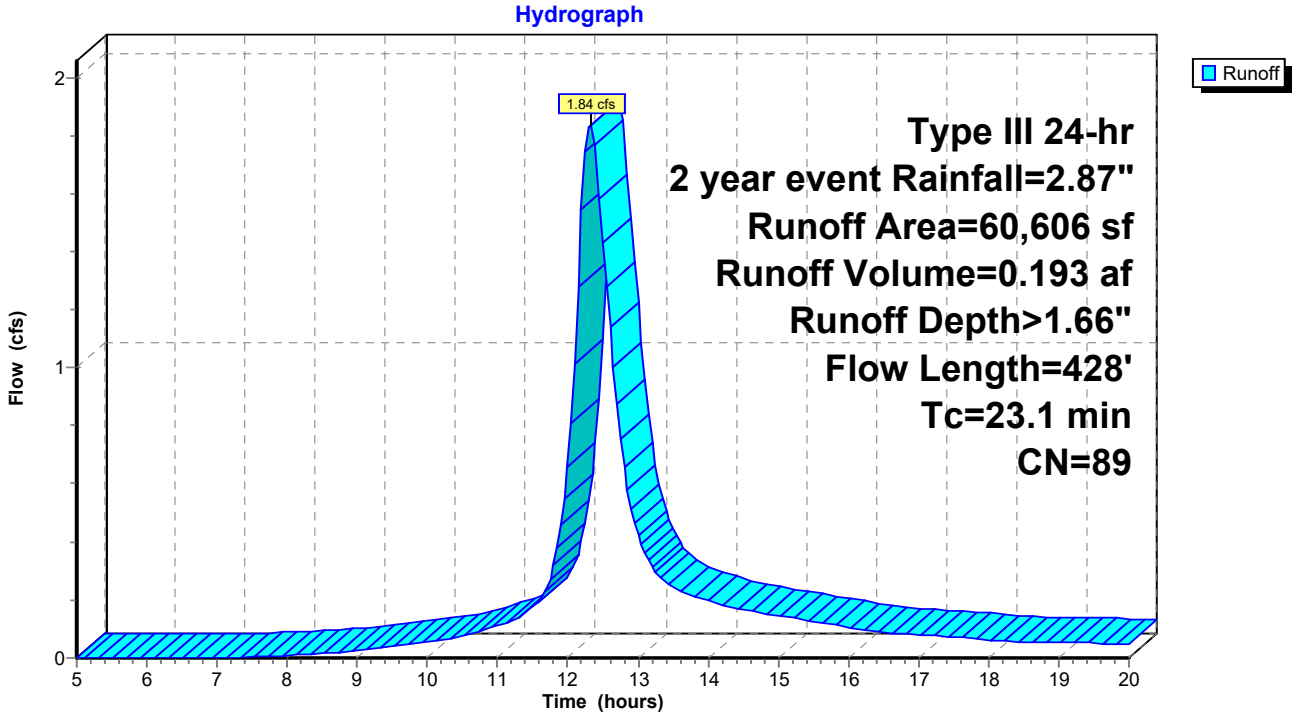
Runoff = 1.84 cfs @ 12.32 hrs, Volume= 0.193 af, Depth> 1.66"
Routed to Pond UD 2B : Underdrain 2B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year event Rainfall=2.87"

Area (sf)	CN	Description
60,606	89	<50% Grass cover, Poor, HSG D
60,606		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0075	0.10		**Sheet Flow, Turf Field** Grass: Short n= 0.150 P2= 2.38"
4.8	175	0.0075	0.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.5	153	0.0050	1.74	0.44	**Pipe Channel, Panel Drains** 12.0" x 3.0" Box Area= 0.3 sf Perim= 2.5' r= 0.10' n= 0.013 Corrugated PE, smooth interior
23.1	428	Total			

Subcatchment Baseball 2B: Baseball Turf; 2B



Summary for Subcatchment Soccer: Soccer Turf

[47] Hint: Peak is 626% of capacity of segment #3

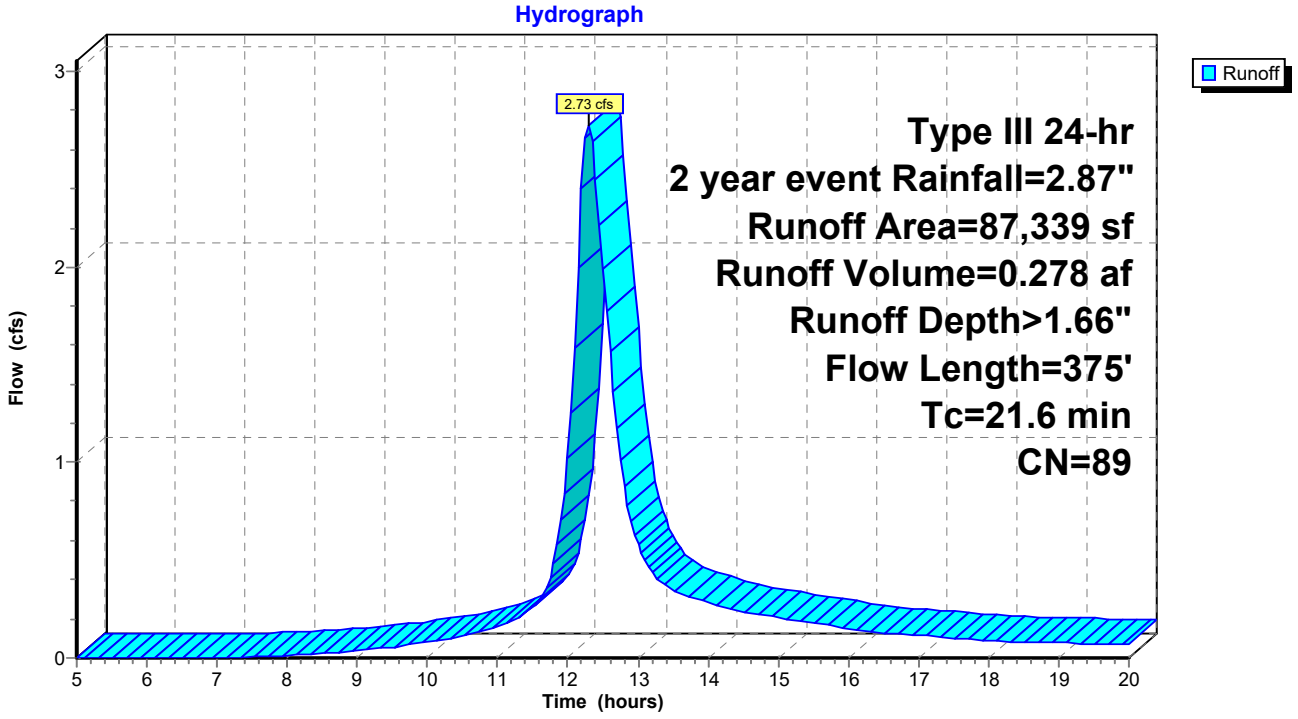
Runoff = 2.73 cfs @ 12.30 hrs, Volume= 0.278 af, Depth> 1.66"
Routed to Pond Underdrain 1 : Soccer Field Underdrain

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year event Rainfall=2.87"

Area (sf)	CN	Description
87,339	89	<50% Grass cover, Poor, HSG D
87,339		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0075	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.38"
3.4	125	0.0075	0.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.4	150	0.0050	1.74	0.44	**Pipe Channel, Panel Drains** 12.0" x 3.0" Box Area= 0.3 sf Perim= 2.5' r= 0.10' n= 0.013 Corrugated PE, smooth interior
21.6	375	Total			

Subcatchment Soccer: Soccer Turf



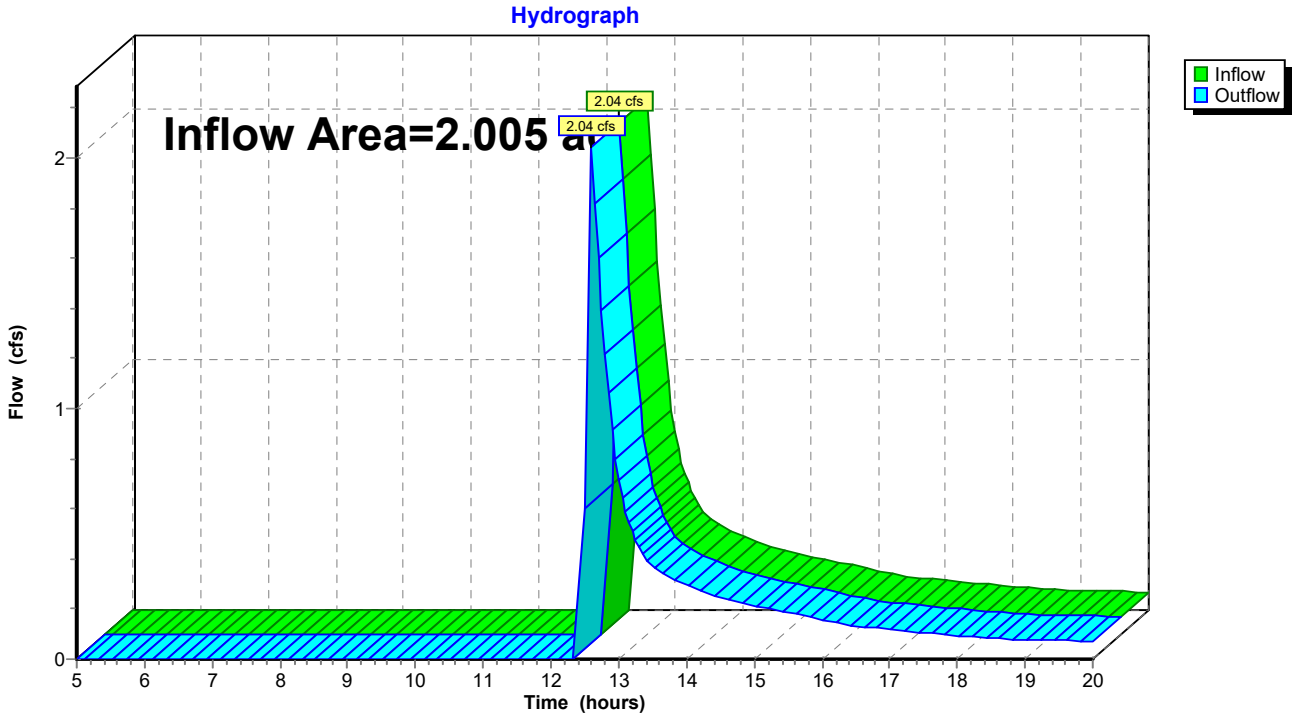
Summary for Reach Woodlands 1: Woodlands 1

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

Inflow Area = 2.005 ac, 0.00% Impervious, Inflow Depth > 0.94" for 2 year event event
Inflow = 2.04 cfs @ 12.60 hrs, Volume= 0.157 af
Outflow = 2.04 cfs @ 12.60 hrs, Volume= 0.157 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach Woodlands 1: Woodlands 1



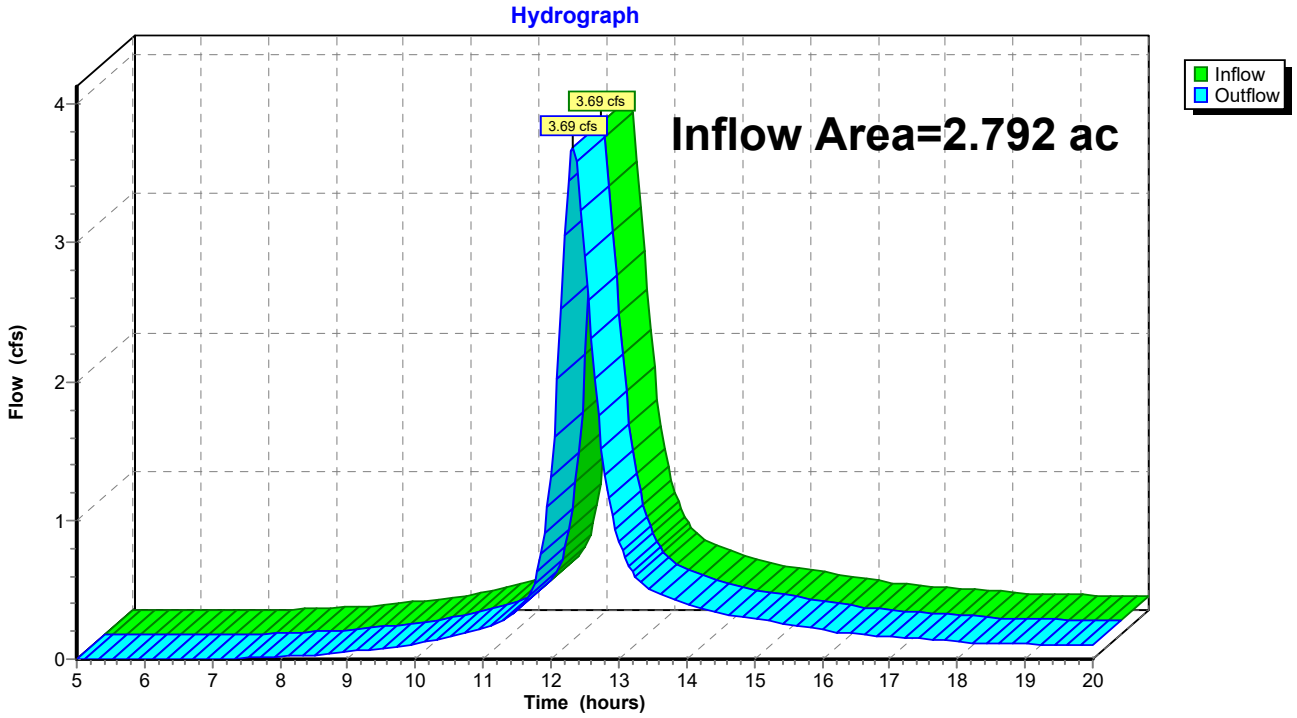
Summary for Reach Woodlands 2: Woodlands 2

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

Inflow Area = 2.792 ac, 0.00% Impervious, Inflow Depth > 1.66" for 2 year event event
Inflow = 3.69 cfs @ 12.33 hrs, Volume= 0.386 af
Outflow = 3.69 cfs @ 12.33 hrs, Volume= 0.386 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach Woodlands 2: Woodlands 2



Summary for Pond Ex Pond A: Ex. Det Pond "A"

[81] Warning: Exceeded Pond Ex Pond FB by 0.54' @ 12.60 hrs

Inflow Area = 2.005 ac, 0.00% Impervious, Inflow Depth > 1.22" for 2 year event event
Inflow = 2.43 cfs @ 12.43 hrs, Volume= 0.204 af
Outflow = 2.04 cfs @ 12.60 hrs, Volume= 0.157 af, Atten= 16%, Lag= 10.0 min
Primary = 2.04 cfs @ 12.60 hrs, Volume= 0.157 af
Routed to Reach Woodlands 1 : Woodlands 1

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,070.10' @ 12.60 hrs Surf.Area= 2,597 sf Storage= 2,255 cf

Plug-Flow detention time= 85.0 min calculated for 0.156 af (77% of inflow)
Center-of-Mass det. time= 29.7 min (866.1 - 836.4)

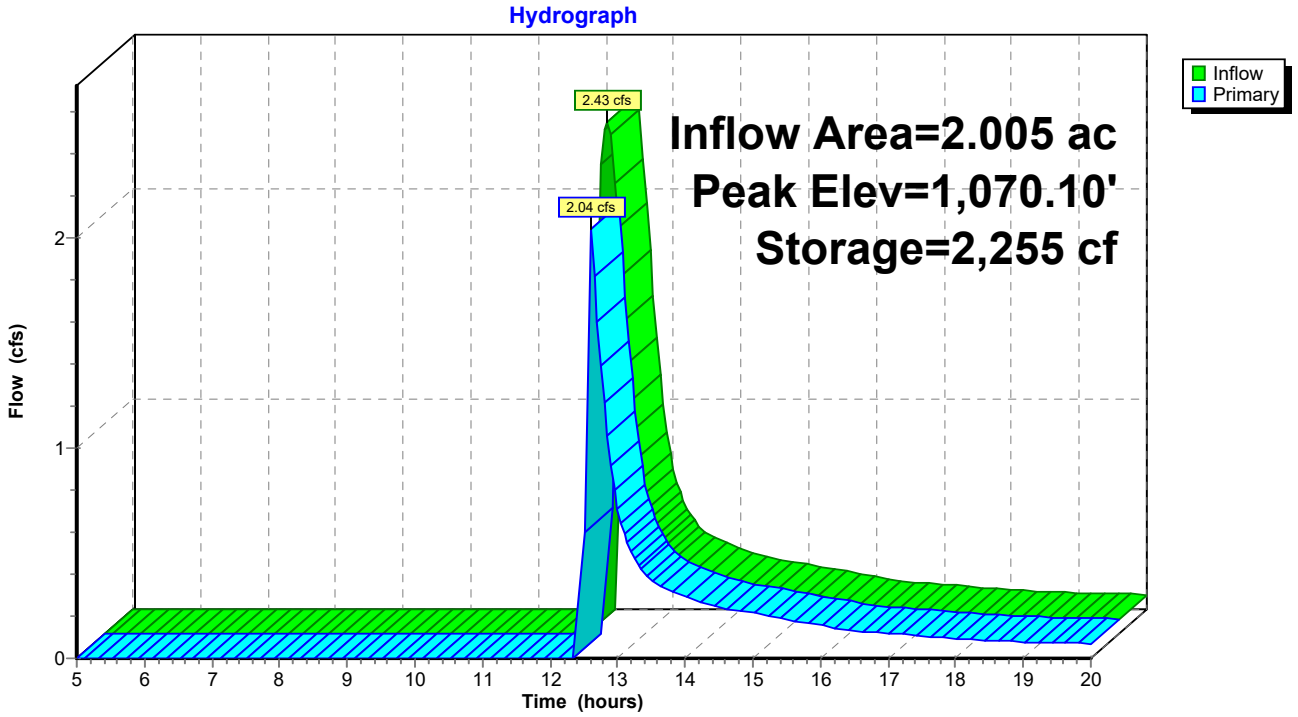
Volume	Invert	Avail.Storage	Storage Description
#1	1,068.99'	56,758 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,068.99	1	0	0
1,069.00	1,500	8	8
1,071.00	3,500	5,000	5,008
1,072.00	100,000	51,750	56,758

Device	Routing	Invert	Outlet Devices
#1	Primary	1,070.00'	**25.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=2.03 cfs @ 12.60 hrs HW=1,070.10' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 2.03 cfs @ 0.83 fps)

Pond Ex Pond A: Ex. Det Pond "A"



Summary for Pond Ex Pond FB: Ex. Det Pond Forebay

[81] Warning: Exceeded Pond Underdrain 1 by 0.50' @ 13.85 hrs

Inflow Area = 2.005 ac, 0.00% Impervious, Inflow Depth > 1.66" for 2 year event event
Inflow = 2.73 cfs @ 12.32 hrs, Volume= 0.278 af
Outflow = 2.43 cfs @ 12.43 hrs, Volume= 0.204 af, Atten= 11%, Lag= 6.9 min
Primary = 2.43 cfs @ 12.43 hrs, Volume= 0.204 af
Routed to Pond Ex Pond A : Ex. Det Pond "A"

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,069.57' @ 12.43 hrs Surf.Area= 15,709 sf Storage= 3,834 cf

Plug-Flow detention time= 102.0 min calculated for 0.203 af (73% of inflow)
Center-of-Mass det. time= 42.1 min (836.4 - 794.3)

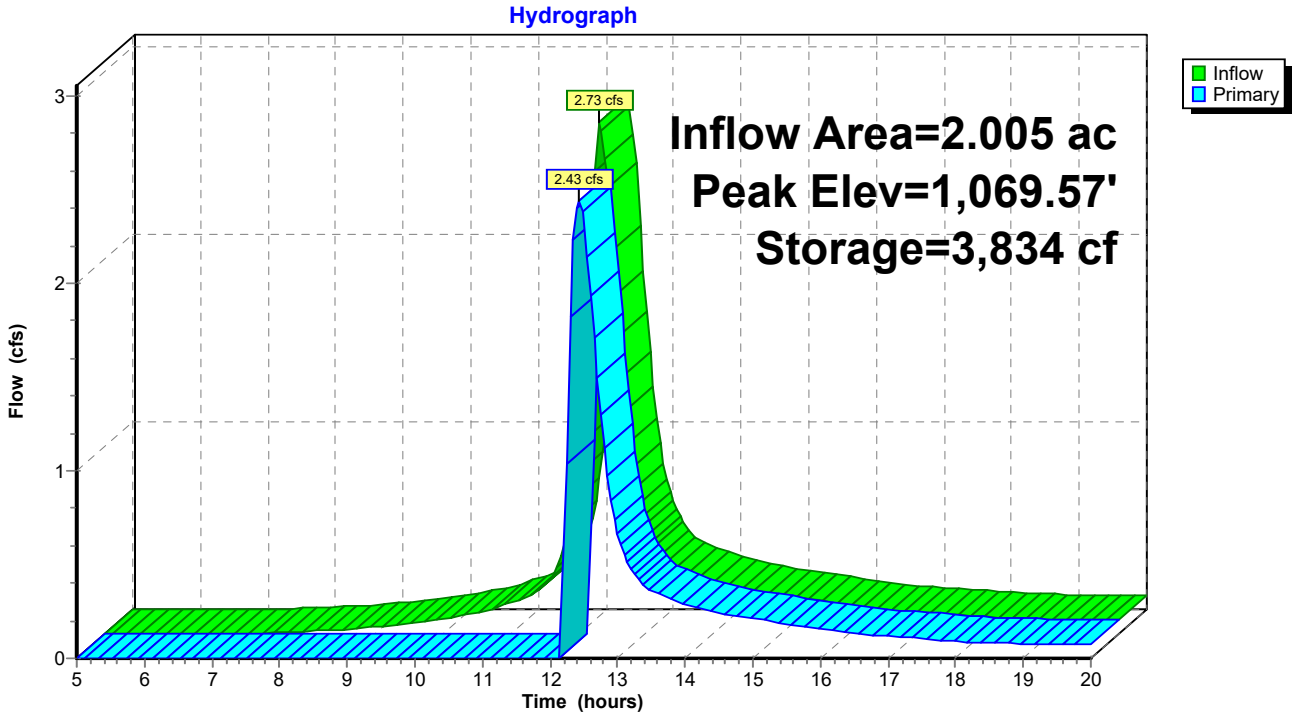
Volume	Invert	Avail.Storage	Storage Description
#1	1,067.99'	28,784 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,067.99	0	0	0
1,068.00	2,000	10	10
1,069.50	2,274	3,206	3,215
1,070.00	100,000	25,569	28,784

Device	Routing	Invert	Outlet Devices
#1	Primary	1,069.50'	**50.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=2.40 cfs @ 12.43 hrs HW=1,069.57' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 2.40 cfs @ 0.70 fps)

Pond Ex Pond FB: Ex. Det Pond Forebay



Summary for Pond LLS 2A: Level Lip Spreader 2A

[57] Hint: Peaked at 1,070.12' (Flood elevation advised)
[81] Warning: Exceeded Pond UD 2A by 2.00' @ 5.00 hrs

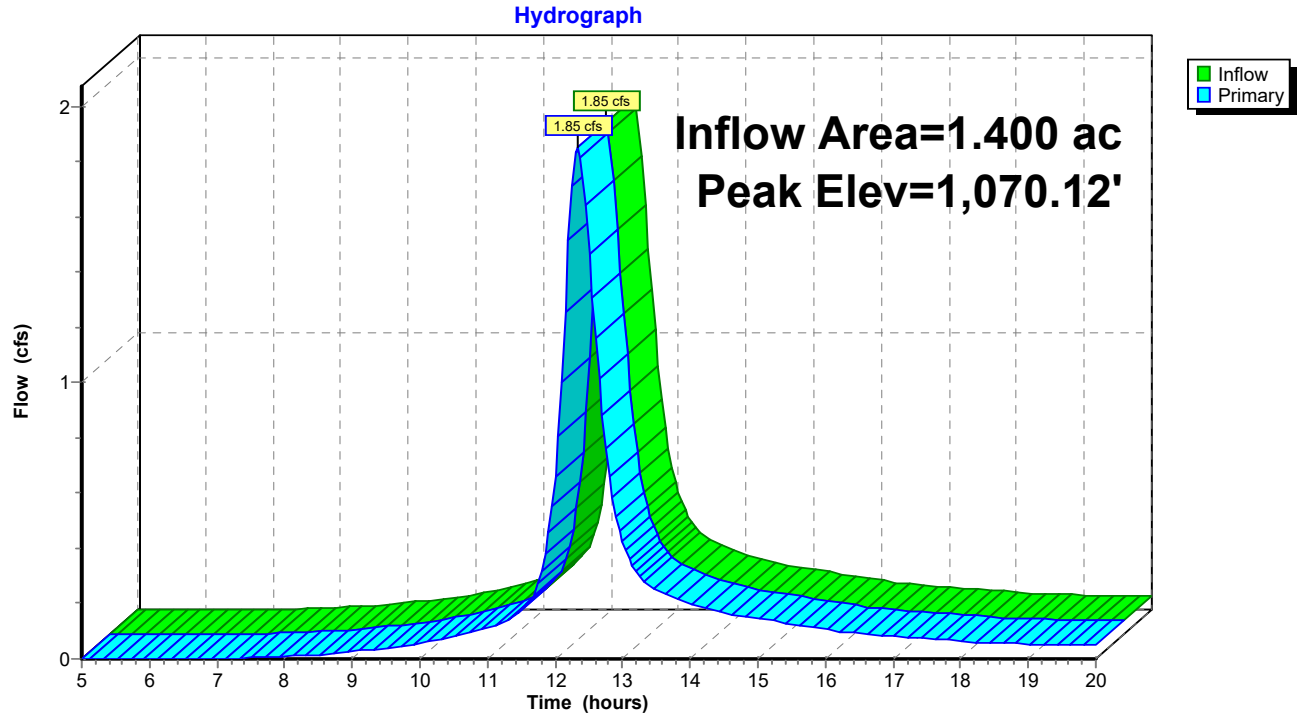
Inflow Area = 1.400 ac, 0.00% Impervious, Inflow Depth > 1.66" for 2 year event event
Inflow = 1.85 cfs @ 12.33 hrs, Volume= 0.194 af
Outflow = 1.85 cfs @ 12.33 hrs, Volume= 0.194 af, Atten= 0%, Lag= 0.0 min
Primary = 1.85 cfs @ 12.33 hrs, Volume= 0.194 af
Routed to Reach Woodlands 2 : Woodlands 2

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,070.12' @ 12.33 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	1,070.00'	**20.0' long x 5.0' 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) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=1.84 cfs @ 12.33 hrs HW=1,070.12' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 1.84 cfs @ 0.80 fps)

Pond LLS 2A: Level Lip Spreader 2A



Summary for Pond LLS 2B: Level Lip Spreader 2B

[57] Hint: Peaked at 1,070.12' (Flood elevation advised)
[81] Warning: Exceeded Pond UD 2B by 2.00' @ 5.00 hrs

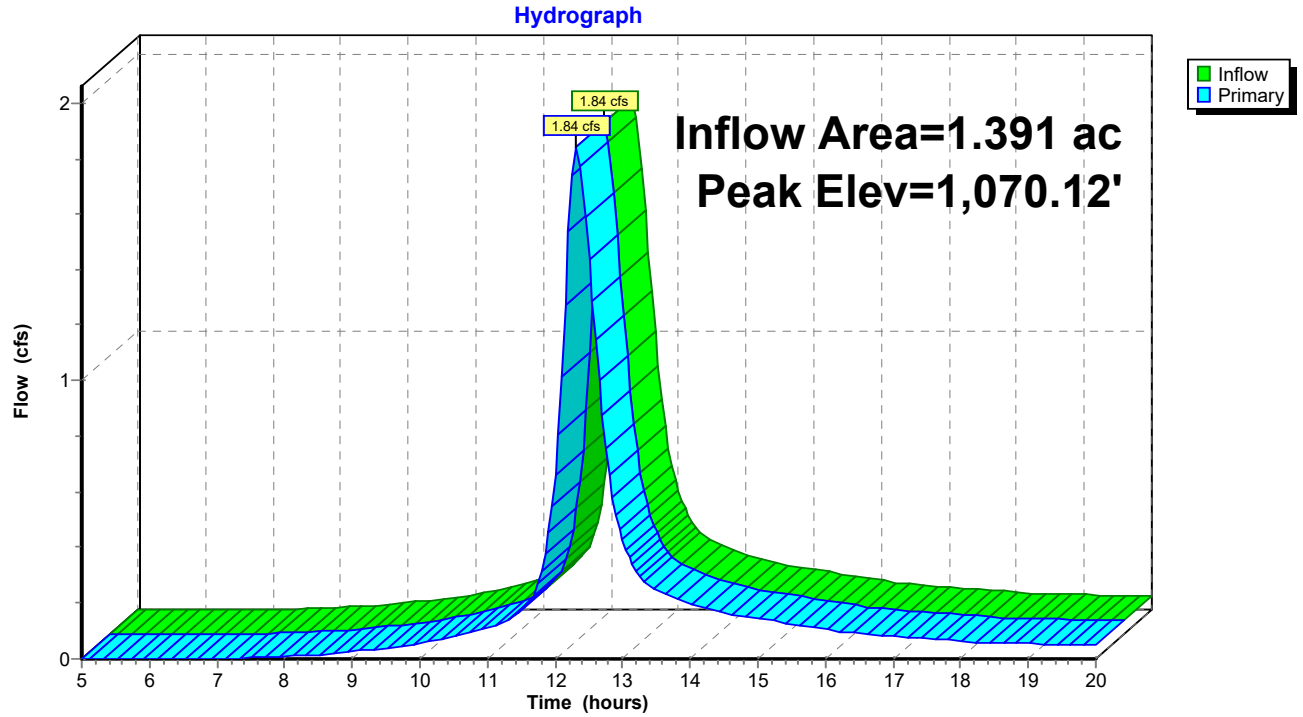
Inflow Area = 1.391 ac, 0.00% Impervious, Inflow Depth > 1.66" for 2 year event event
Inflow = 1.84 cfs @ 12.32 hrs, Volume= 0.193 af
Outflow = 1.84 cfs @ 12.32 hrs, Volume= 0.193 af, Atten= 0%, Lag= 0.0 min
Primary = 1.84 cfs @ 12.32 hrs, Volume= 0.193 af
Routed to Reach Woodlands 2 : Woodlands 2

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,070.12' @ 12.32 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	1,070.00'	**20.0' long x 5.0' 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) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=1.83 cfs @ 12.32 hrs HW=1,070.12' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 1.83 cfs @ 0.79 fps)

Pond LLS 2B: Level Lip Spreader 2B



Summary for Pond UD 2A: Underdrain 2A

Inflow Area = 1.400 ac, 0.00% Impervious, Inflow Depth > 1.66" for 2 year event event
Inflow = 1.86 cfs @ 12.31 hrs, Volume= 0.194 af
Outflow = 1.85 cfs @ 12.33 hrs, Volume= 0.194 af, Atten= 1%, Lag= 1.3 min
Primary = 1.85 cfs @ 12.33 hrs, Volume= 0.194 af
Routed to Pond LLS 2A : Level Lip Spreader 2A

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,068.91' @ 12.33 hrs Surf.Area= 151 sf Storage= 65 cf

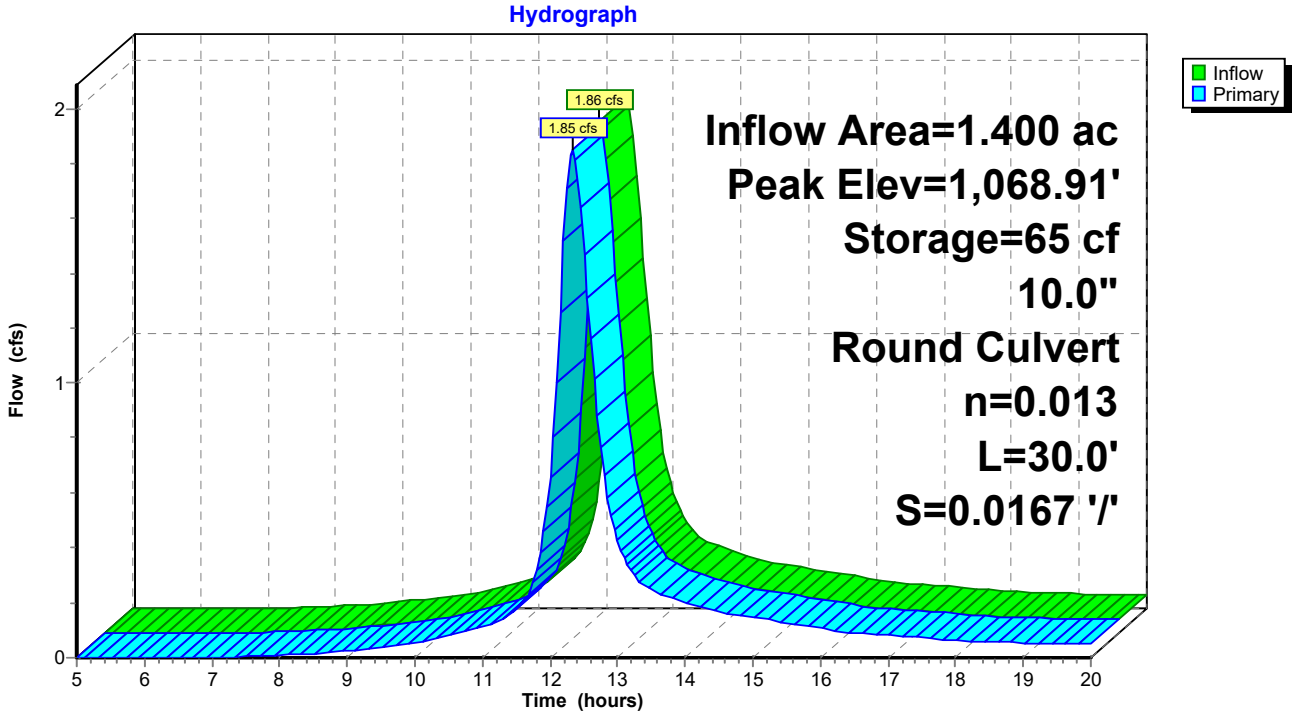
Plug-Flow detention time= 0.3 min calculated for 0.193 af (100% of inflow)
Center-of-Mass det. time= 0.3 min (795.4 - 795.1)

Volume	Invert	Avail.Storage	Storage Description
#1	1,068.00'	255 cf	**12.0" Round Pipe Storage** L= 325.0' S= 0.0050 '/'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,068.00'	**10.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,068.00' / 1,067.50' S= 0.0167 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=1.84 cfs @ 12.33 hrs HW=1,068.91' (Free Discharge)
1=Culvert (Inlet Controls 1.84 cfs @ 3.38 fps)

Pond UD 2A: Underdrain 2A



Summary for Pond UD 2B: Underdrain 2B

Inflow Area = 1.391 ac, 0.00% Impervious, Inflow Depth > 1.66" for 2 year event event
Inflow = 1.84 cfs @ 12.32 hrs, Volume= 0.193 af
Outflow = 1.84 cfs @ 12.32 hrs, Volume= 0.193 af, Atten= 0%, Lag= 0.1 min
Primary = 1.84 cfs @ 12.32 hrs, Volume= 0.193 af
Routed to Pond LLS 2B : Level Lip Spreader 2B

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,068.91' @ 12.32 hrs Surf.Area= 15 sf Storage= 6 cf

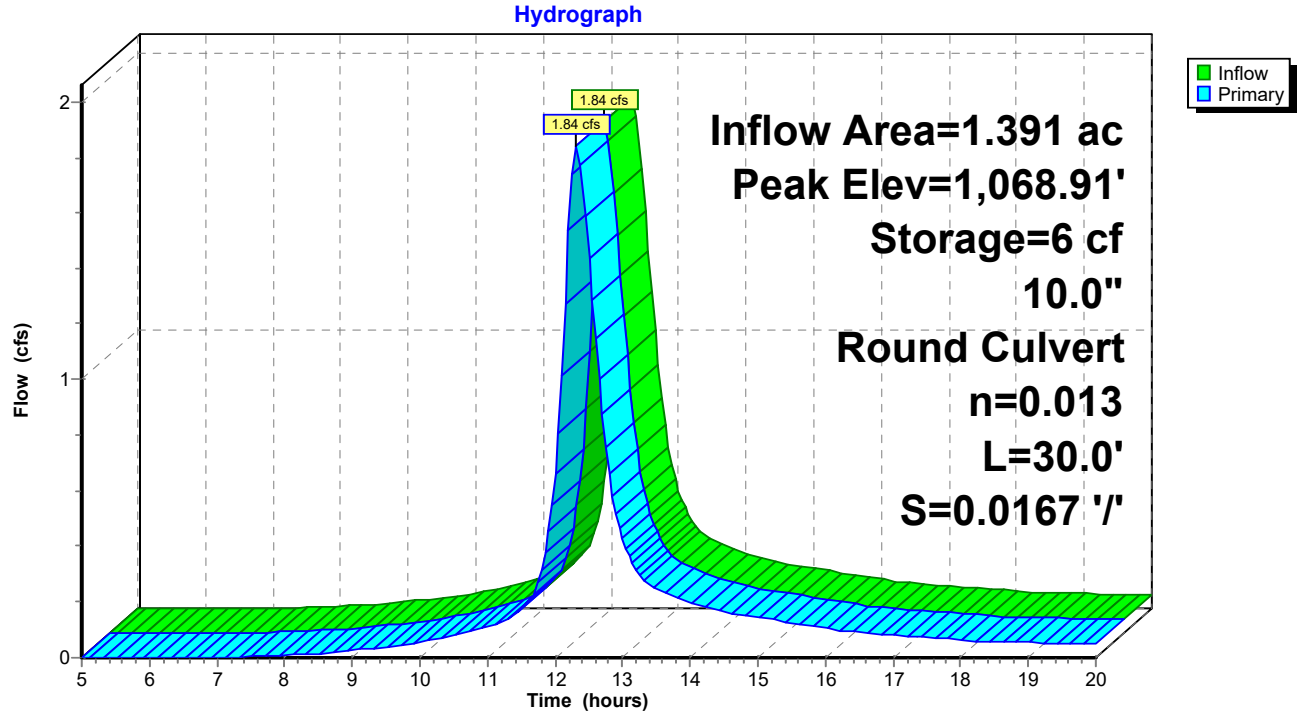
Plug-Flow detention time= 0.0 min calculated for 0.192 af (100% of inflow)
Center-of-Mass det. time= 0.0 min (795.4 - 795.4)

Volume	Invert	Avail.Storage	Storage Description
#1	1,068.00'	263 cf	**12.0" Round Pipe Storage** L= 335.0' S= 0.0500 '/'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,068.00'	**10.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,068.00' / 1,067.50' S= 0.0167 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=1.83 cfs @ 12.32 hrs HW=1,068.90' (Free Discharge)
1=Culvert (Inlet Controls 1.83 cfs @ 3.35 fps)

Pond UD 2B: Underdrain 2B



Summary for Pond Underdrain 1: Soccer Field Underdrain

[44] Hint: Outlet device #1 is below defined storage
[88] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 2.005 ac, 0.00% Impervious, Inflow Depth > 1.66" for 2 year event event
Inflow = 2.73 cfs @ 12.30 hrs, Volume= 0.278 af
Outflow = 2.73 cfs @ 12.32 hrs, Volume= 0.278 af, Atten= 0%, Lag= 1.4 min
Primary = 2.73 cfs @ 12.32 hrs, Volume= 0.278 af
Routed to Pond Ex Pond FB : Ex. Det Pond Forebay

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,070.02' @ 12.32 hrs Surf.Area= 157 sf Storage= 82 cf

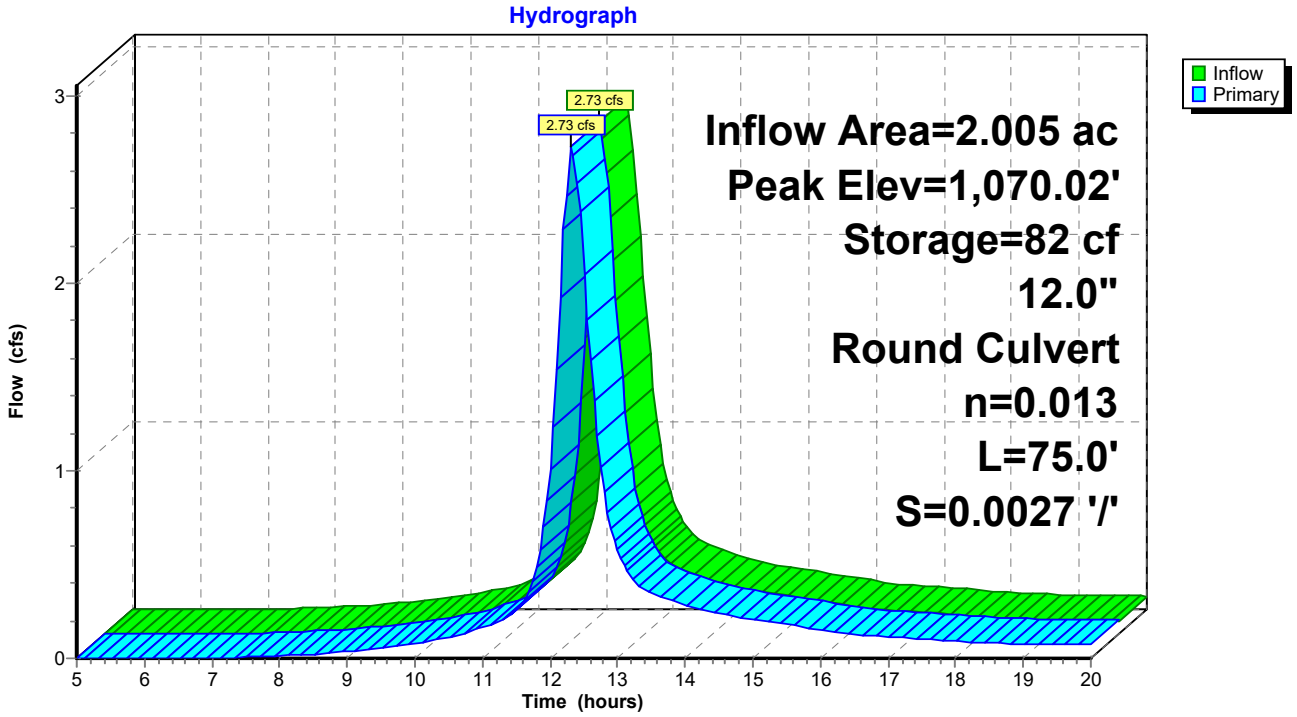
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.1 min (794.3 - 794.2)

Volume	Invert	Avail.Storage	Storage Description
#1	1,069.00'	275 cf	**12.0" Round Pipe Storage** L= 350.0' S= 0.0050 '/'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,068.50'	**12.0" Round Culvert** L= 75.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,068.50' / 1,068.30' S= 0.0027 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.70 cfs @ 12.32 hrs HW=1,070.01' (Free Discharge)
1=Culvert (Barrel Controls 2.70 cfs @ 3.43 fps)

Pond Underdrain 1: Soccer Field Underdrain



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

Subcatchment Baseball 2A: Baseball Turf; Runoff Area=60,997 sf 0.00% Impervious Runoff Depth>2.99"
Flow Length=470' Tc=22.7 min CN=89 Runoff=3.28 cfs 0.348 af

Subcatchment Baseball 2B: Baseball Turf; Runoff Area=60,606 sf 0.00% Impervious Runoff Depth>2.99"
Flow Length=428' Tc=23.1 min CN=89 Runoff=3.23 cfs 0.346 af

Subcatchment Soccer: Soccer Turf Runoff Area=87,339 sf 0.00% Impervious Runoff Depth>2.99"
Flow Length=375' Tc=21.6 min CN=89 Runoff=4.79 cfs 0.499 af

Reach Woodlands 1: Woodlands 1 Inflow=4.38 cfs 0.378 af
Outflow=4.38 cfs 0.378 af

Reach Woodlands 2: Woodlands 2 Inflow=6.45 cfs 0.694 af
Outflow=6.45 cfs 0.694 af

Pond Ex Pond A: Ex. Det Pond "A" Peak Elev=1,070.16' Storage=2,426 cf Inflow=4.38 cfs 0.425 af
Outflow=4.38 cfs 0.378 af

Pond Ex Pond FB: Ex. Det Pond Forebay Peak Elev=1,069.60' Storage=4,466 cf Inflow=4.84 cfs 0.499 af
Outflow=4.38 cfs 0.425 af

Pond LLS 2A: Level Lip Spreader 2A Peak Elev=1,070.17' Inflow=3.24 cfs 0.348 af
Outflow=3.24 cfs 0.348 af

Pond LLS 2B: Level Lip Spreader 2B Peak Elev=1,070.17' Inflow=3.23 cfs 0.346 af
Outflow=3.23 cfs 0.346 af

Pond UD 2A: Underdrain 2A Peak Elev=1,069.93' Storage=220 cf Inflow=3.28 cfs 0.348 af
10.0" Round Culvert n=0.013 L=30.0' S=0.0167 '/' Outflow=3.24 cfs 0.348 af

Pond UD 2B: Underdrain 2B Peak Elev=1,069.93' Storage=23 cf Inflow=3.23 cfs 0.346 af
10.0" Round Culvert n=0.013 L=30.0' S=0.0167 '/' Outflow=3.23 cfs 0.346 af

Pond Underdrain 1: Soccer Field Underdrain Peak Elev=1,071.58' Storage=274 cf Inflow=4.79 cfs 0.499 af
12.0" Round Culvert n=0.013 L=75.0' S=0.0027 '/' Outflow=4.84 cfs 0.499 af

Total Runoff Area = 4.797 ac Runoff Volume = 1.193 af Average Runoff Depth = 2.99"
100.00% Pervious = 4.797 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment Baseball 2A: Baseball Turf; 2A

[47] Hint: Peak is 753% of capacity of segment #3

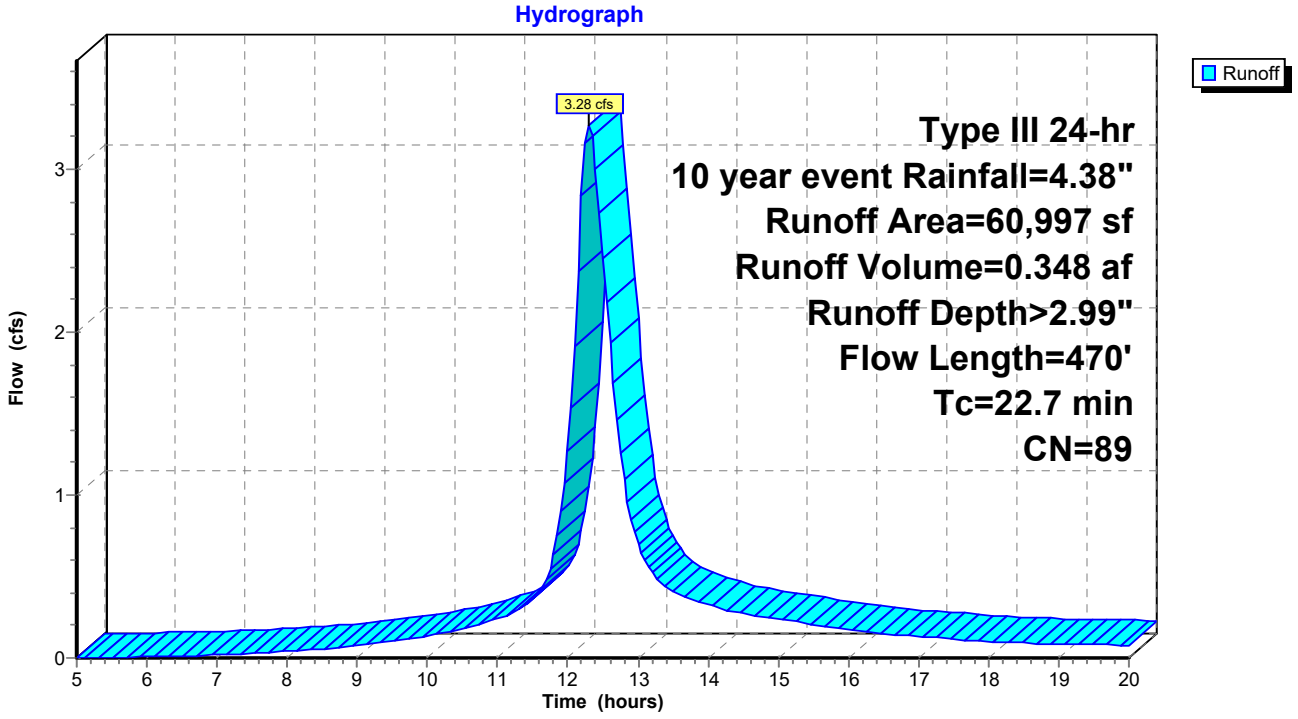
Runoff = 3.28 cfs @ 12.31 hrs, Volume= 0.348 af, Depth> 2.99"
Routed to Pond UD 2A : Underdrain 2A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year event Rainfall=4.38"

Area (sf)	CN	Description
60,997	89	<50% Grass cover, Poor, HSG D
60,997		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0075	0.10		**Sheet Flow, Turf Field** Grass: Short n= 0.150 P2= 2.38"
3.6	130	0.0075	0.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.3	240	0.0050	1.74	0.44	**Pipe Channel, Panel Drains** 12.0" x 3.0" Box Area= 0.3 sf Perim= 2.5' r= 0.10' n= 0.013 Corrugated PE, smooth interior
22.7	470	Total			

Subcatchment Baseball 2A: Baseball Turf; 2A



Summary for Subcatchment Baseball 2B: Baseball Turf; 2B

[47] Hint: Peak is 743% of capacity of segment #3

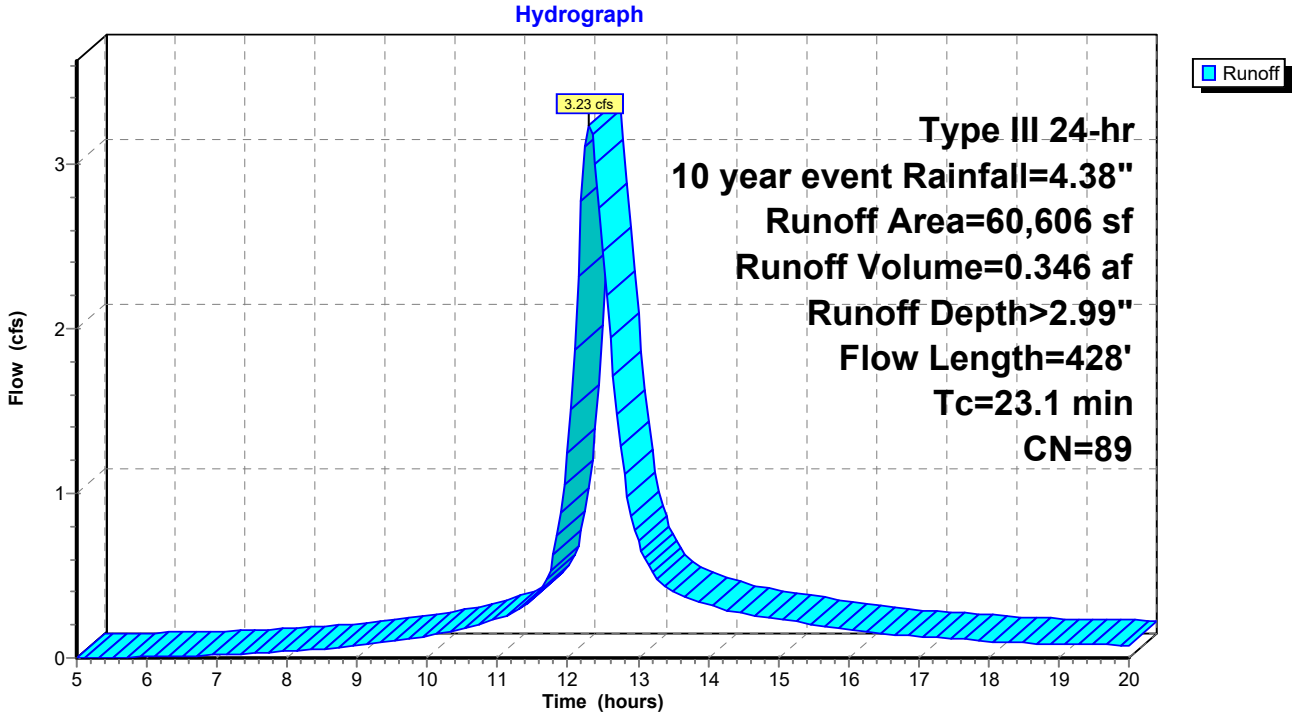
Runoff = 3.23 cfs @ 12.31 hrs, Volume= 0.346 af, Depth> 2.99"
Routed to Pond UD 2B : Underdrain 2B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year event Rainfall=4.38"

Area (sf)	CN	Description
60,606	89	<50% Grass cover, Poor, HSG D
60,606		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0075	0.10		**Sheet Flow, Turf Field** Grass: Short n= 0.150 P2= 2.38"
4.8	175	0.0075	0.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.5	153	0.0050	1.74	0.44	**Pipe Channel, Panel Drains** 12.0" x 3.0" Box Area= 0.3 sf Perim= 2.5' r= 0.10' n= 0.013 Corrugated PE, smooth interior
23.1	428	Total			

Subcatchment Baseball 2B: Baseball Turf; 2B



Summary for Subcatchment Soccer: Soccer Turf

[47] Hint: Peak is 1100% of capacity of segment #3

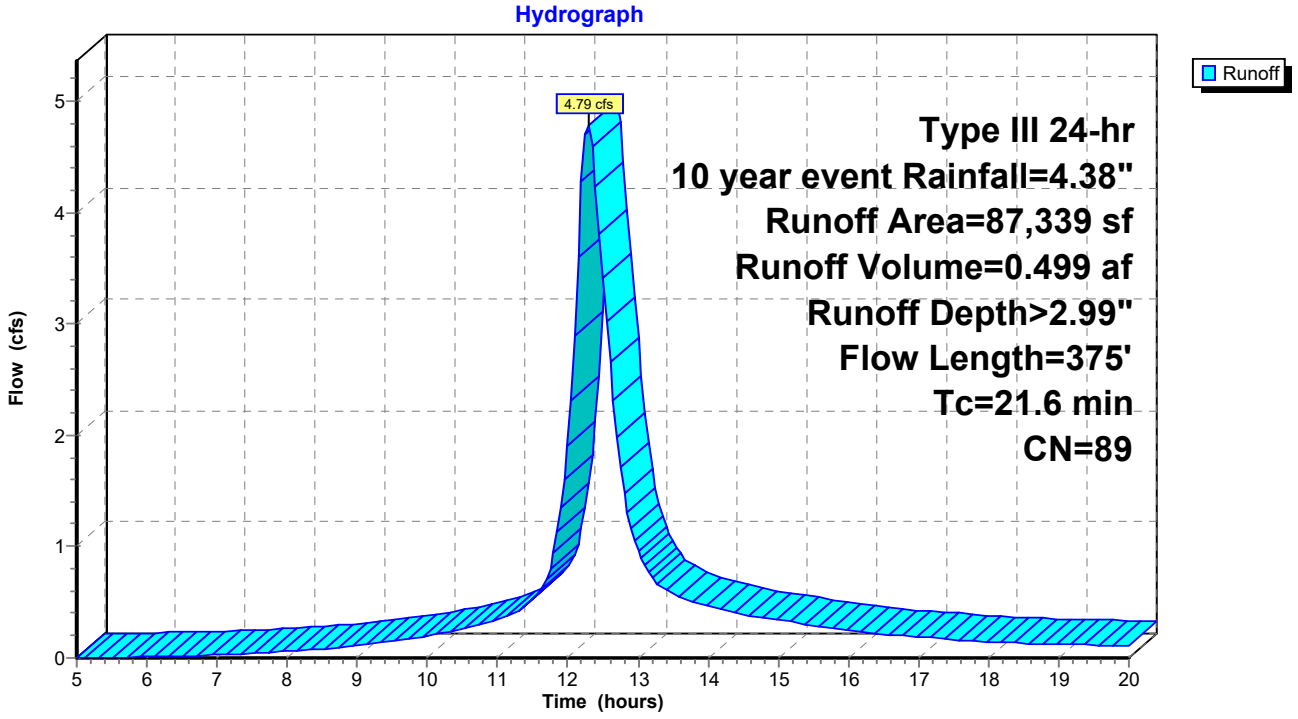
Runoff = 4.79 cfs @ 12.29 hrs, Volume= 0.499 af, Depth> 2.99"
Routed to Pond Underdrain 1 : Soccer Field Underdrain

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year event Rainfall=4.38"

Area (sf)	CN	Description
87,339	89	<50% Grass cover, Poor, HSG D
87,339		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0075	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.38"
3.4	125	0.0075	0.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.4	150	0.0050	1.74	0.44	**Pipe Channel, Panel Drains** 12.0" x 3.0" Box Area= 0.3 sf Perim= 2.5' r= 0.10' n= 0.013 Corrugated PE, smooth interior
21.6	375	Total			

Subcatchment Soccer: Soccer Turf



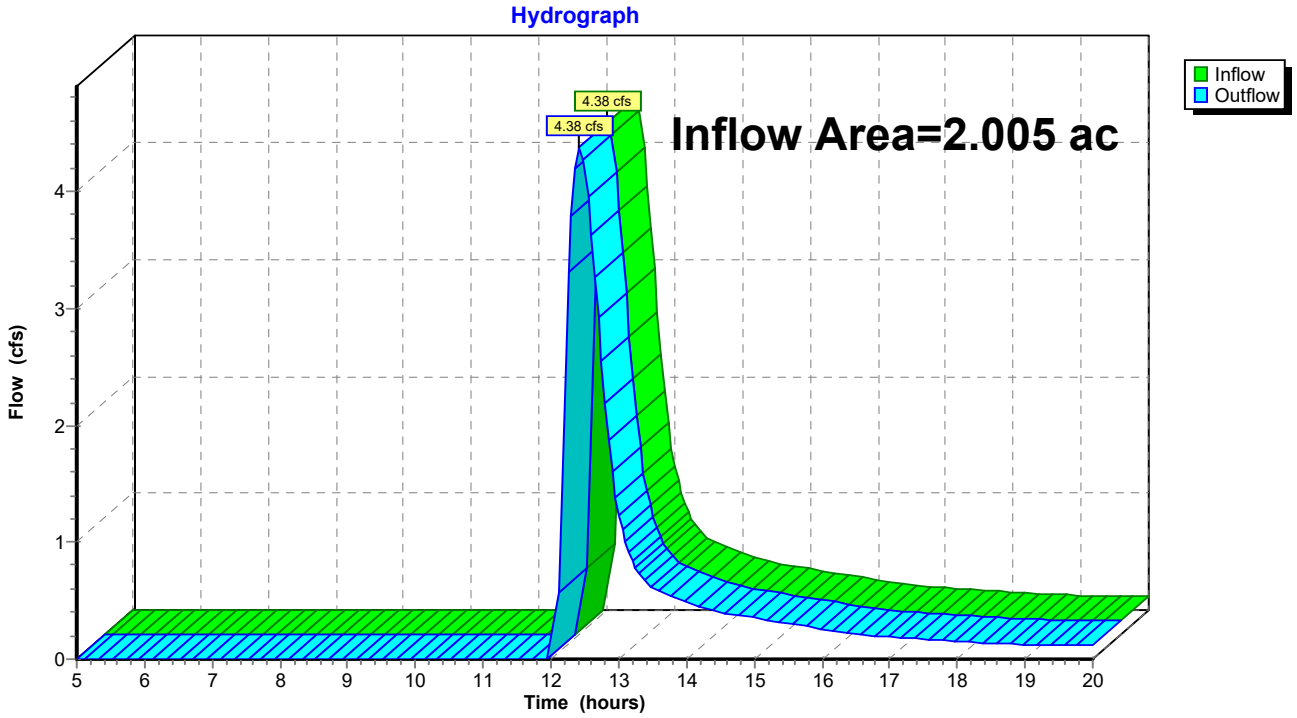
Summary for Reach Woodlands 1: Woodlands 1

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

Inflow Area = 2.005 ac, 0.00% Impervious, Inflow Depth > 2.26" for 10 year event event
Inflow = 4.38 cfs @ 12.42 hrs, Volume= 0.378 af
Outflow = 4.38 cfs @ 12.42 hrs, Volume= 0.378 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach Woodlands 1: Woodlands 1



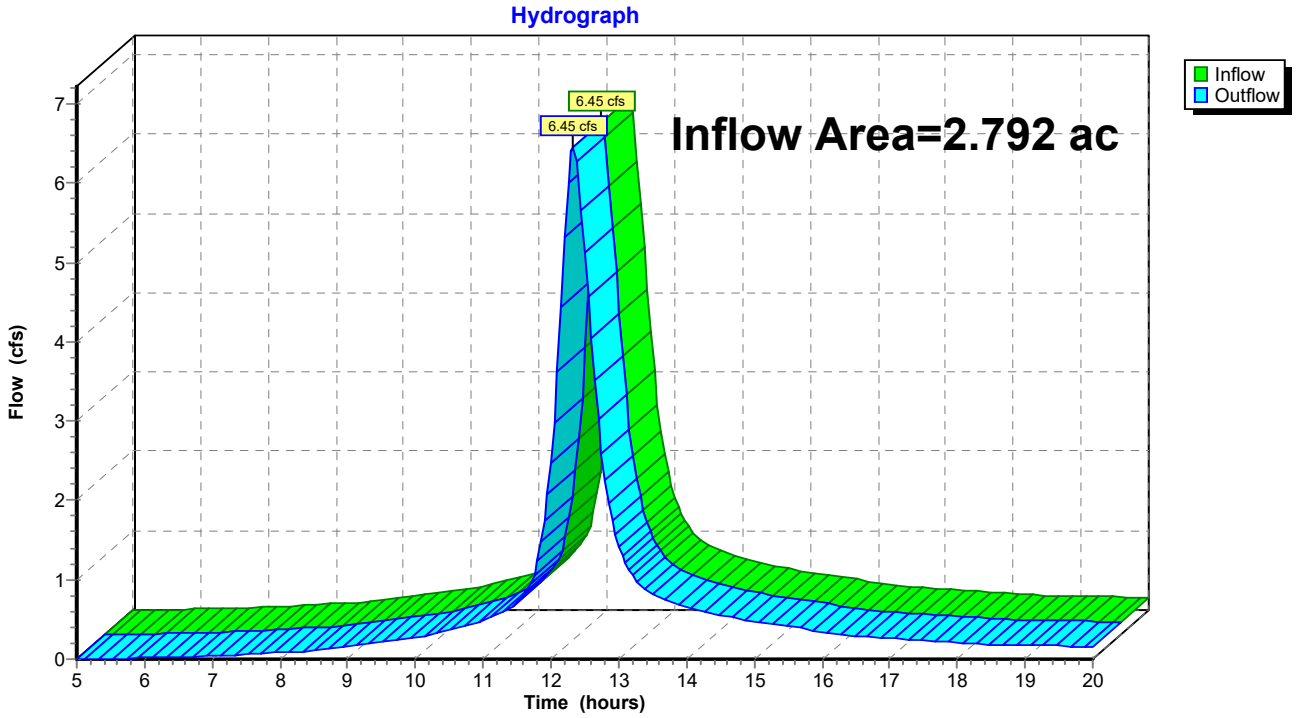
Summary for Reach Woodlands 2: Woodlands 2

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

Inflow Area = 2.792 ac, 0.00% Impervious, Inflow Depth > 2.99" for 10 year event event
Inflow = 6.45 cfs @ 12.33 hrs, Volume= 0.694 af
Outflow = 6.45 cfs @ 12.33 hrs, Volume= 0.694 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach Woodlands 2: Woodlands 2



Summary for Pond Ex Pond A: Ex. Det Pond "A"

[81] Warning: Exceeded Pond Ex Pond FB by 0.56' @ 12.45 hrs

Inflow Area = 2.005 ac, 0.00% Impervious, Inflow Depth > 2.54" for 10 year event event
Inflow = 4.38 cfs @ 12.40 hrs, Volume= 0.425 af
Outflow = 4.38 cfs @ 12.42 hrs, Volume= 0.378 af, Atten= 0%, Lag= 1.1 min
Primary = 4.38 cfs @ 12.42 hrs, Volume= 0.378 af
Routed to Reach Woodlands 1 : Woodlands 1

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,070.16' @ 12.42 hrs Surf.Area= 2,662 sf Storage= 2,426 cf

Plug-Flow detention time= 45.9 min calculated for 0.378 af (89% of inflow)
Center-of-Mass det. time= 13.2 min (826.4 - 813.2)

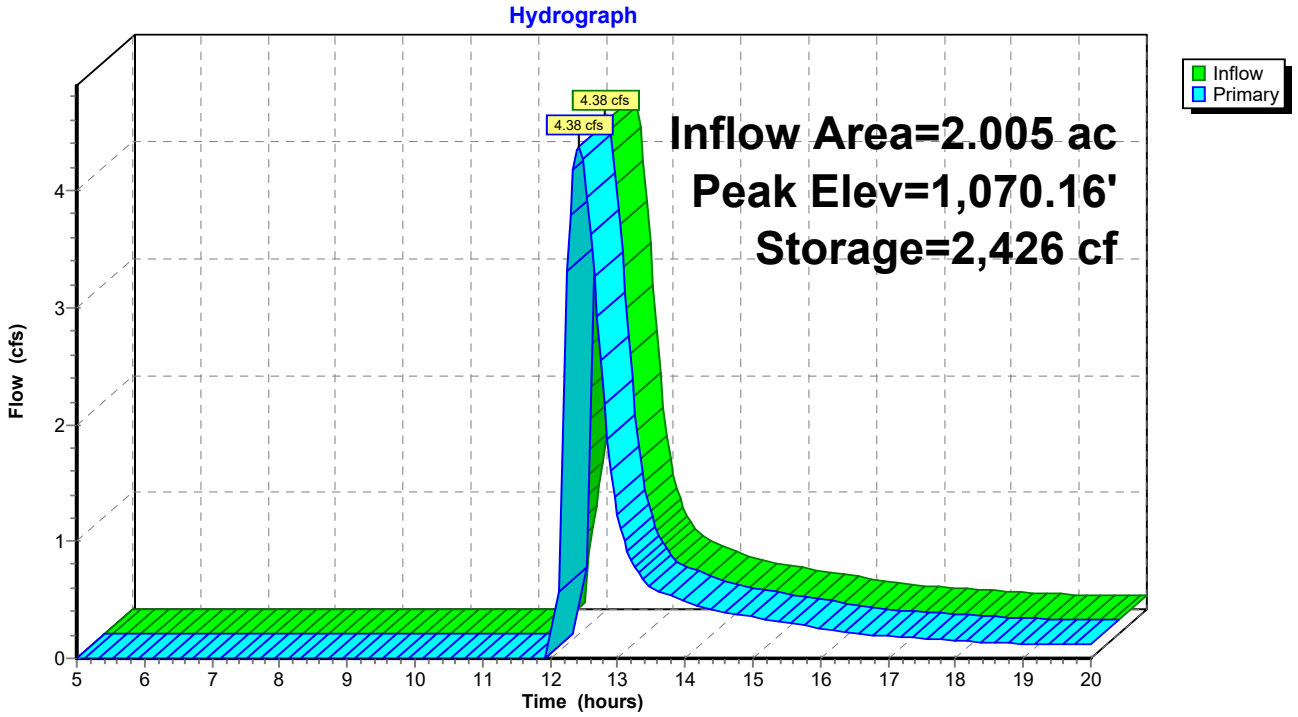
Volume	Invert	Avail.Storage	Storage Description
#1	1,068.99'	56,758 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,068.99	1	0	0
1,069.00	1,500	8	8
1,071.00	3,500	5,000	5,008
1,072.00	100,000	51,750	56,758

Device	Routing	Invert	Outlet Devices
#1	Primary	1,070.00'	**25.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=4.35 cfs @ 12.42 hrs HW=1,070.16' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 4.35 cfs @ 1.08 fps)

Pond Ex Pond A: Ex. Det Pond "A"



Summary for Pond Ex Pond FB: Ex. Det Pond Forebay

[81] Warning: Exceeded Pond Underdrain 1 by 0.50' @ 15.35 hrs

Inflow Area = 2.005 ac, 0.00% Impervious, Inflow Depth > 2.99" for 10 year event event
Inflow = 4.84 cfs @ 12.31 hrs, Volume= 0.499 af
Outflow = 4.38 cfs @ 12.40 hrs, Volume= 0.425 af, Atten= 10%, Lag= 5.7 min
Primary = 4.38 cfs @ 12.40 hrs, Volume= 0.425 af
Routed to Pond Ex Pond A : Ex. Det Pond "A"

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,069.60' @ 12.40 hrs Surf.Area= 22,229 sf Storage= 4,466 cf

Plug-Flow detention time= 75.4 min calculated for 0.425 af (85% of inflow)
Center-of-Mass det. time= 32.5 min (813.2 - 780.8)

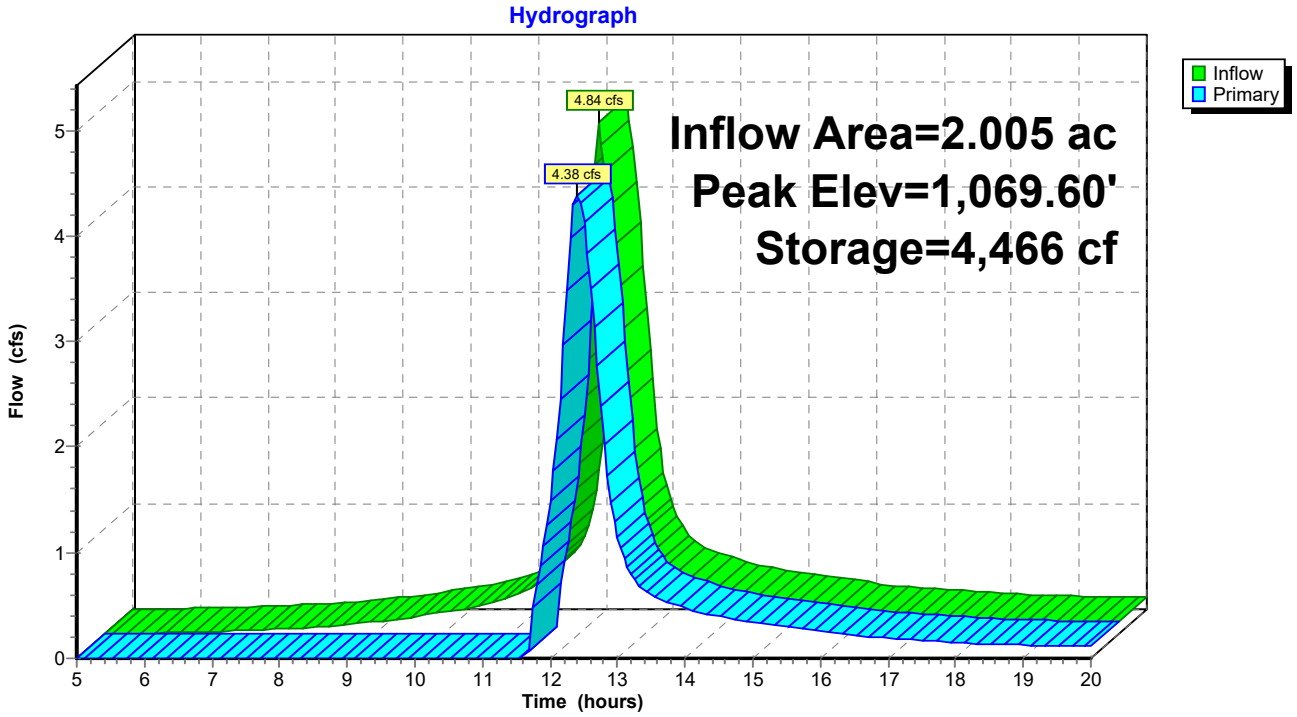
Volume	Invert	Avail.Storage	Storage Description
#1	1,067.99'	28,784 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,067.99	0	0	0
1,068.00	2,000	10	10
1,069.50	2,274	3,206	3,215
1,070.00	100,000	25,569	28,784

Device	Routing	Invert	Outlet Devices
#1	Primary	1,069.50'	**50.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=4.37 cfs @ 12.40 hrs HW=1,069.60' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 4.37 cfs @ 0.86 fps)

Pond Ex Pond FB: Ex. Det Pond Forebay



Summary for Pond LLS 2A: Level Lip Spreader 2A

[57] Hint: Peaked at 1,070.17' (Flood elevation advised)
[81] Warning: Exceeded Pond UD 2A by 2.00' @ 5.00 hrs

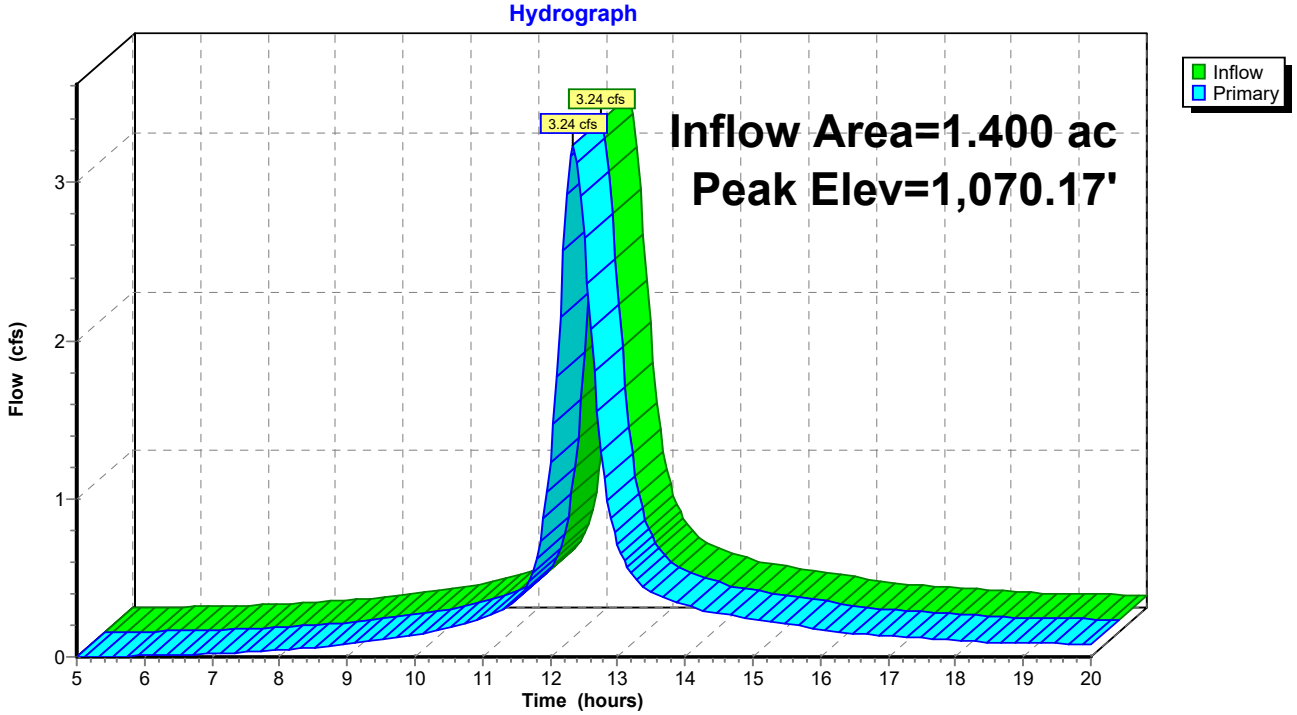
Inflow Area = 1.400 ac, 0.00% Impervious, Inflow Depth > 2.99" for 10 year event event
Inflow = 3.24 cfs @ 12.34 hrs, Volume= 0.348 af
Outflow = 3.24 cfs @ 12.34 hrs, Volume= 0.348 af, Atten= 0%, Lag= 0.0 min
Primary = 3.24 cfs @ 12.34 hrs, Volume= 0.348 af
Routed to Reach Woodlands 2 : Woodlands 2

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,070.17' @ 12.34 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	1,070.00'	**20.0' long x 5.0' 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) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=3.22 cfs @ 12.34 hrs HW=1,070.17' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 3.22 cfs @ 0.96 fps)

Pond LLS 2A: Level Lip Spreader 2A



Summary for Pond LLS 2B: Level Lip Spreader 2B

[57] Hint: Peaked at 1,070.17' (Flood elevation advised)
[81] Warning: Exceeded Pond UD 2B by 2.00' @ 5.00 hrs

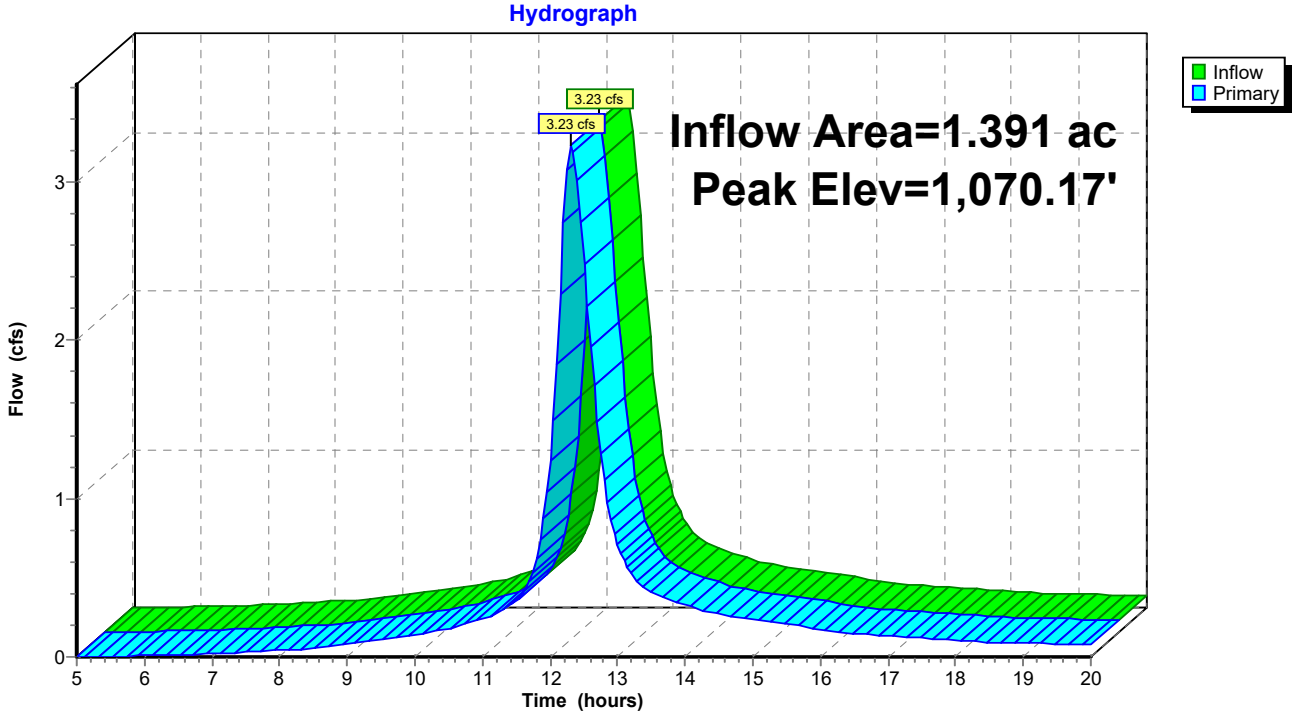
Inflow Area = 1.391 ac, 0.00% Impervious, Inflow Depth > 2.99" for 10 year event event
Inflow = 3.23 cfs @ 12.31 hrs, Volume= 0.346 af
Outflow = 3.23 cfs @ 12.31 hrs, Volume= 0.346 af, Atten= 0%, Lag= 0.0 min
Primary = 3.23 cfs @ 12.31 hrs, Volume= 0.346 af
Routed to Reach Woodlands 2 : Woodlands 2

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,070.17' @ 12.31 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	1,070.00'	**20.0' long x 5.0' 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) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=3.21 cfs @ 12.31 hrs HW=1,070.17' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 3.21 cfs @ 0.96 fps)

Pond LLS 2B: Level Lip Spreader 2B



Summary for Pond UD 2A: Underdrain 2A

Inflow Area = 1.400 ac, 0.00% Impervious, Inflow Depth > 2.99" for 10 year event event
Inflow = 3.28 cfs @ 12.31 hrs, Volume= 0.348 af
Outflow = 3.24 cfs @ 12.34 hrs, Volume= 0.348 af, Atten= 1%, Lag= 2.2 min
Primary = 3.24 cfs @ 12.34 hrs, Volume= 0.348 af
Routed to Pond LLS 2A : Level Lip Spreader 2A

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,069.93' @ 12.34 hrs Surf.Area= 116 sf Storage= 220 cf

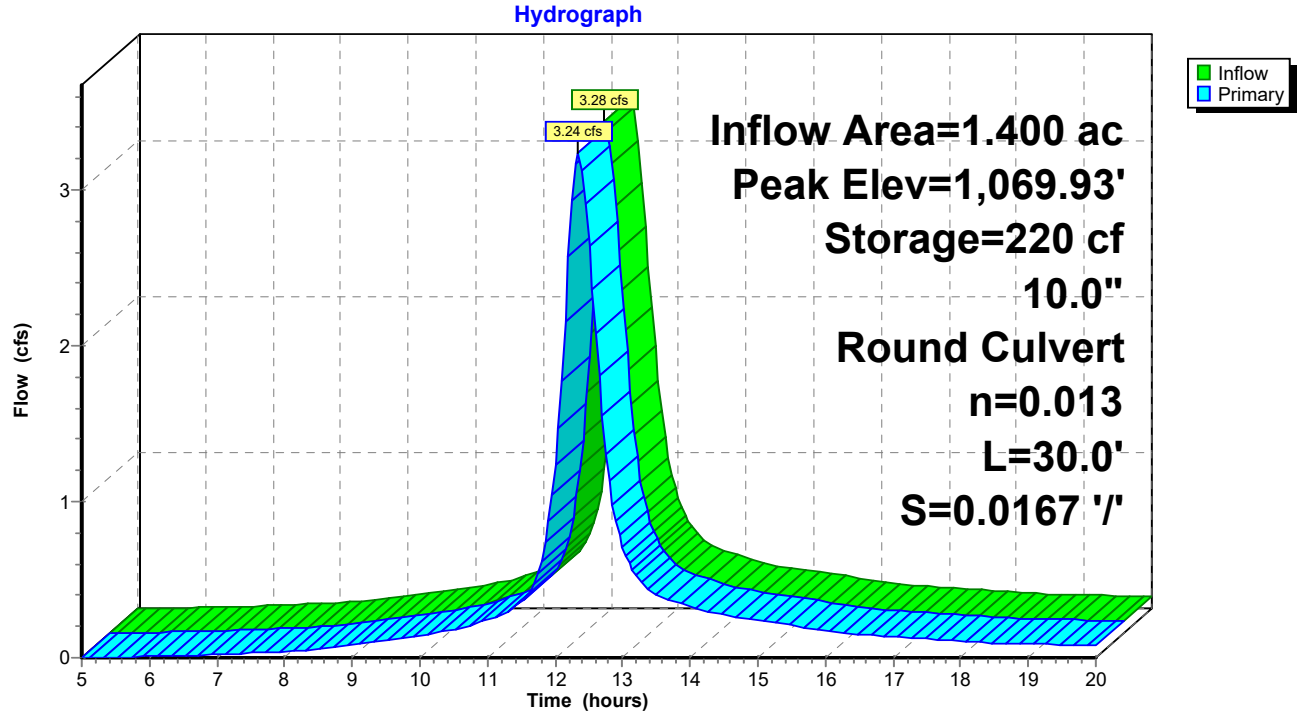
Plug-Flow detention time= 0.5 min calculated for 0.348 af (100% of inflow)
Center-of-Mass det. time= 0.5 min (781.8 - 781.3)

Volume	Invert	Avail.Storage	Storage Description
#1	1,068.00'	255 cf	**12.0" Round Pipe Storage** L= 325.0' S= 0.0050 '/'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,068.00'	**10.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,068.00' / 1,067.50' S= 0.0167 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=3.22 cfs @ 12.34 hrs HW=1,069.92' (Free Discharge)
1=Culvert (Inlet Controls 3.22 cfs @ 5.91 fps)

Pond UD 2A: Underdrain 2A



Summary for Pond UD 2B: Underdrain 2B

Inflow Area = 1.391 ac, 0.00% Impervious, Inflow Depth > 2.99" for 10 year event event
Inflow = 3.23 cfs @ 12.31 hrs, Volume= 0.346 af
Outflow = 3.23 cfs @ 12.31 hrs, Volume= 0.346 af, Atten= 0%, Lag= 0.2 min
Primary = 3.23 cfs @ 12.31 hrs, Volume= 0.346 af
Routed to Pond LLS 2B : Level Lip Spreader 2B

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,069.93' @ 12.31 hrs Surf.Area= 16 sf Storage= 23 cf

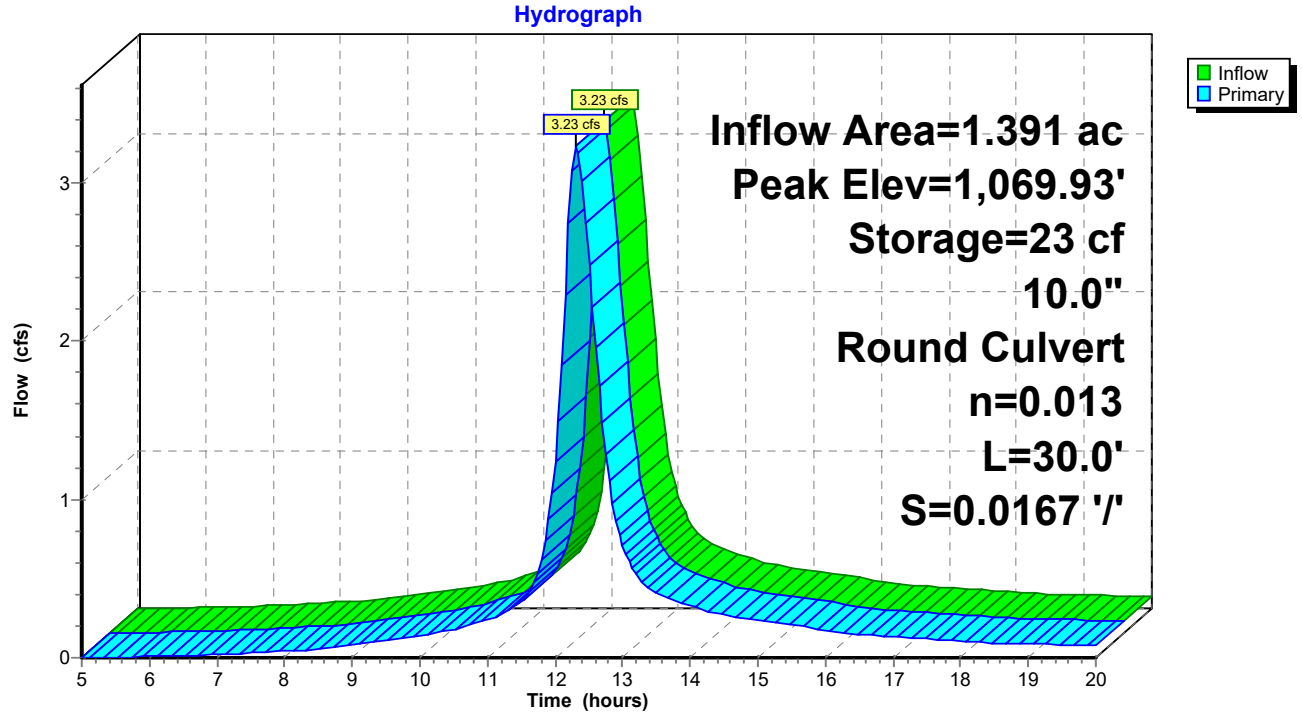
Plug-Flow detention time= 0.1 min calculated for 0.346 af (100% of inflow)
Center-of-Mass det. time= 0.0 min (781.7 - 781.6)

Volume	Invert	Avail.Storage	Storage Description
#1	1,068.00'	263 cf	**12.0" Round Pipe Storage** L= 335.0' S= 0.0500 '/'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,068.00'	**10.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,068.00' / 1,067.50' S= 0.0167 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=3.22 cfs @ 12.31 hrs HW=1,069.92' (Free Discharge)
1=Culvert (Inlet Controls 3.22 cfs @ 5.90 fps)

Pond UD 2B: Underdrain 2B



Summary for Pond Underdrain 1: Soccer Field Underdrain

[44] Hint: Outlet device #1 is below defined storage
[88] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 2.005 ac, 0.00% Impervious, Inflow Depth > 2.99" for 10 year event event
Inflow = 4.79 cfs @ 12.29 hrs, Volume= 0.499 af
Outflow = 4.84 cfs @ 12.31 hrs, Volume= 0.499 af, Atten= 0%, Lag= 1.0 min
Primary = 4.84 cfs @ 12.31 hrs, Volume= 0.499 af
Routed to Pond Ex Pond FB : Ex. Det Pond Forebay

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,071.58' @ 12.31 hrs Surf.Area= 18 sf Storage= 274 cf

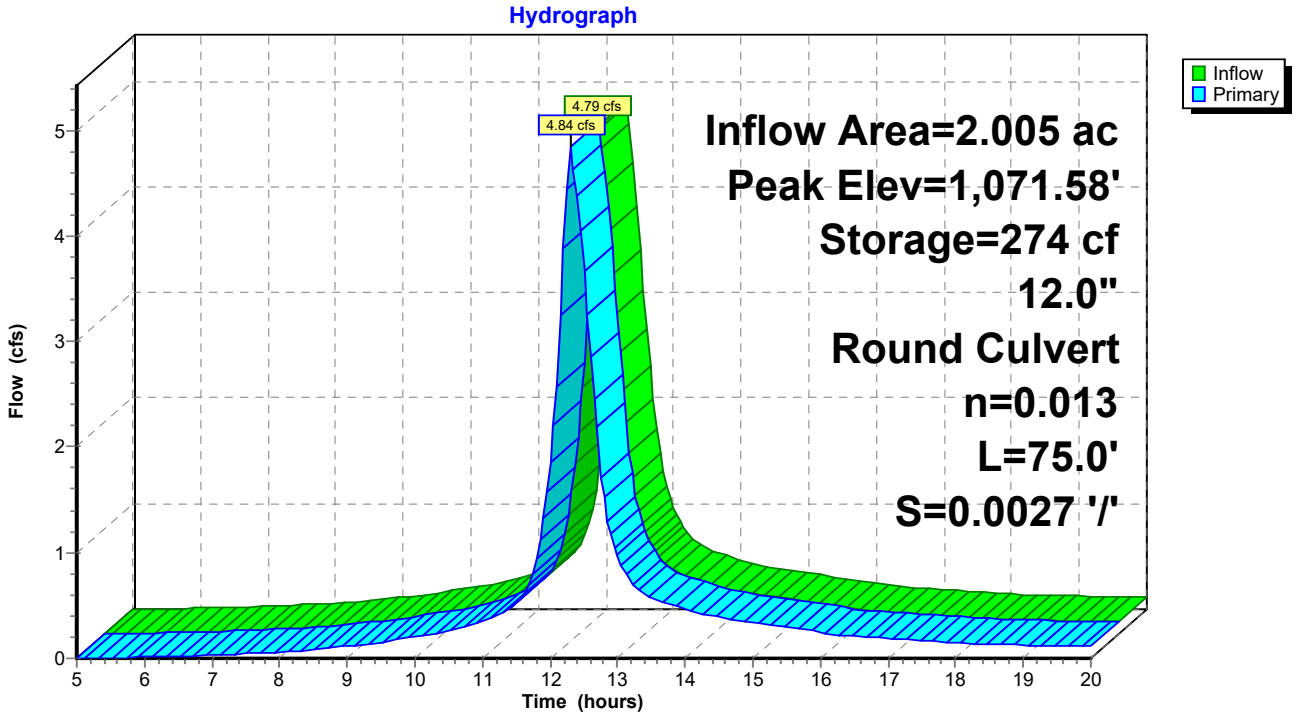
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.3 min (780.8 - 780.4)

Volume	Invert	Avail.Storage	Storage Description
#1	1,069.00'	275 cf	**12.0" Round Pipe Storage** L= 350.0' S= 0.0050 '/'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,068.50'	**12.0" Round Culvert** L= 75.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,068.50' / 1,068.30' S= 0.0027 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=4.81 cfs @ 12.31 hrs HW=1,071.54' (Free Discharge)
1=Culvert (Barrel Controls 4.81 cfs @ 6.12 fps)

Pond Underdrain 1: Soccer Field Underdrain



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

Subcatchment Baseball 2A: Baseball Turf; Runoff Area=60,997 sf 0.00% Impervious Runoff Depth>3.84"
Flow Length=470' Tc=22.7 min CN=89 Runoff=4.16 cfs 0.448 af

Subcatchment Baseball 2B: Baseball Turf; Runoff Area=60,606 sf 0.00% Impervious Runoff Depth>3.84"
Flow Length=428' Tc=23.1 min CN=89 Runoff=4.10 cfs 0.445 af

Subcatchment Soccer: Soccer Turf Runoff Area=87,339 sf 0.00% Impervious Runoff Depth>3.84"
Flow Length=375' Tc=21.6 min CN=89 Runoff=6.08 cfs 0.641 af

Reach Woodlands 1: Woodlands 1 Inflow=5.53 cfs 0.520 af
Outflow=5.53 cfs 0.520 af

Reach Woodlands 2: Woodlands 2 Inflow=8.26 cfs 0.892 af
Outflow=8.26 cfs 0.892 af

Pond Ex Pond A: Ex. Det Pond "A" Peak Elev=1,070.19' Storage=2,499 cf Inflow=5.53 cfs 0.567 af
Outflow=5.53 cfs 0.520 af

Pond Ex Pond FB: Ex. Det Pond Forebay Peak Elev=1,069.62' Storage=4,882 cf Inflow=6.10 cfs 0.641 af
Outflow=5.53 cfs 0.567 af

Pond LLS 2A: Level Lip Spreader 2A Peak Elev=1,070.20' Inflow=4.16 cfs 0.448 af
Outflow=4.16 cfs 0.448 af

Pond LLS 2B: Level Lip Spreader 2B Peak Elev=1,070.20' Inflow=4.10 cfs 0.445 af
Outflow=4.10 cfs 0.445 af

Pond UD 2A: Underdrain 2A Peak Elev=1,070.93' Storage=255 cf Inflow=4.16 cfs 0.448 af
10.0" Round Culvert n=0.013 L=30.0' S=0.0167 '/' Outflow=4.16 cfs 0.448 af

Pond UD 2B: Underdrain 2B Peak Elev=1,070.86' Storage=37 cf Inflow=4.10 cfs 0.445 af
10.0" Round Culvert n=0.013 L=30.0' S=0.0167 '/' Outflow=4.10 cfs 0.445 af

Pond Underdrain 1: Soccer Field Underdrain Peak Elev=1,072.91' Storage=275 cf Inflow=6.08 cfs 0.641 af
12.0" Round Culvert n=0.013 L=75.0' S=0.0027 '/' Outflow=6.10 cfs 0.641 af

Total Runoff Area = 4.797 ac Runoff Volume = 1.534 af Average Runoff Depth = 3.84"
100.00% Pervious = 4.797 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment Baseball 2A: Baseball Turf; 2A

[47] Hint: Peak is 956% of capacity of segment #3

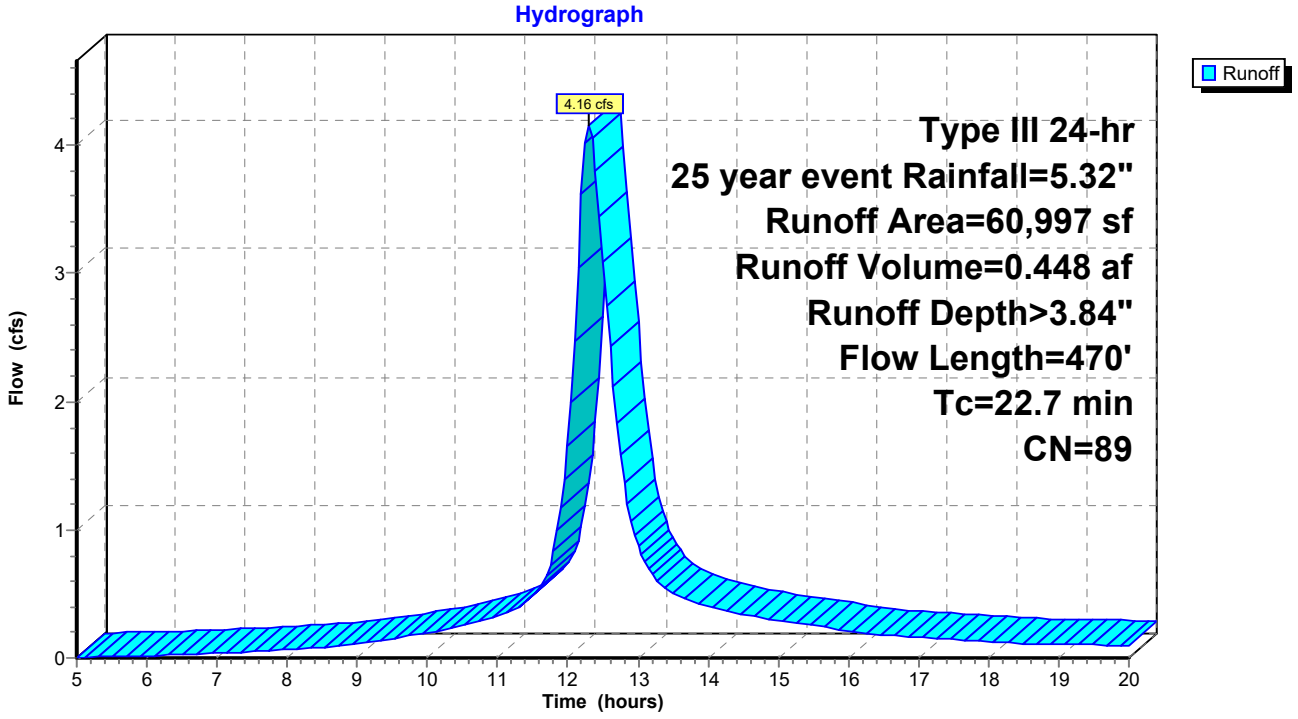
Runoff = 4.16 cfs @ 12.30 hrs, Volume= 0.448 af, Depth> 3.84"
Routed to Pond UD 2A : Underdrain 2A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year event Rainfall=5.32"

Area (sf)	CN	Description
60,997	89	<50% Grass cover, Poor, HSG D
60,997		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0075	0.10		**Sheet Flow, Turf Field** Grass: Short n= 0.150 P2= 2.38"
3.6	130	0.0075	0.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.3	240	0.0050	1.74	0.44	**Pipe Channel, Panel Drains** 12.0" x 3.0" Box Area= 0.3 sf Perim= 2.5' r= 0.10' n= 0.013 Corrugated PE, smooth interior
22.7	470	Total			

Subcatchment Baseball 2A: Baseball Turf; 2A



Summary for Subcatchment Baseball 2B: Baseball Turf; 2B

[47] Hint: Peak is 943% of capacity of segment #3

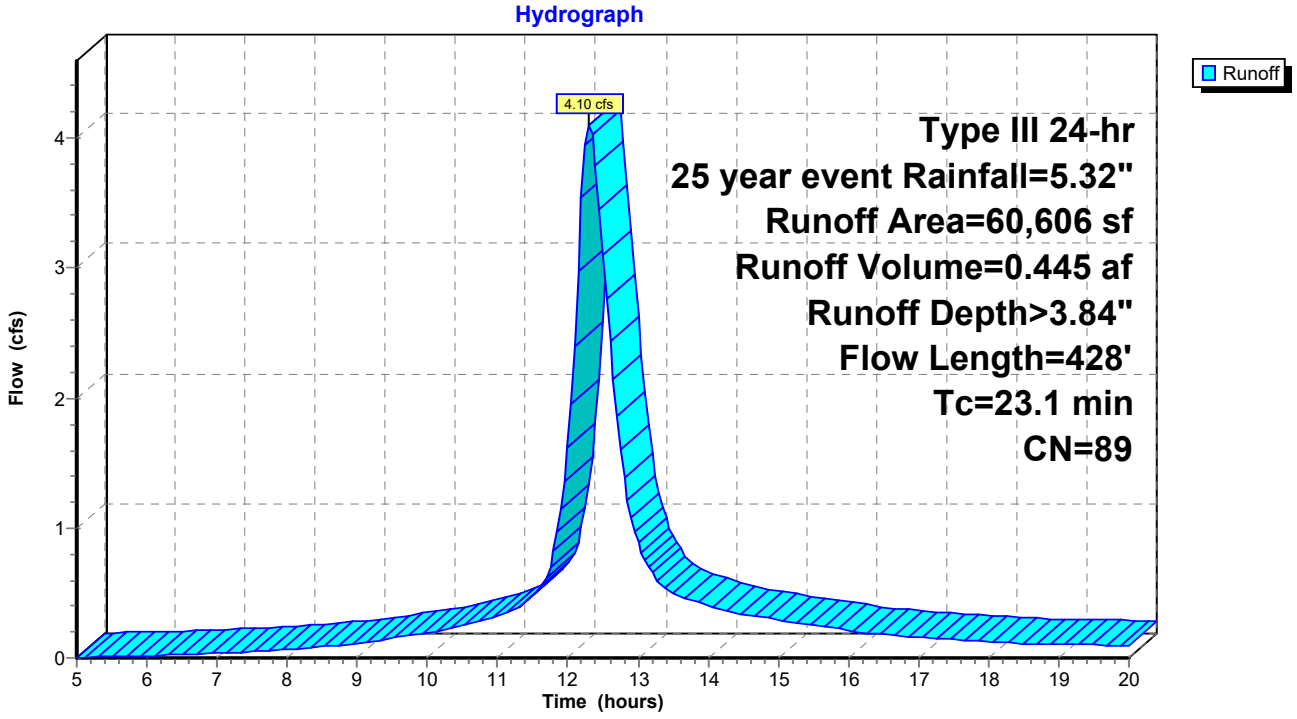
Runoff = 4.10 cfs @ 12.31 hrs, Volume= 0.445 af, Depth> 3.84"
Routed to Pond UD 2B : Underdrain 2B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year event Rainfall=5.32"

Area (sf)	CN	Description
60,606	89	<50% Grass cover, Poor, HSG D
60,606		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0075	0.10		**Sheet Flow, Turf Field** Grass: Short n= 0.150 P2= 2.38"
4.8	175	0.0075	0.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.5	153	0.0050	1.74	0.44	**Pipe Channel, Panel Drains** 12.0" x 3.0" Box Area= 0.3 sf Perim= 2.5' r= 0.10' n= 0.013 Corrugated PE, smooth interior
23.1	428	Total			

Subcatchment Baseball 2B: Baseball Turf; 2B



Summary for Subcatchment Soccer: Soccer Turf

[47] Hint: Peak is 1396% of capacity of segment #3

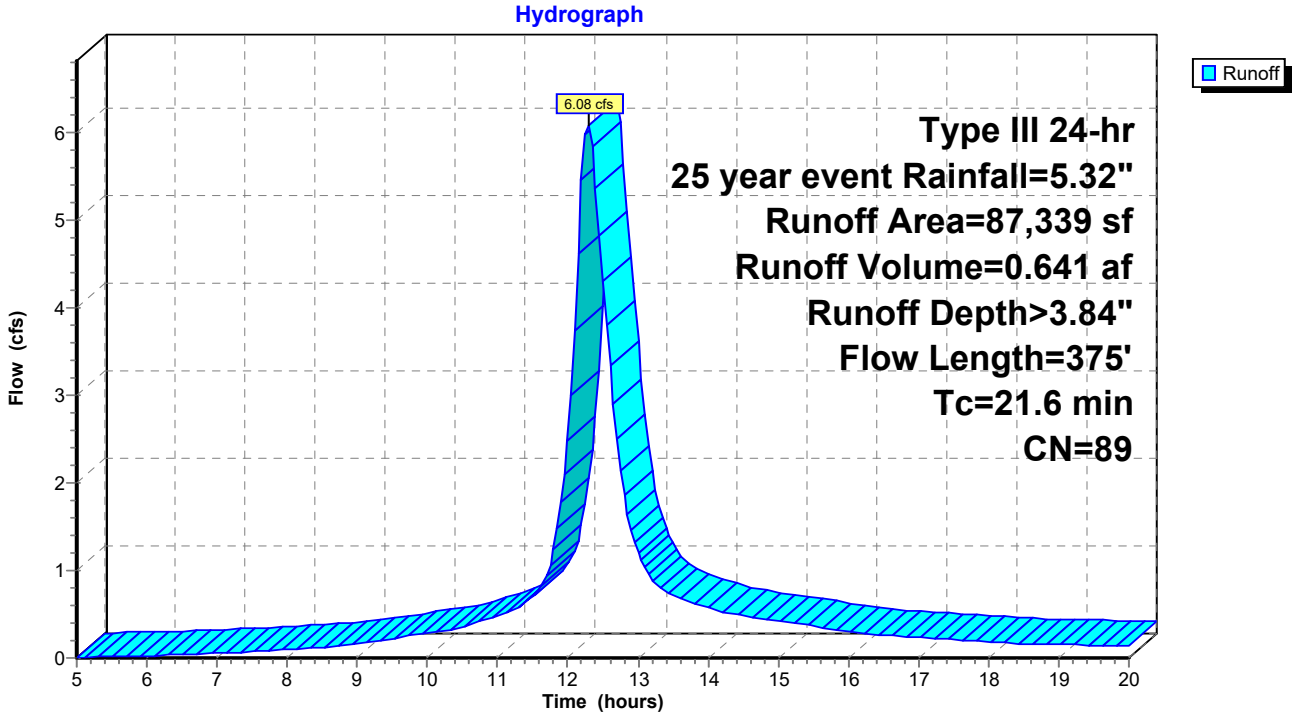
Runoff = 6.08 cfs @ 12.29 hrs, Volume= 0.641 af, Depth> 3.84"
Routed to Pond Underdrain 1 : Soccer Field Underdrain

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year event Rainfall=5.32"

Area (sf)	CN	Description
87,339	89	<50% Grass cover, Poor, HSG D
87,339		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0075	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.38"
3.4	125	0.0075	0.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.4	150	0.0050	1.74	0.44	**Pipe Channel, Panel Drains** 12.0" x 3.0" Box Area= 0.3 sf Perim= 2.5' r= 0.10' n= 0.013 Corrugated PE, smooth interior
21.6	375	Total			

Subcatchment Soccer: Soccer Turf



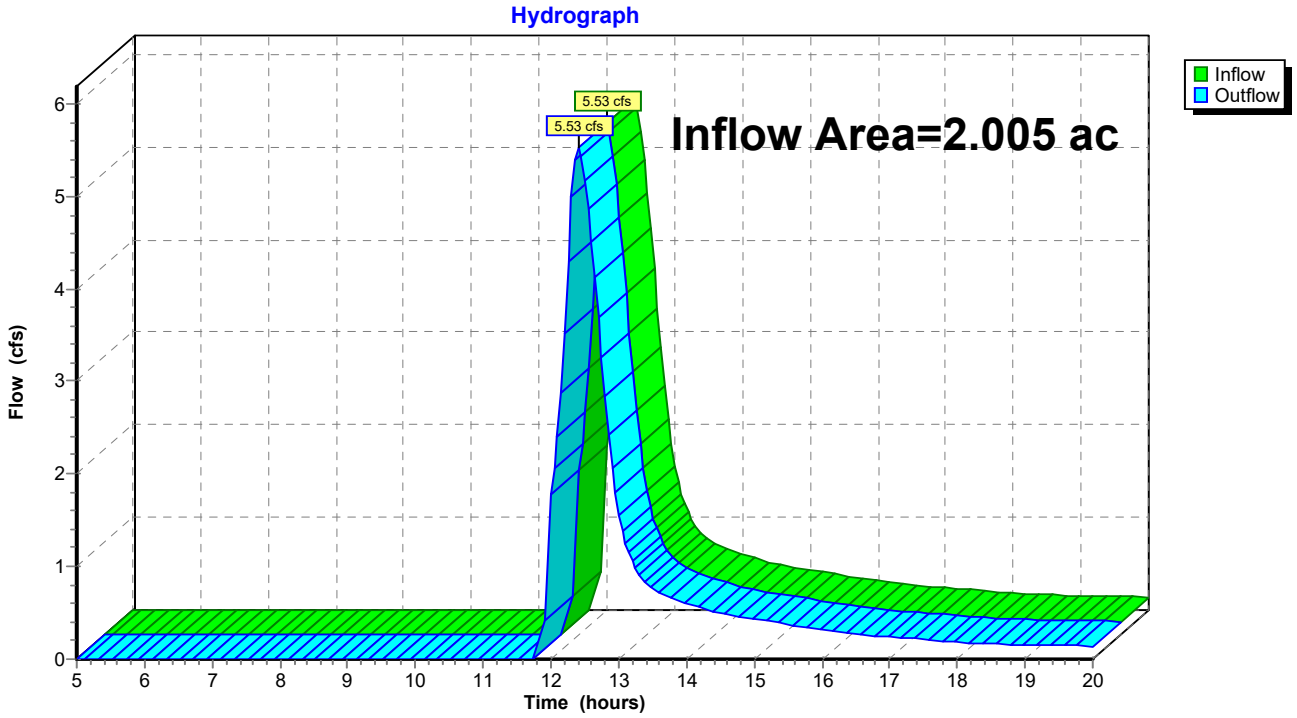
Summary for Reach Woodlands 1: Woodlands 1

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

Inflow Area = 2.005 ac, 0.00% Impervious, Inflow Depth > 3.11" for 25 year event event
Inflow = 5.53 cfs @ 12.40 hrs, Volume= 0.520 af
Outflow = 5.53 cfs @ 12.40 hrs, Volume= 0.520 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach Woodlands 1: Woodlands 1



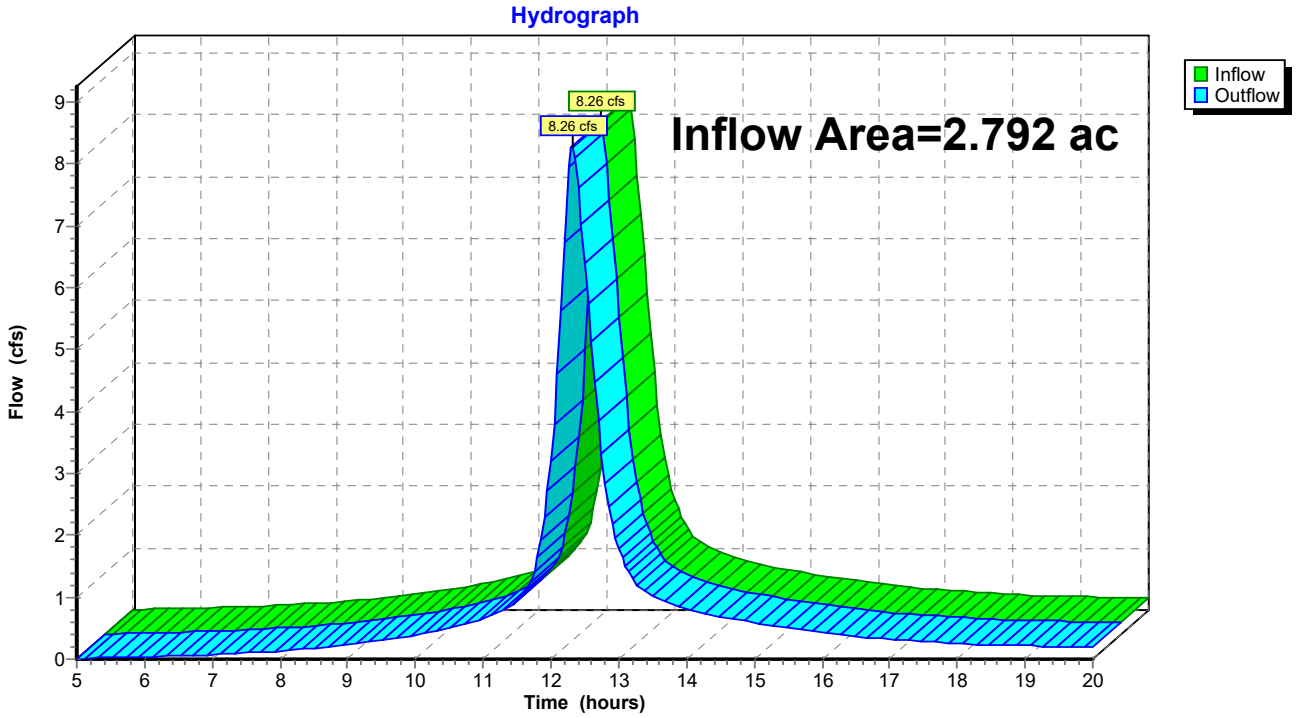
Summary for Reach Woodlands 2: Woodlands 2

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

Inflow Area = 2.792 ac, 0.00% Impervious, Inflow Depth > 3.84" for 25 year event event
Inflow = 8.26 cfs @ 12.31 hrs, Volume= 0.892 af
Outflow = 8.26 cfs @ 12.31 hrs, Volume= 0.892 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach Woodlands 2: Woodlands 2



Summary for Pond Ex Pond A: Ex. Det Pond "A"

[81] Warning: Exceeded Pond Ex Pond FB by 0.57' @ 12.45 hrs

Inflow Area = 2.005 ac, 0.00% Impervious, Inflow Depth > 3.39" for 25 year event event
Inflow = 5.53 cfs @ 12.38 hrs, Volume= 0.567 af
Outflow = 5.53 cfs @ 12.40 hrs, Volume= 0.520 af, Atten= 0%, Lag= 1.1 min
Primary = 5.53 cfs @ 12.40 hrs, Volume= 0.520 af
Routed to Reach Woodlands 1 : Woodlands 1

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,070.19' @ 12.40 hrs Surf.Area= 2,689 sf Storage= 2,499 cf

Plug-Flow detention time= 37.2 min calculated for 0.518 af (91% of inflow)
Center-of-Mass det. time= 11.4 min (816.6 - 805.1)

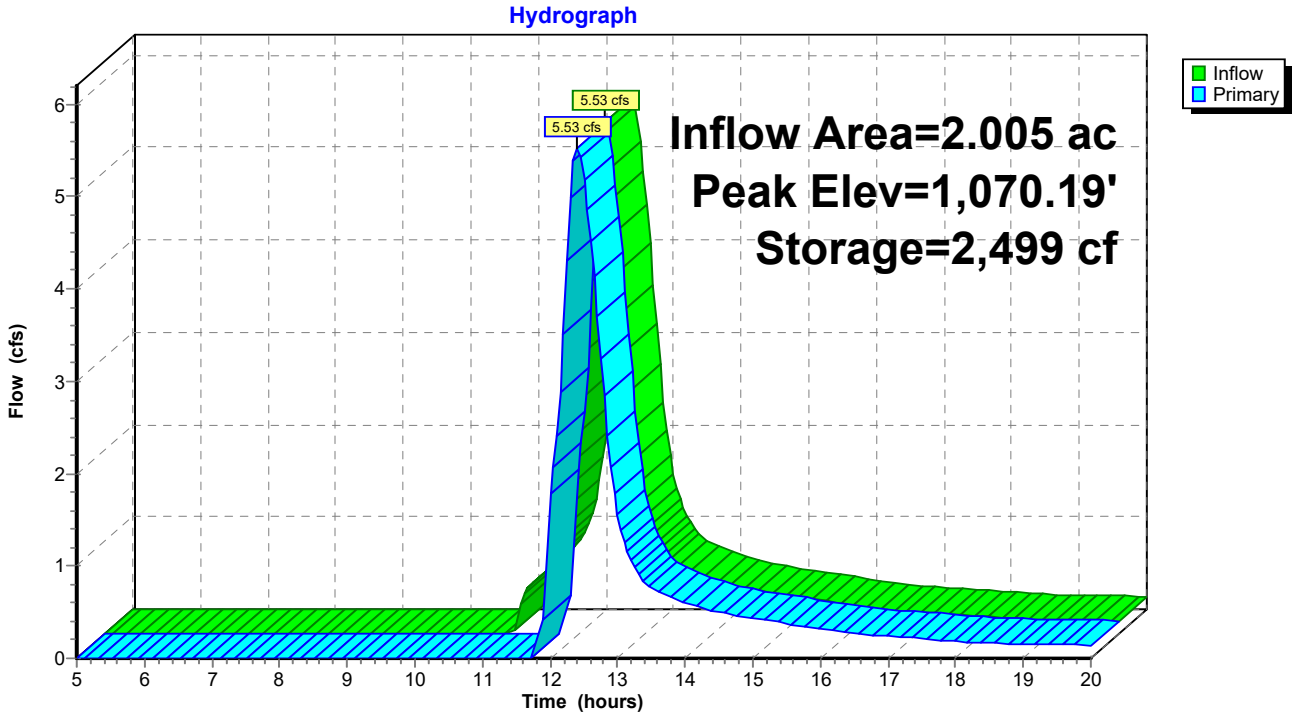
Volume	Invert	Avail.Storage	Storage Description
#1	1,068.99'	56,758 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,068.99	1	0	0
1,069.00	1,500	8	8
1,071.00	3,500	5,000	5,008
1,072.00	100,000	51,750	56,758

Device	Routing	Invert	Outlet Devices
#1	Primary	1,070.00'	**25.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=5.51 cfs @ 12.40 hrs HW=1,070.19' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 5.51 cfs @ 1.17 fps)

Pond Ex Pond A: Ex. Det Pond "A"



Summary for Pond Ex Pond FB: Ex. Det Pond Forebay

[82] Warning: Early inflow requires earlier time span
[81] Warning: Exceeded Pond Underdrain 1 by 0.50' @ 16.00 hrs

Inflow Area = 2.005 ac, 0.00% Impervious, Inflow Depth > 3.84" for 25 year event event
Inflow = 6.10 cfs @ 12.27 hrs, Volume= 0.641 af
Outflow = 5.53 cfs @ 12.38 hrs, Volume= 0.567 af, Atten= 9%, Lag= 6.6 min
Primary = 5.53 cfs @ 12.38 hrs, Volume= 0.567 af
Routed to Pond Ex Pond A : Ex. Det Pond "A"

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,069.62' @ 12.38 hrs Surf.Area= 25,621 sf Storage= 4,882 cf

Plug-Flow detention time= 65.8 min calculated for 0.565 af (88% of inflow)
Center-of-Mass det. time= 30.3 min (805.1 - 774.9)

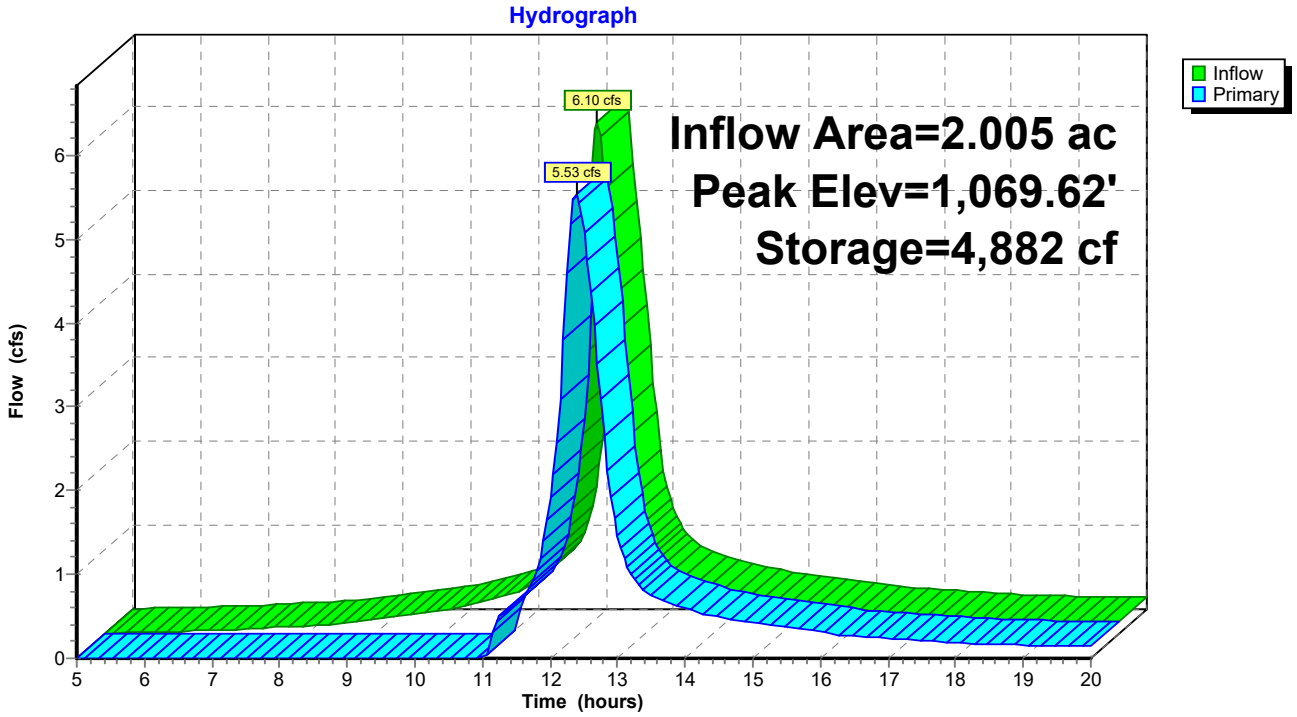
Volume	Invert	Avail.Storage	Storage Description
#1	1,067.99'	28,784 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,067.99	0	0	0
1,068.00	2,000	10	10
1,069.50	2,274	3,206	3,215
1,070.00	100,000	25,569	28,784

Device	Routing	Invert	Outlet Devices
#1	Primary	1,069.50'	**50.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=5.51 cfs @ 12.38 hrs HW=1,069.62' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 5.51 cfs @ 0.92 fps)

Pond Ex Pond FB: Ex. Det Pond Forebay



Summary for Pond LLS 2A: Level Lip Spreader 2A

[82] Warning: Early inflow requires earlier time span
[57] Hint: Peaked at 1,070.20' (Flood elevation advised)
[81] Warning: Exceeded Pond UD 2A by 1.97' @ 5.00 hrs

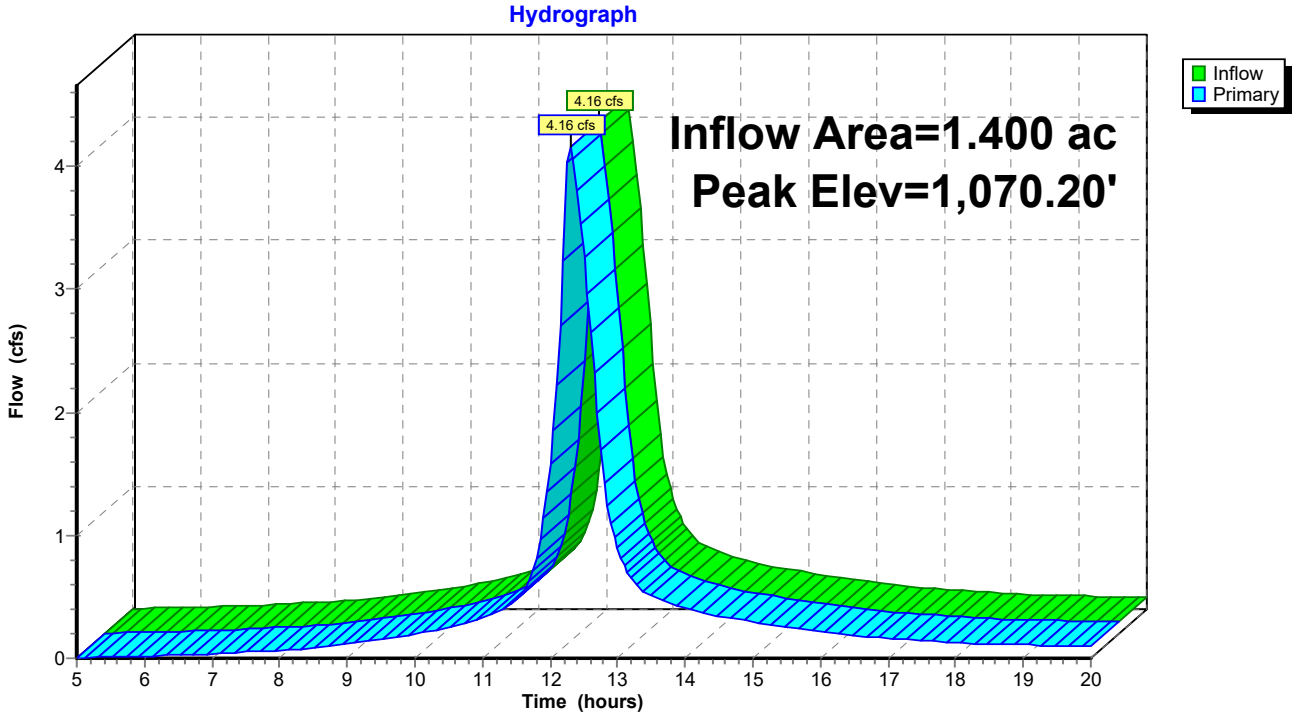
Inflow Area = 1.400 ac, 0.00% Impervious, Inflow Depth > 3.84" for 25 year event event
Inflow = 4.16 cfs @ 12.30 hrs, Volume= 0.448 af
Outflow = 4.16 cfs @ 12.30 hrs, Volume= 0.448 af, Atten= 0%, Lag= 0.0 min
Primary = 4.16 cfs @ 12.30 hrs, Volume= 0.448 af
Routed to Reach Woodlands 2 : Woodlands 2

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,070.20' @ 12.30 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	1,070.00'	**20.0' long x 5.0' 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) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=4.15 cfs @ 12.30 hrs HW=1,070.20' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 4.15 cfs @ 1.04 fps)

Pond LLS 2A: Level Lip Spreader 2A



Summary for Pond LLS 2B: Level Lip Spreader 2B

[82] Warning: Early inflow requires earlier time span
[57] Hint: Peaked at 1,070.20' (Flood elevation advised)
[81] Warning: Exceeded Pond UD 2B by 1.99' @ 5.00 hrs

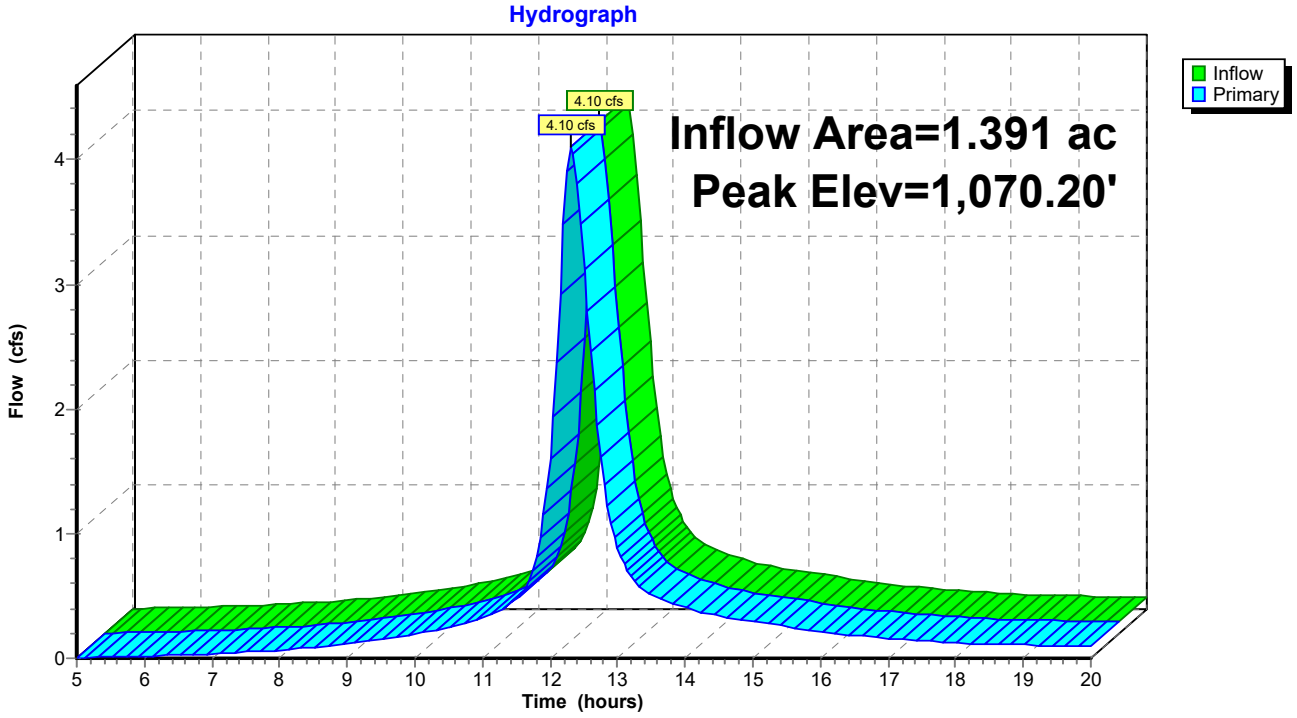
Inflow Area = 1.391 ac, 0.00% Impervious, Inflow Depth > 3.84" for 25 year event event
Inflow = 4.10 cfs @ 12.31 hrs, Volume= 0.445 af
Outflow = 4.10 cfs @ 12.31 hrs, Volume= 0.445 af, Atten= 0%, Lag= 0.0 min
Primary = 4.10 cfs @ 12.31 hrs, Volume= 0.445 af
Routed to Reach Woodlands 2 : Woodlands 2

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,070.20' @ 12.31 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	1,070.00'	**20.0' long x 5.0' 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) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=4.08 cfs @ 12.31 hrs HW=1,070.20' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 4.08 cfs @ 1.04 fps)

Pond LLS 2B: Level Lip Spreader 2B



Summary for Pond UD 2A: Underdrain 2A

[82] Warning: Early inflow requires earlier time span
[93] Warning: Storage range exceeded by 0.30'

Inflow Area = 1.400 ac, 0.00% Impervious, Inflow Depth > 3.84" for 25 year event event
Inflow = 4.16 cfs @ 12.30 hrs, Volume= 0.448 af
Outflow = 4.16 cfs @ 12.30 hrs, Volume= 0.448 af, Atten= 0%, Lag= 0.0 min
Primary = 4.16 cfs @ 12.30 hrs, Volume= 0.448 af
Routed to Pond LLS 2A : Level Lip Spreader 2A

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,070.93' @ 12.30 hrs Storage= 255 cf

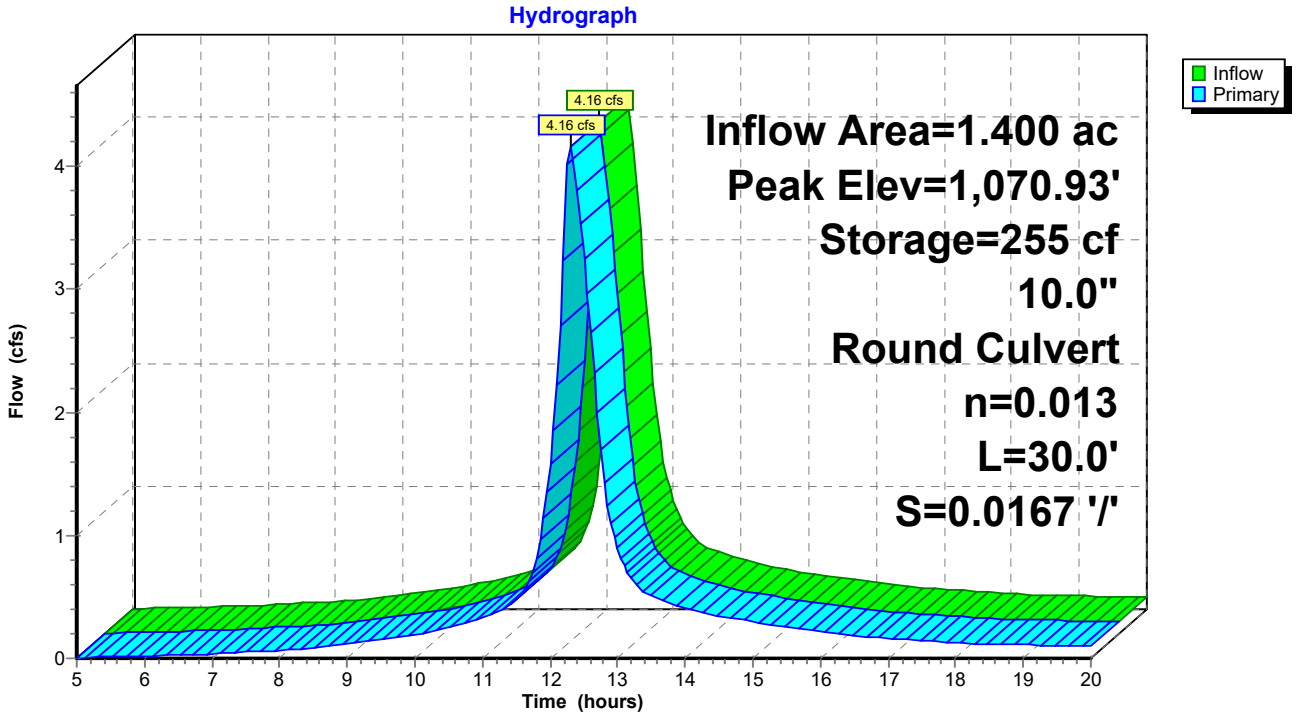
Plug-Flow detention time= 0.6 min calculated for 0.448 af (100% of inflow)
Center-of-Mass det. time= 0.5 min (776.0 - 775.4)

Volume	Invert	Avail.Storage	Storage Description
#1	1,068.00'	255 cf	**12.0" Round Pipe Storage** L= 325.0' S= 0.0050 '/'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,068.00'	**10.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,068.00' / 1,067.50' S= 0.0167 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=4.15 cfs @ 12.30 hrs HW=1,070.92' (Free Discharge)
1=Culvert (Inlet Controls 4.15 cfs @ 7.61 fps)

Pond UD 2A: Underdrain 2A



Summary for Pond UD 2B: Underdrain 2B

[82] Warning: Early inflow requires earlier time span

Inflow Area = 1.391 ac, 0.00% Impervious, Inflow Depth > 3.84" for 25 year event event
Inflow = 4.10 cfs @ 12.31 hrs, Volume= 0.445 af
Outflow = 4.10 cfs @ 12.31 hrs, Volume= 0.445 af, Atten= 0%, Lag= 0.3 min
Primary = 4.10 cfs @ 12.31 hrs, Volume= 0.445 af
Routed to Pond LLS 2B : Level Lip Spreader 2B

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,070.86' @ 12.31 hrs Surf.Area= 16 sf Storage= 37 cf

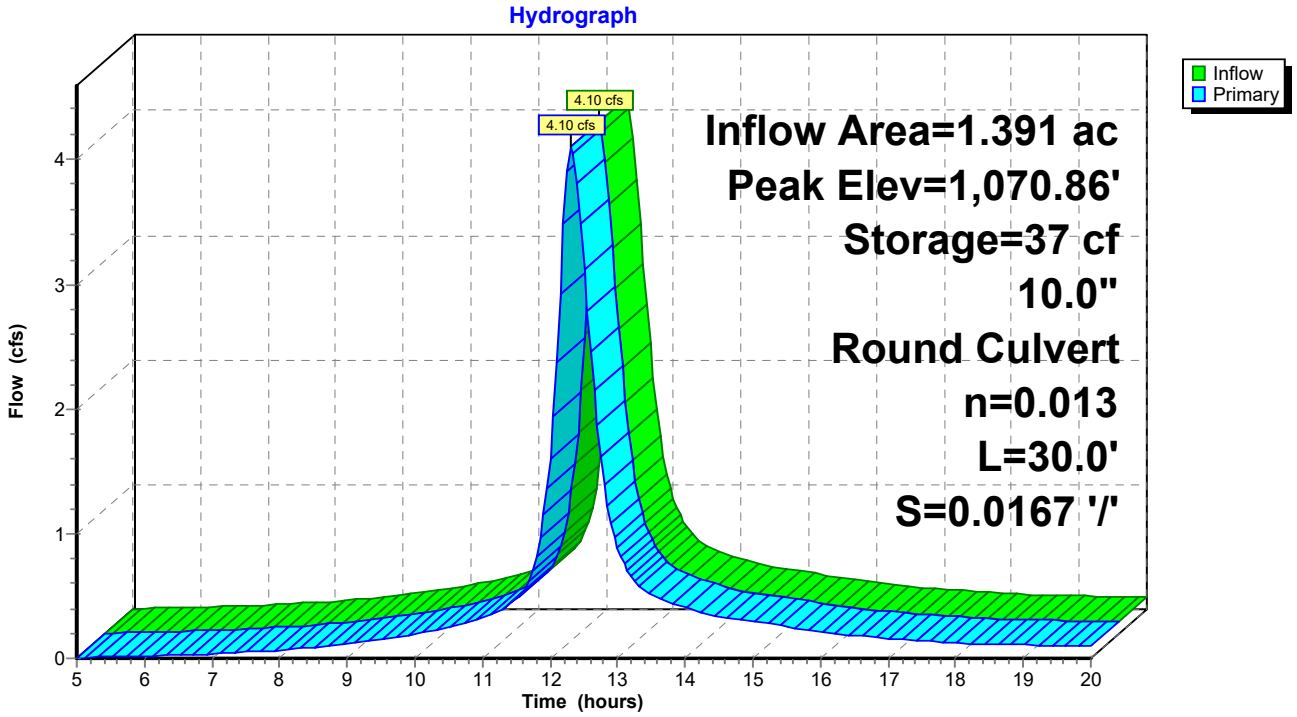
Plug-Flow detention time= 0.1 min calculated for 0.445 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (775.8 - 775.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,068.00'	263 cf	**12.0" Round Pipe Storage** L= 335.0' S= 0.0500 '/'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,068.00'	**10.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,068.00' / 1,067.50' S= 0.0167 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=4.08 cfs @ 12.31 hrs HW=1,070.83' (Free Discharge)
1=Culvert (Inlet Controls 4.08 cfs @ 7.48 fps)

Pond UD 2B: Underdrain 2B



Summary for Pond Underdrain 1: Soccer Field Underdrain

[82] Warning: Early inflow requires earlier time span
[44] Hint: Outlet device #1 is below defined storage
[93] Warning: Storage range exceeded by 1.16'
[88] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 2.005 ac, 0.00% Impervious, Inflow Depth > 3.84" for 25 year event event
Inflow = 6.08 cfs @ 12.29 hrs, Volume= 0.641 af
Outflow = 6.10 cfs @ 12.27 hrs, Volume= 0.641 af, Atten= 0%, Lag= 0.0 min
Primary = 6.10 cfs @ 12.27 hrs, Volume= 0.641 af
Routed to Pond Ex Pond FB : Ex. Det Pond Forebay

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,072.91' @ 12.27 hrs Storage= 275 cf

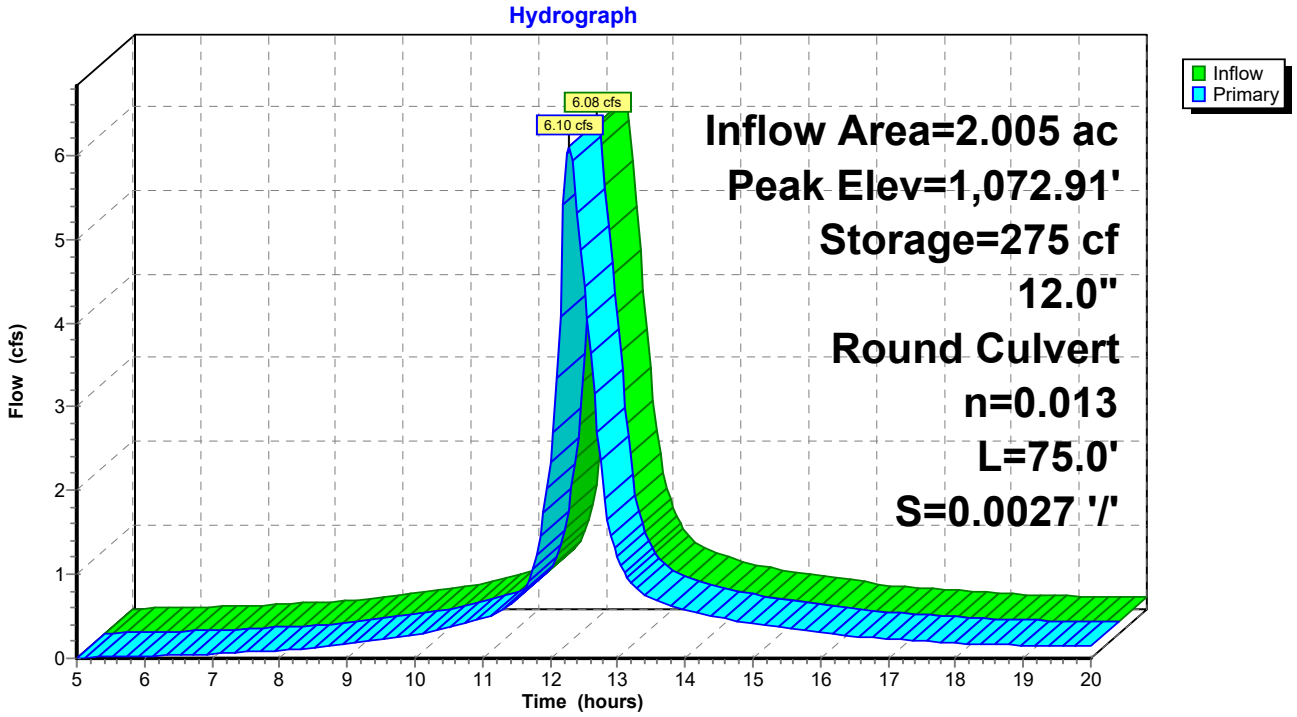
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.3 min (774.9 - 774.5)

Volume	Invert	Avail.Storage	Storage Description
#1	1,069.00'	275 cf	**12.0" Round Pipe Storage** L= 350.0' S= 0.0050 '/'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,068.50'	**12.0" Round Culvert** L= 75.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,068.50' / 1,068.30' S= 0.0027 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=6.02 cfs @ 12.27 hrs HW=1,072.82' (Free Discharge)
1=Culvert (Barrel Controls 6.02 cfs @ 7.67 fps)

Pond Underdrain 1: Soccer Field Underdrain



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

Subcatchment Baseball 2A: Baseball Turf; Runoff Area=60,997 sf 0.00% Impervious Runoff Depth>5.15"
Flow Length=470' Tc=22.7 min CN=89 Runoff=5.50 cfs 0.602 af

Subcatchment Baseball 2B: Baseball Turf; Runoff Area=60,606 sf 0.00% Impervious Runoff Depth>5.15"
Flow Length=428' Tc=23.1 min CN=89 Runoff=5.43 cfs 0.598 af

Subcatchment Soccer: Soccer Turf Runoff Area=87,339 sf 0.00% Impervious Runoff Depth>5.16"
Flow Length=375' Tc=21.6 min CN=89 Runoff=8.04 cfs 0.862 af

Reach Woodlands 1: Woodlands 1 Inflow=7.28 cfs 0.740 af
Outflow=7.28 cfs 0.740 af

Reach Woodlands 2: Woodlands 2 Inflow=11.29 cfs 1.199 af
Outflow=11.29 cfs 1.199 af

Pond Ex Pond A: Ex. Det Pond "A" Peak Elev=1,070.23' Storage=2,602 cf Inflow=7.29 cfs 0.787 af
Outflow=7.28 cfs 0.740 af

Pond Ex Pond FB: Ex. Det Pond Forebay Peak Elev=1,069.64' Storage=5,551 cf Inflow=8.29 cfs 0.862 af
Outflow=7.29 cfs 0.787 af

Pond LLS 2A: Level Lip Spreader 2A Peak Elev=1,070.25' Inflow=5.87 cfs 0.601 af
Outflow=5.87 cfs 0.601 af

Pond LLS 2B: Level Lip Spreader 2B Peak Elev=1,070.24' Inflow=5.43 cfs 0.598 af
Outflow=5.43 cfs 0.598 af

Pond UD 2A: Underdrain 2A Peak Elev=1,073.42' Storage=255 cf Inflow=5.50 cfs 0.602 af
10.0" Round Culvert n=0.013 L=30.0' S=0.0167 '/' Outflow=5.87 cfs 0.601 af

Pond UD 2B: Underdrain 2B Peak Elev=1,072.69' Storage=66 cf Inflow=5.43 cfs 0.598 af
10.0" Round Culvert n=0.013 L=30.0' S=0.0167 '/' Outflow=5.43 cfs 0.598 af

Pond Underdrain 1: Soccer Field Underdrain Peak Elev=1,075.96' Storage=275 cf Inflow=8.04 cfs 0.862 af
12.0" Round Culvert n=0.013 L=75.0' S=0.0027 '/' Outflow=8.29 cfs 0.862 af

Total Runoff Area = 4.797 ac Runoff Volume = 2.061 af Average Runoff Depth = 5.16"
100.00% Pervious = 4.797 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment Baseball 2A: Baseball Turf; 2A

[47] Hint: Peak is 1265% of capacity of segment #3

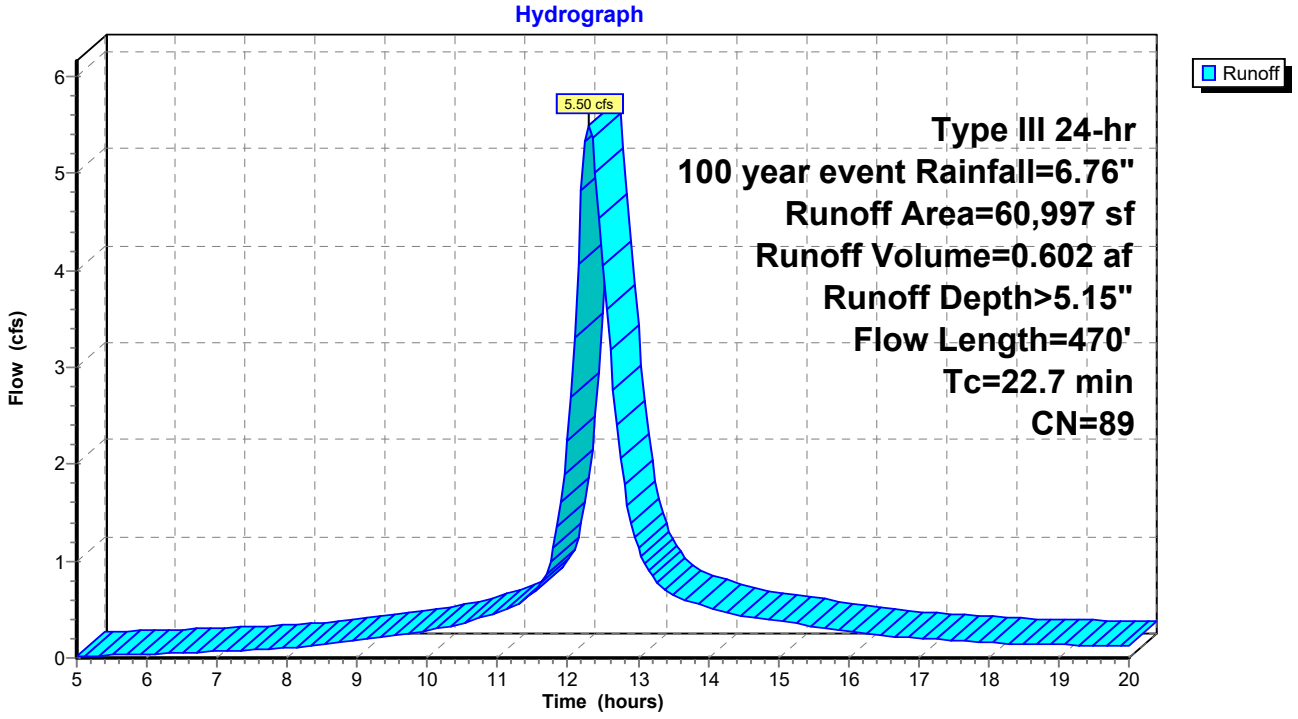
Runoff = 5.50 cfs @ 12.30 hrs, Volume= 0.602 af, Depth> 5.15"
Routed to Pond UD 2A : Underdrain 2A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 year event Rainfall=6.76"

Area (sf)	CN	Description
60,997	89	<50% Grass cover, Poor, HSG D
60,997		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0075	0.10		**Sheet Flow, Turf Field** Grass: Short n= 0.150 P2= 2.38"
3.6	130	0.0075	0.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.3	240	0.0050	1.74	0.44	**Pipe Channel, Panel Drains** 12.0" x 3.0" Box Area= 0.3 sf Perim= 2.5' r= 0.10' n= 0.013 Corrugated PE, smooth interior
22.7	470	Total			

Subcatchment Baseball 2A: Baseball Turf; 2A



Summary for Subcatchment Baseball 2B: Baseball Turf; 2B

[47] Hint: Peak is 1248% of capacity of segment #3

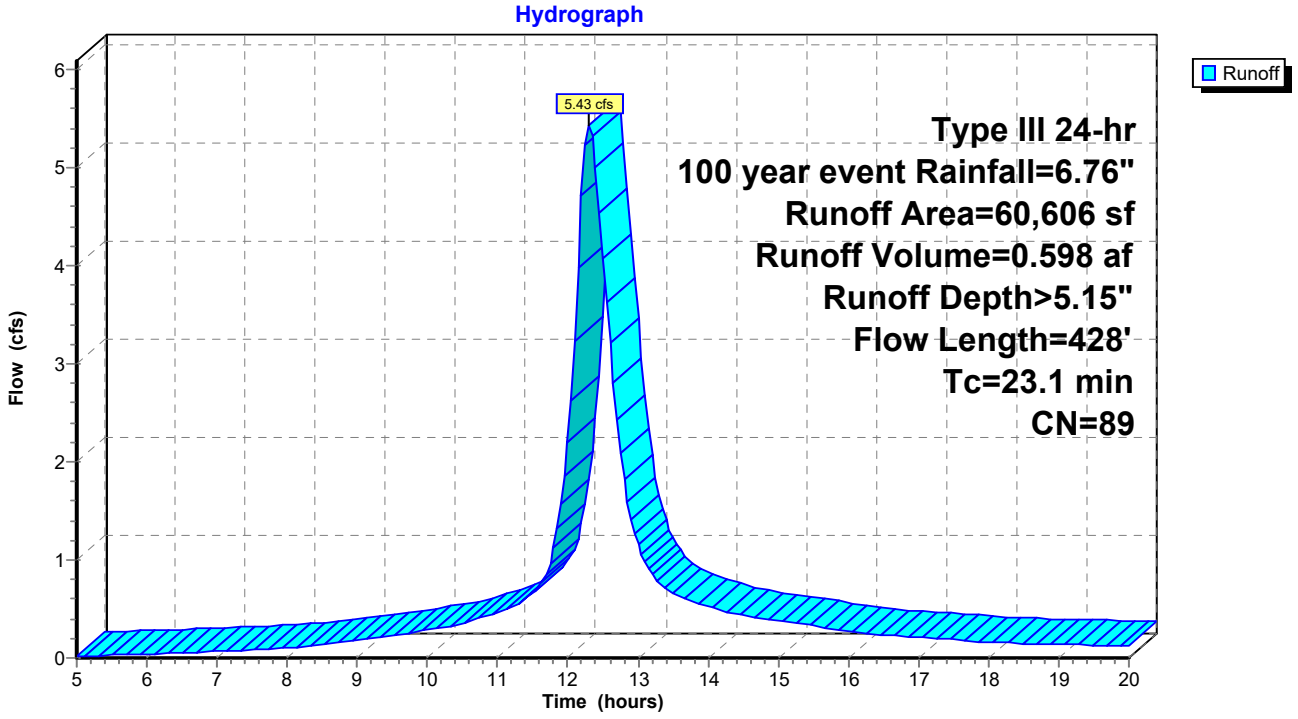
Runoff = 5.43 cfs @ 12.31 hrs, Volume= 0.598 af, Depth> 5.15"
Routed to Pond UD 2B : Underdrain 2B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 year event Rainfall=6.76"

Area (sf)	CN	Description
60,606	89	<50% Grass cover, Poor, HSG D
60,606		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0075	0.10		**Sheet Flow, Turf Field** Grass: Short n= 0.150 P2= 2.38"
4.8	175	0.0075	0.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.5	153	0.0050	1.74	0.44	**Pipe Channel, Panel Drains** 12.0" x 3.0" Box Area= 0.3 sf Perim= 2.5' r= 0.10' n= 0.013 Corrugated PE, smooth interior
23.1	428	Total			

Subcatchment Baseball 2B: Baseball Turf; 2B



Summary for Subcatchment Soccer: Soccer Turf

[47] Hint: Peak is 1848% of capacity of segment #3

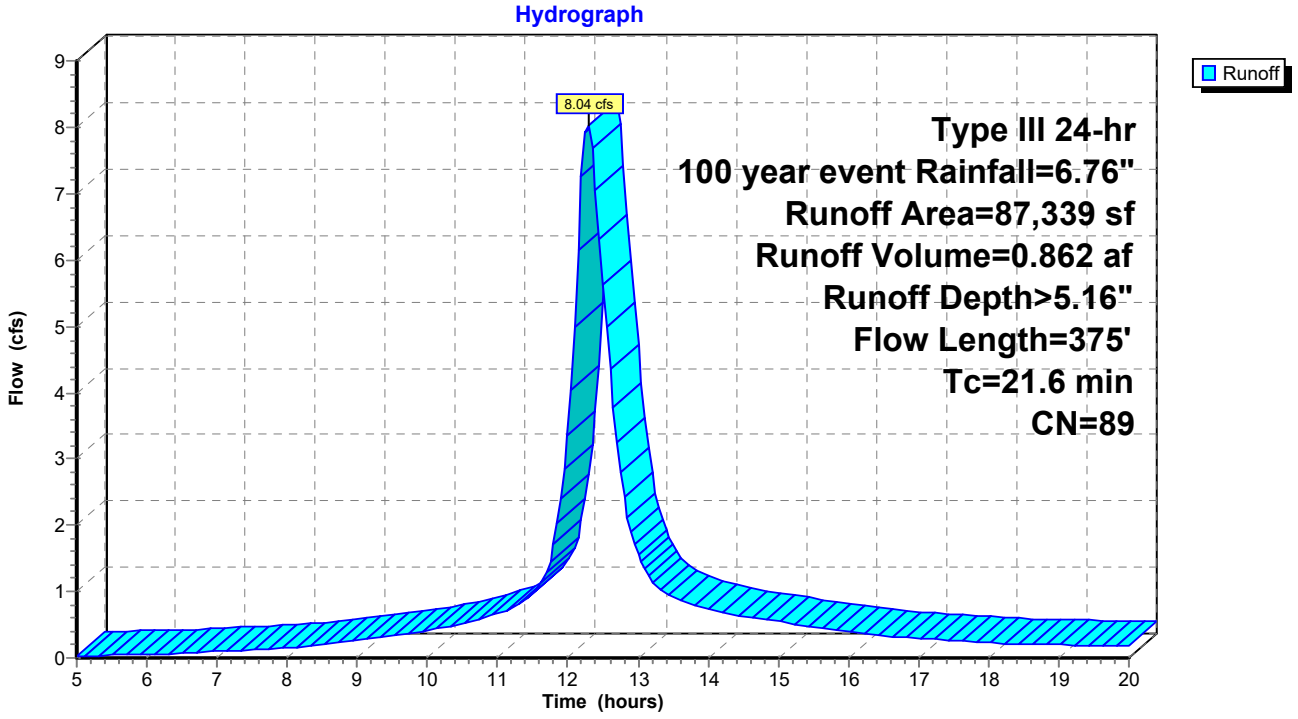
Runoff = 8.04 cfs @ 12.29 hrs, Volume= 0.862 af, Depth> 5.16"
Routed to Pond Underdrain 1 : Soccer Field Underdrain

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 year event Rainfall=6.76"

Area (sf)	CN	Description
87,339	89	<50% Grass cover, Poor, HSG D
87,339		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0075	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.38"
3.4	125	0.0075	0.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.4	150	0.0050	1.74	0.44	**Pipe Channel, Panel Drains** 12.0" x 3.0" Box Area= 0.3 sf Perim= 2.5' r= 0.10' n= 0.013 Corrugated PE, smooth interior
21.6	375	Total			

Subcatchment Soccer: Soccer Turf



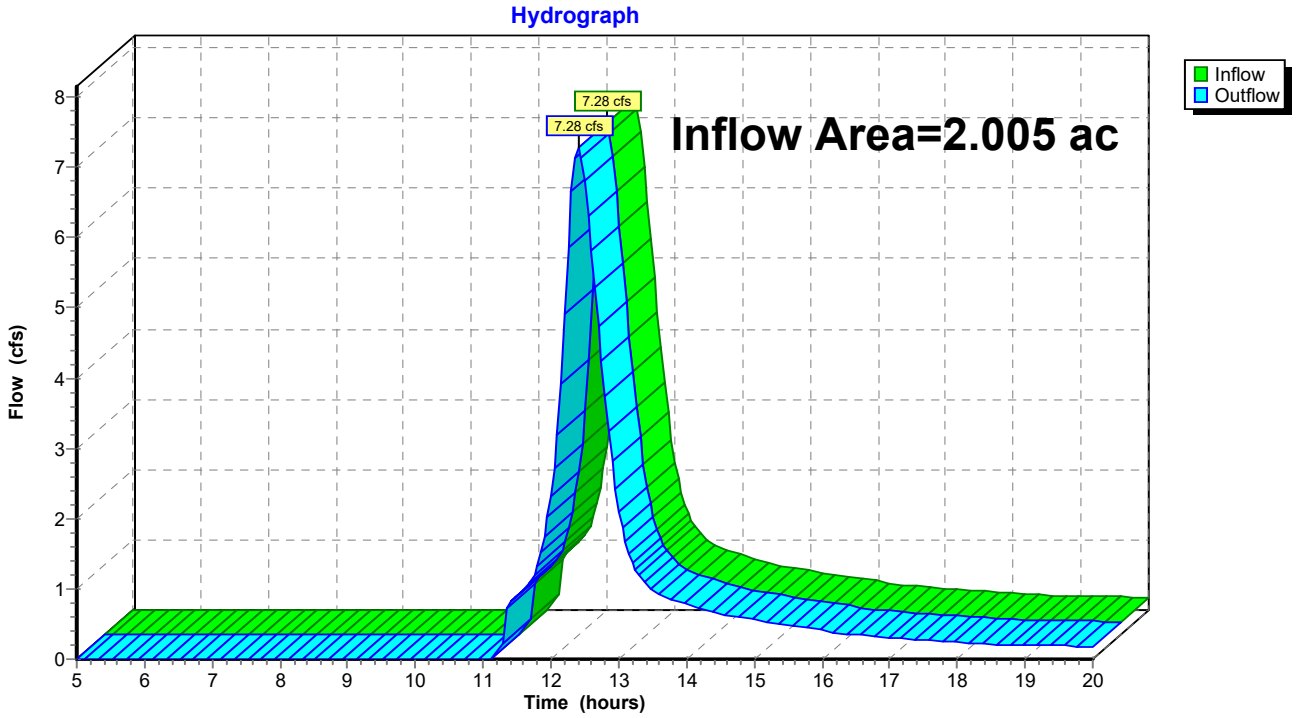
Summary for Reach Woodlands 1: Woodlands 1

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

Inflow Area = 2.005 ac, 0.00% Impervious, Inflow Depth > 4.43" for 100 year event event
Inflow = 7.28 cfs @ 12.40 hrs, Volume= 0.740 af
Outflow = 7.28 cfs @ 12.40 hrs, Volume= 0.740 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach Woodlands 1: Woodlands 1



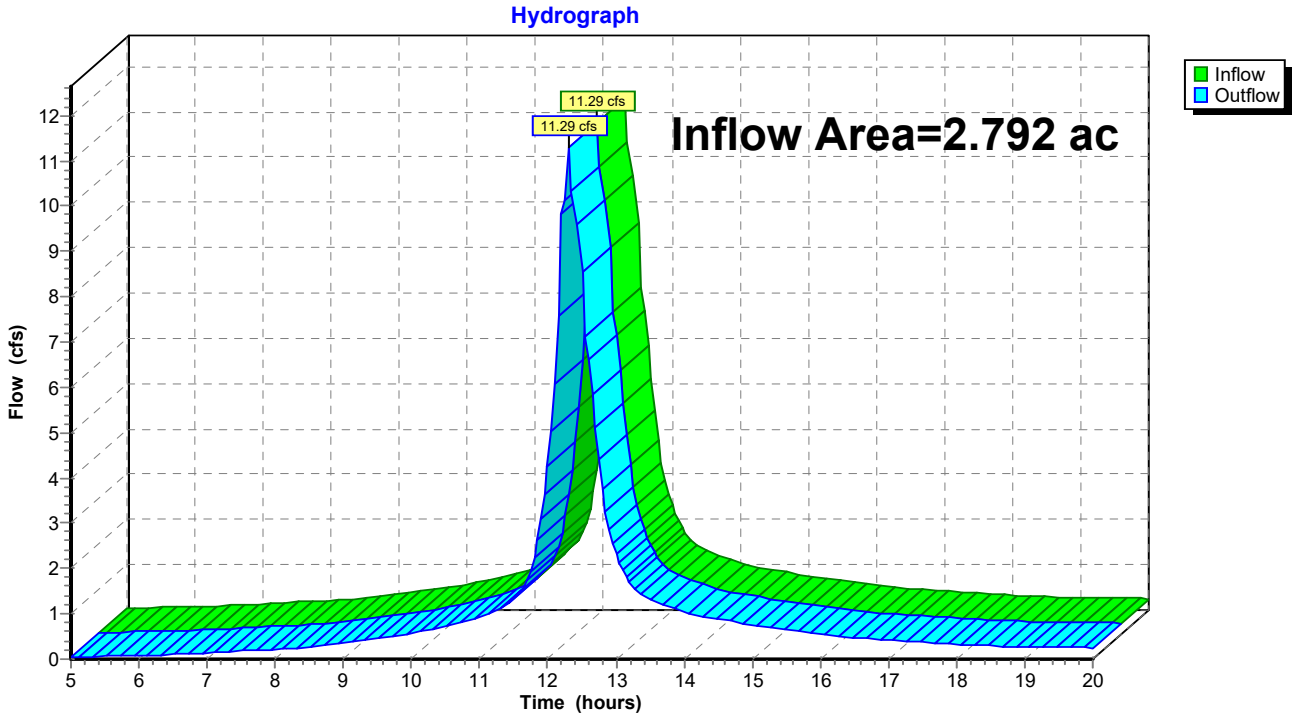
Summary for Reach Woodlands 2: Woodlands 2

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

Inflow Area = 2.792 ac, 0.00% Impervious, Inflow Depth > 5.15" for 100 year event event
Inflow = 11.29 cfs @ 12.30 hrs, Volume= 1.199 af
Outflow = 11.29 cfs @ 12.30 hrs, Volume= 1.199 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach Woodlands 2: Woodlands 2



Summary for Pond Ex Pond A: Ex. Det Pond "A"

[81] Warning: Exceeded Pond Ex Pond FB by 0.58' @ 12.40 hrs

Inflow Area = 2.005 ac, 0.00% Impervious, Inflow Depth > 4.71" for 100 year event event
Inflow = 7.29 cfs @ 12.38 hrs, Volume= 0.787 af
Outflow = 7.28 cfs @ 12.40 hrs, Volume= 0.740 af, Atten= 0%, Lag= 1.0 min
Primary = 7.28 cfs @ 12.40 hrs, Volume= 0.740 af
Routed to Reach Woodlands 1 : Woodlands 1

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,070.23' @ 12.40 hrs Surf.Area= 2,727 sf Storage= 2,602 cf

Plug-Flow detention time= 30.6 min calculated for 0.737 af (94% of inflow)
Center-of-Mass det. time= 10.7 min (806.5 - 795.7)

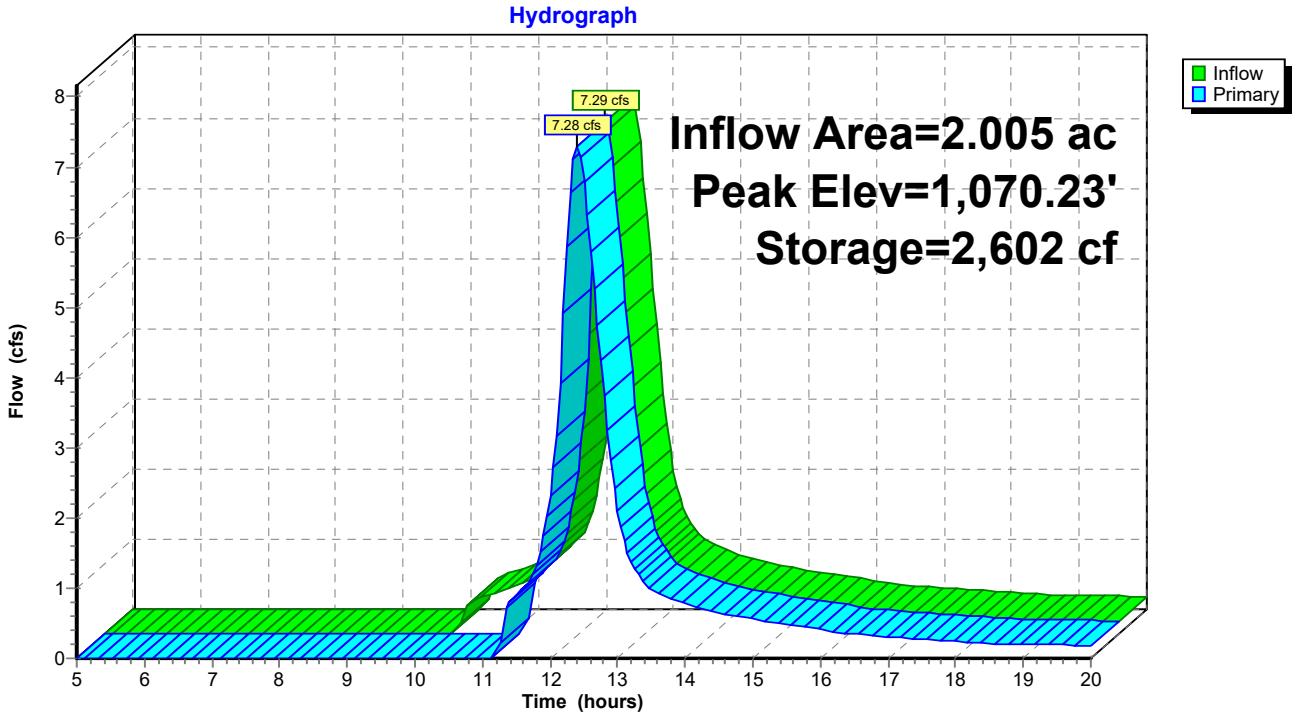
Volume	Invert	Avail.Storage	Storage Description
#1	1,068.99'	56,758 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,068.99	1	0	0
1,069.00	1,500	8	8
1,071.00	3,500	5,000	5,008
1,072.00	100,000	51,750	56,758

Device	Routing	Invert	Outlet Devices
#1	Primary	1,070.00'	**25.0' long x 15.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=7.27 cfs @ 12.40 hrs HW=1,070.23' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 7.27 cfs @ 1.28 fps)

Pond Ex Pond A: Ex. Det Pond "A"



Summary for Pond Ex Pond FB: Ex. Det Pond Forebay

[82] Warning: Early inflow requires earlier time span
[81] Warning: Exceeded Pond Underdrain 1 by 0.50' @ 19.90 hrs

Inflow Area = 2.005 ac, 0.00% Impervious, Inflow Depth > 5.16" for 100 year event event
Inflow = 8.29 cfs @ 12.26 hrs, Volume= 0.862 af
Outflow = 7.29 cfs @ 12.38 hrs, Volume= 0.787 af, Atten= 12%, Lag= 7.5 min
Primary = 7.29 cfs @ 12.38 hrs, Volume= 0.787 af
Routed to Pond Ex Pond A : Ex. Det Pond "A"

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,069.64' @ 12.38 hrs Surf.Area= 30,301 sf Storage= 5,551 cf

Plug-Flow detention time= 56.5 min calculated for 0.787 af (91% of inflow)
Center-of-Mass det. time= 27.3 min (795.7 - 768.5)

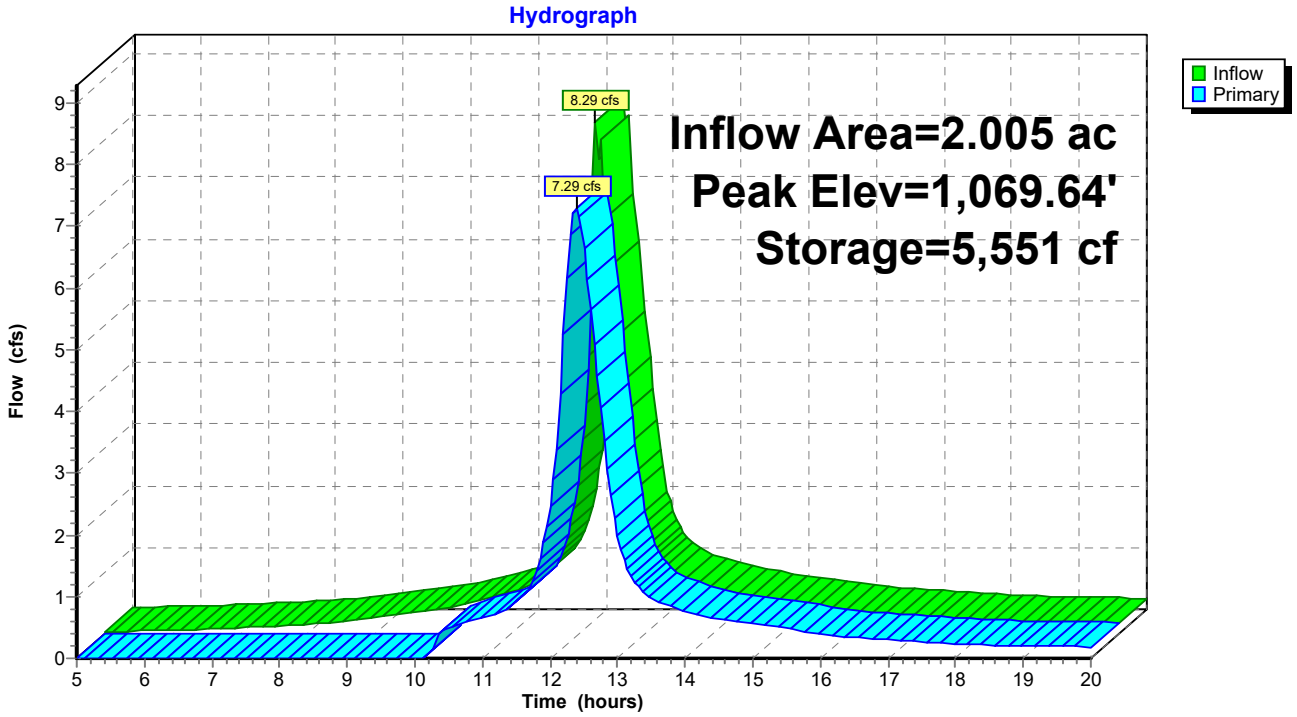
Volume	Invert	Avail.Storage	Storage Description
#1	1,067.99'	28,784 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,067.99	0	0	0
1,068.00	2,000	10	10
1,069.50	2,274	3,206	3,215
1,070.00	100,000	25,569	28,784

Device	Routing	Invert	Outlet Devices
#1	Primary	1,069.50'	**50.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=7.25 cfs @ 12.38 hrs HW=1,069.64' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 7.25 cfs @ 1.01 fps)

Pond Ex Pond FB: Ex. Det Pond Forebay



Summary for Pond LLS 2A: Level Lip Spreader 2A

[82] Warning: Early inflow requires earlier time span
[57] Hint: Peaked at 1,070.25' (Flood elevation advised)
[81] Warning: Exceeded Pond UD 2A by 1.94' @ 5.00 hrs

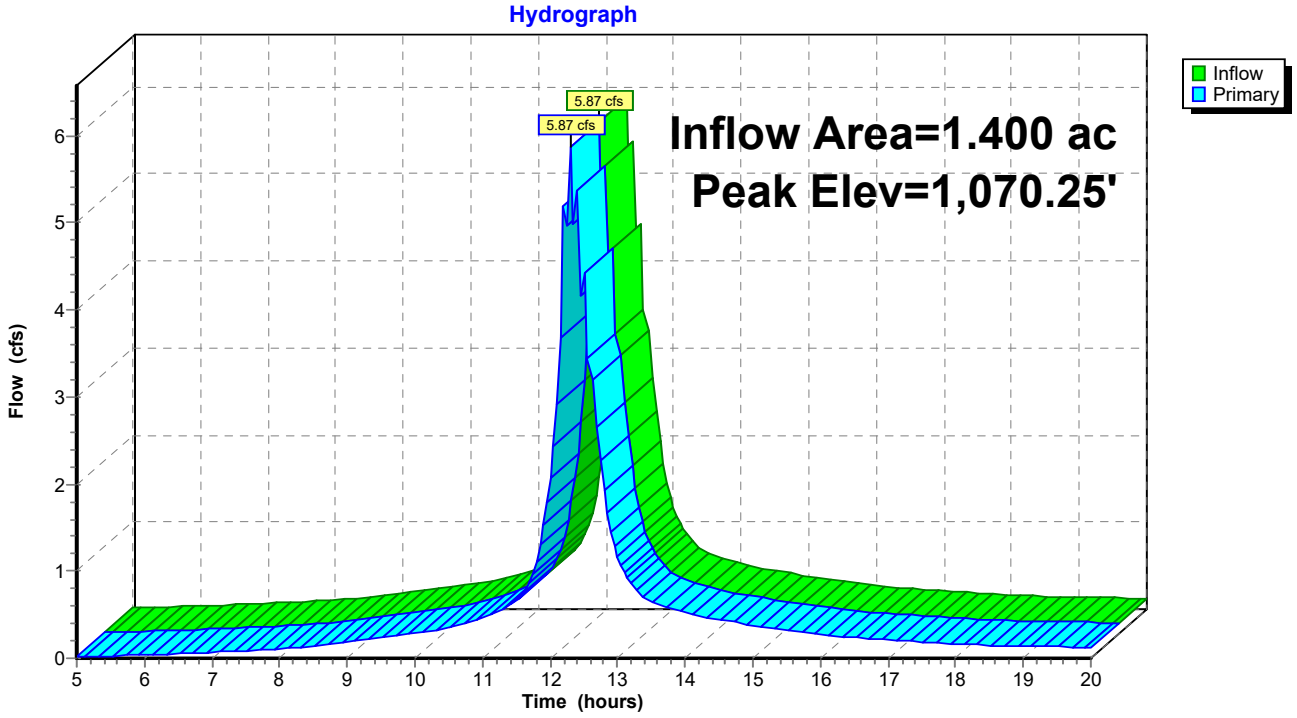
Inflow Area = 1.400 ac, 0.00% Impervious, Inflow Depth > 5.15" for 100 year event event
Inflow = 5.87 cfs @ 12.30 hrs, Volume= 0.601 af
Outflow = 5.87 cfs @ 12.30 hrs, Volume= 0.601 af, Atten= 0%, Lag= 0.0 min
Primary = 5.87 cfs @ 12.30 hrs, Volume= 0.601 af
Routed to Reach Woodlands 2 : Woodlands 2

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,070.25' @ 12.30 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	1,070.00'	**20.0' long x 5.0' 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) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=5.86 cfs @ 12.30 hrs HW=1,070.25' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 5.86 cfs @ 1.18 fps)

Pond LLS 2A: Level Lip Spreader 2A



Summary for Pond LLS 2B: Level Lip Spreader 2B

[82] Warning: Early inflow requires earlier time span
[57] Hint: Peaked at 1,070.24' (Flood elevation advised)
[81] Warning: Exceeded Pond UD 2B by 1.98' @ 5.00 hrs

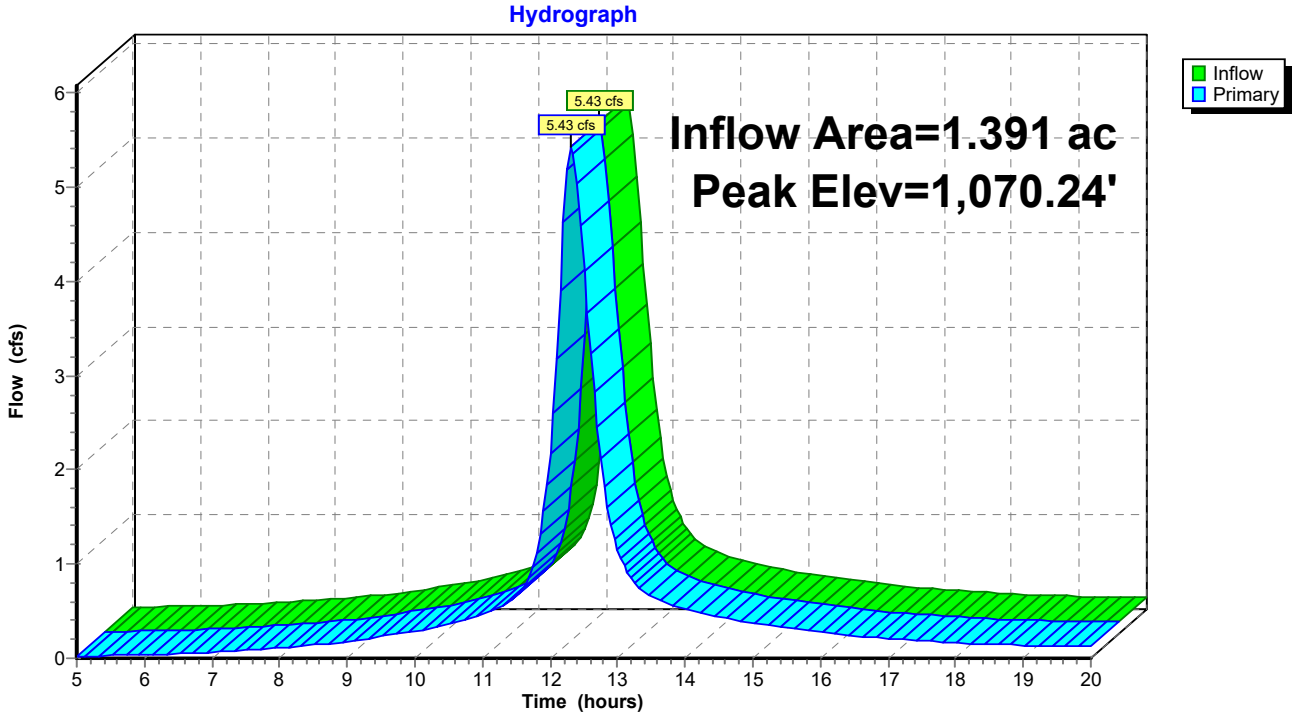
Inflow Area = 1.391 ac, 0.00% Impervious, Inflow Depth > 5.15" for 100 year event event
Inflow = 5.43 cfs @ 12.31 hrs, Volume= 0.598 af
Outflow = 5.43 cfs @ 12.31 hrs, Volume= 0.598 af, Atten= 0%, Lag= 0.0 min
Primary = 5.43 cfs @ 12.31 hrs, Volume= 0.598 af
Routed to Reach Woodlands 2 : Woodlands 2

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,070.24' @ 12.31 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	1,070.00'	**20.0' long x 5.0' 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) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=5.40 cfs @ 12.31 hrs HW=1,070.24' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 5.40 cfs @ 1.15 fps)

Pond LLS 2B: Level Lip Spreader 2B



Summary for Pond UD 2A: Underdrain 2A

[82] Warning: Early inflow requires earlier time span
[93] Warning: Storage range exceeded by 2.79'
[88] Warning: Qout>Qin may require smaller dt or Finer Routing
[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=1)

Inflow Area = 1.400 ac, 0.00% Impervious, Inflow Depth > 5.15" for 100 year event event
Inflow = 5.50 cfs @ 12.30 hrs, Volume= 0.602 af
Outflow = 5.87 cfs @ 12.30 hrs, Volume= 0.601 af, Atten= 0%, Lag= 0.0 min
Primary = 5.87 cfs @ 12.30 hrs, Volume= 0.601 af
Routed to Pond LLS 2A : Level Lip Spreader 2A

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,073.42' @ 12.30 hrs Storage= 255 cf

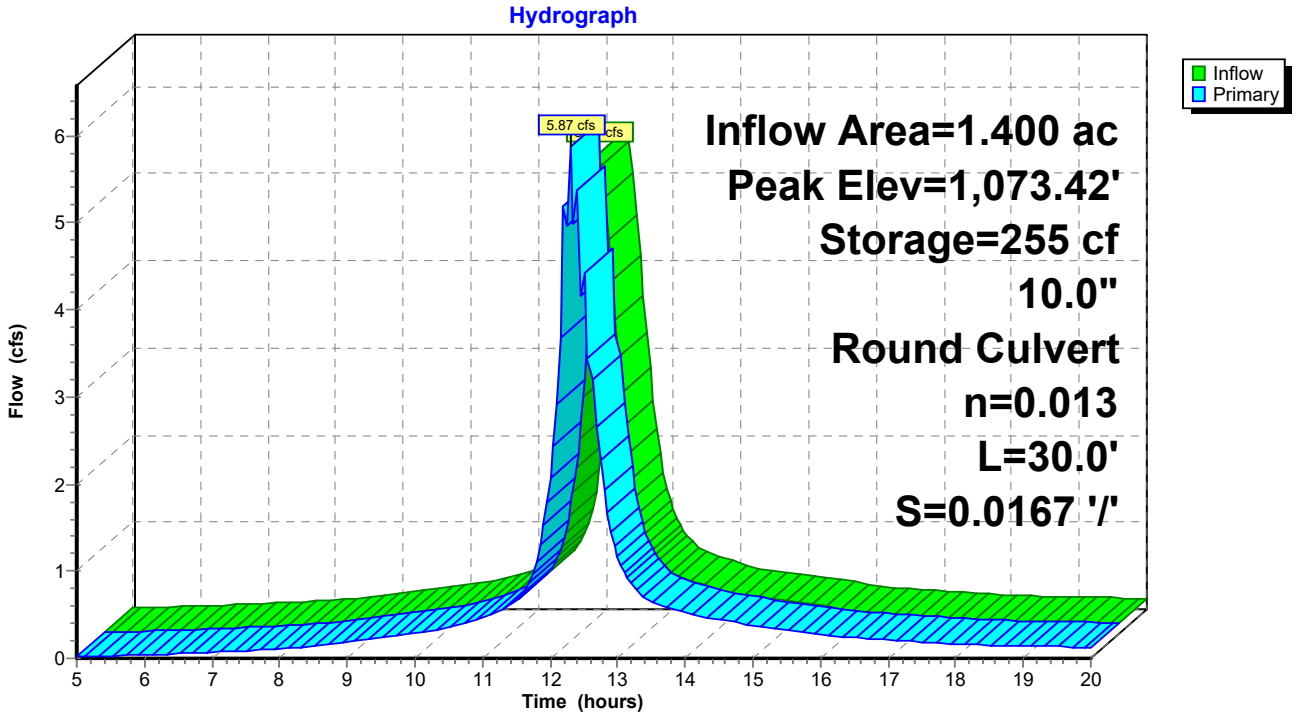
Plug-Flow detention time= 0.6 min calculated for 0.601 af (100% of inflow)
Center-of-Mass det. time= 0.5 min (769.6 - 769.0)

Volume	Invert	Avail.Storage	Storage Description
#1	1,068.00'	255 cf	**12.0" Round Pipe Storage** L= 325.0' S= 0.0050 '/'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,068.00'	**10.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,068.00' / 1,067.50' S= 0.0167 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=5.87 cfs @ 12.30 hrs HW=1,073.41' (Free Discharge)
↑**1=Culvert** (Inlet Controls 5.87 cfs @ 10.75 fps)

Pond UD 2A: Underdrain 2A



Summary for Pond UD 2B: Underdrain 2B

[82] Warning: Early inflow requires earlier time span

Inflow Area = 1.391 ac, 0.00% Impervious, Inflow Depth > 5.15" for 100 year event event
Inflow = 5.43 cfs @ 12.31 hrs, Volume= 0.598 af
Outflow = 5.43 cfs @ 12.31 hrs, Volume= 0.598 af, Atten= 0%, Lag= 0.4 min
Primary = 5.43 cfs @ 12.31 hrs, Volume= 0.598 af
Routed to Pond LLS 2B : Level Lip Spreader 2B

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,072.69' @ 12.31 hrs Surf.Area= 16 sf Storage= 66 cf

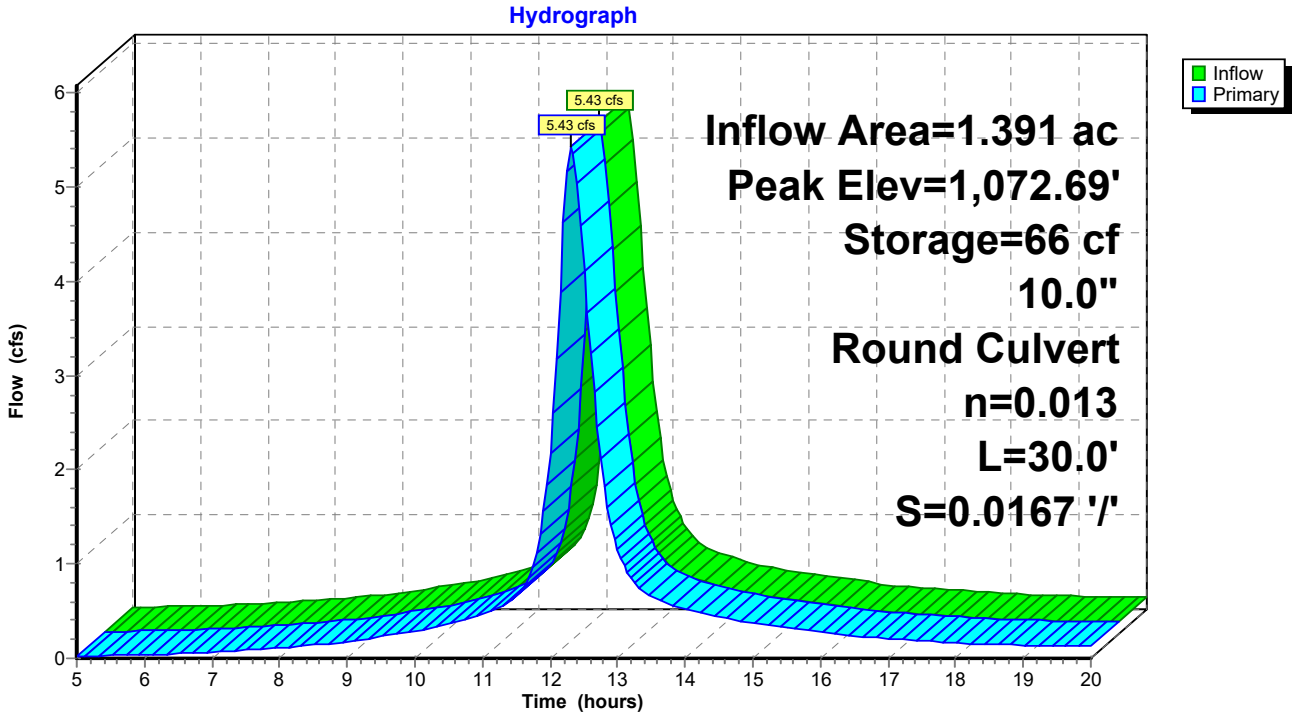
Plug-Flow detention time= 0.1 min calculated for 0.596 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (769.4 - 769.3)

Volume	Invert	Avail.Storage	Storage Description
#1	1,068.00'	263 cf	**12.0" Round Pipe Storage** L= 335.0' S= 0.0500 '/'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,068.00'	**10.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,068.00' / 1,067.50' S= 0.0167 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=5.40 cfs @ 12.31 hrs HW=1,072.64' (Free Discharge)
1=Culvert (Inlet Controls 5.40 cfs @ 9.90 fps)

Pond UD 2B: Underdrain 2B



Summary for Pond Underdrain 1: Soccer Field Underdrain

[82] Warning: Early inflow requires earlier time span
[44] Hint: Outlet device #1 is below defined storage
[93] Warning: Storage range exceeded by 4.21'
[88] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 2.005 ac, 0.00% Impervious, Inflow Depth > 5.16" for 100 year event event
Inflow = 8.04 cfs @ 12.29 hrs, Volume= 0.862 af
Outflow = 8.29 cfs @ 12.26 hrs, Volume= 0.862 af, Atten= 0%, Lag= 0.0 min
Primary = 8.29 cfs @ 12.26 hrs, Volume= 0.862 af
Routed to Pond Ex Pond FB : Ex. Det Pond Forebay

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,075.96' @ 12.26 hrs Storage= 275 cf

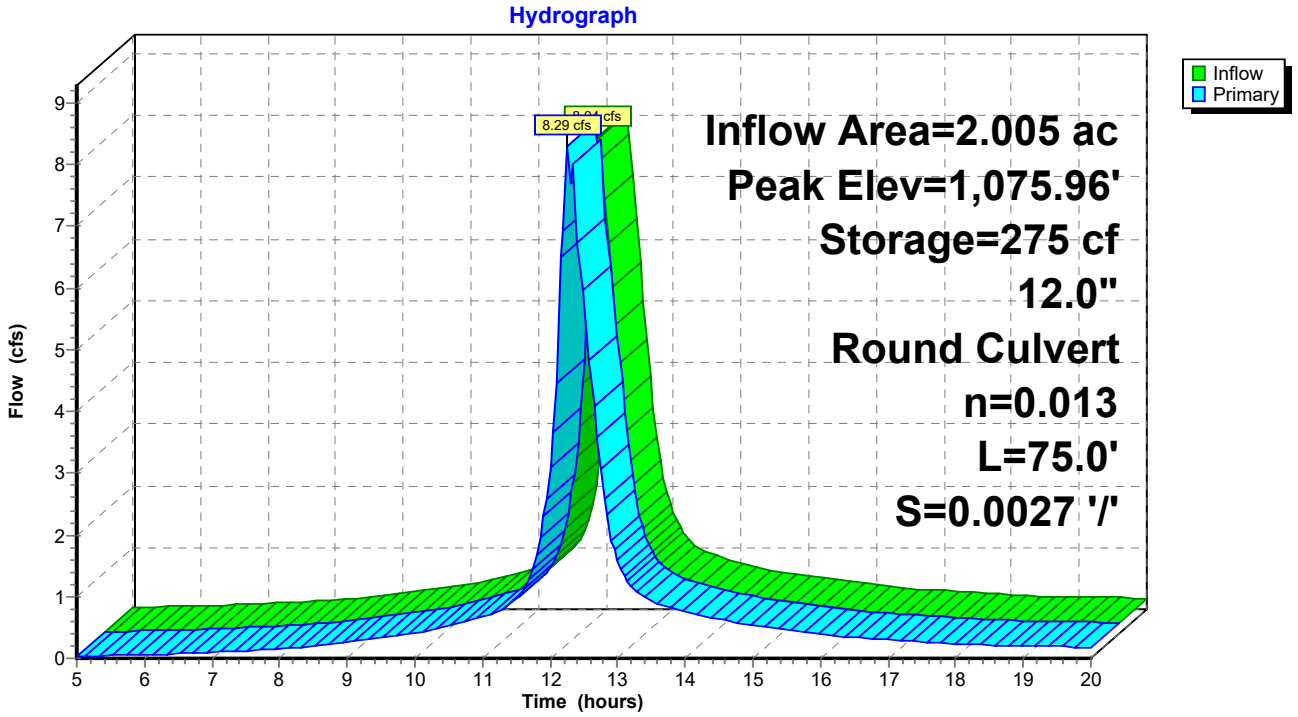
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.3 min (768.5 - 768.1)

Volume	Invert	Avail.Storage	Storage Description
#1	1,069.00'	275 cf	**12.0" Round Pipe Storage** L= 350.0' S= 0.0050 '/'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,068.50'	**12.0" Round Culvert** L= 75.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,068.50' / 1,068.30' S= 0.0027 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=8.14 cfs @ 12.26 hrs HW=1,075.73' (Free Discharge)
1=Culvert (Barrel Controls 8.14 cfs @ 10.36 fps)

Pond Underdrain 1: Soccer Field Underdrain



Inspection and Mainteance Plan — Appendix D

CONTENTS:

Winchendon School
Synthetic Turf Fields

Stormwater Facilities
Inspection and Maintenance Plan
April 6, 2022

Applicant:

Winchendon School
172 Ash St.
Winchendon, MA 01475

Submitted by:

Melissa Flynn, P.E.
Civil Engineer
SMRT, Inc.
Architecture Engineering Planning
200 Brickstone Square, Suite 303
Andover, MA 01810

STORMWATER FACILITIES
INSPECTION AND MAINTENANCE PLAN
April 2022
Winchendon School Synthetic Turf Fields
Winchendon School, Winchendon, MA

CONSTRUCTION PHASE

1. Requirements
    a. Responsibilities: the maintenance of all stormwater measures will be the direct responsibility of the Contractor undertaking the work. All work shall conform to the terms and conditions and Massachusetts Stormwater Handbook.
    b. Inspection Frequency: Notwithstanding any other schedule noted below, general inspections should be conducted once a week and before and after any significant events (rainfall of 0.5 inch or more in 24 hours).
    c. Maintenance and Corrective Action Timeline: If corrective action is necessary, it will be started by the end of the next workday and completed within seven days, or before the next storm event, whichever comes first. Documentation for corrective actions will be kept with associated inspection forms.
    d. Inspector Qualifications: All construction inspections shall be conducted by a person with knowledge of erosion and stormwater control and knowledge of the standards and conditions of the permit.
    e. Documentation: Inspection forms and documentation of corrective actions during construction shall be maintained for a minimum of three years after permanent stabilization has been achieved.
    f. Inspection Scope: The scope of construction inspections shall include disturbed and impervious areas, material storage areas, and vehicle access points (i.e. construction entrance) in addition to established erosion control measures.

POST CONSTRUCTION PHASE

2. Requirements
    a. Responsibilities: After acceptance by the Owner, the maintenance of all stormwater management facilities, the inspection and maintenance of the stormwater management system will be the responsibility of The Winchendon School, Inc..
    b. Inspector Qualifications: All post-construction inspections shall be conducted by a person with knowledge of erosion and stormwater control and knowledge of the standards and conditions of the permit.
    c. Documentation: Post-construction I&M and corrective action forms shall be maintained for a minimum of five years after permanent stabilization has been achieved.

d. Inspection Frequency and Scope: Feature-specific inspection scopes and frequencies are provide on individual BMP Inspection and Maintenance Logs. Additional first year requirements are provided.

e. Maintenance and Corrective Action Timeline: If corrective action is necessary, it will be started by the end of the next workday and completed within seven days, or before the next storm event, whichever comes first. Documentation for corrective actions will be kept with associated inspection forms.

BMP INSPECTION AND MAINTENANCE LOGS

3. Individual BMPs:
    a. Detention Pond
    b. Level Lip Spreaders

ROUTINE MAINTENANCE REQUIREMENTS

4. Requirements:
    a. **Storm Drain Structures:** Storm drain structures (including catch basins, manholes, and outlet control structures) shall be inspected on an annual basis to remove any obstructions to flow; remove accumulated sediments and debris in sumps, and to identify repair maintenance. Sediment shall be removed from sumps when sediment results in less than 1 foot of available sump storage. This shall be accomplished through the use of a vacuum or similar hydraulic flushing or any mechanical means. Sediment shall be contained at the pipe outlets and not allowed to transport downstream. Do not enter structures without use of OSHA-approved methods.

    b. **Piped drainage systems:** shall be inspected on an annual basis to remove any obstructions to flow; remove accumulated sediments and debris at the inlet, at the outlet, and within the conduit; and any erosion damage observed at the pipe inlet and outlet. Sediment shall be removed when its level exceeds 20% of the pipe diameter. This may be accomplished by hydraulic flushing or any mechanical means. Sediment shall be contained at the pipe outlets and not allowed to transport downstream.

    c. **Ditches, Swales, and Pipe Outlet Aprons: Open swales, ditches and aprons shall be inspected at a minimum on a quarterly basis, and before and after a major rainfall event to assure that debris and/or sediments do not reduce the effectiveness of the system. Debris noticed during an inspection shall be removed at that time, or within 24-hours of the inspection. Any sign of erosion or blockage shall be immediately repaired and stabilized to ensure the stability of the structure and proper function. Maintenance shall include, but not be limited to, mowing, trimming and removal vegetation in the ditches as required to prevent vegetation from blocking or diverting storm flows, replacement of riprap channel lining to prevent scour of the channel invert, removing vegetation and debris from the culverts, inlet and outlet structures.**

d. Riprap ditches, aprons, and level spreaders where stone is displaced should be replaced and chinked to assure stability. With time, additional riprap may be added to maintain design depths and grades. Vegetation growing through riprap and accumulated sediments and debris should be removed on a bi-annual basis.

STORMWATER FACILITIES
OPERATION, INSPECTION AND MAINTENANCE INSPECTION REPORT

GENERAL Project: Winchendon School Synthetic Turf Fields

Winchendon, MA

Inspector: Qualifications:

Date/Time:

Inspection Type: □ Annual/Biannual/_____

□ Storm Event-Storm start date & rainfall (inches):

Weather conditions (at time of inspection):

General Observations:

Outstanding Issues from Previous Report:

BMP's	Functional?	Condition?	Notes
Storm Drain Structures:	□ Yes □ No		_____
Ditches, Swales, and Pipe Outlet Aprons:	□ Yes □ No		_____
Drainage Pipes and Culverts:	□ Yes □ No		_____
Riprap ditches, aprons, and level spreaders:	□ Yes □ No		_____

Other:

CORRECTIVE ACTIONS, FOLLOW UP, SCHEDULE, RESPONSIBLE PARTIES AND GENERAL NOTES

Long Term Pollution Protection Plan — Appendix E

CONTENTS:

LONG-TERM POLLUTION PREVENTION PLAN

Winchendon Synthetic Turf Fields
Winchendon School

Winchendon, MA

During construction activities, the maintenance of all stormwater measures will be the direct responsibility of the Contractor undertaking the work. All work shall conform to the terms and conditions of all relevant local, State and/or Federal permits. After acceptance by the Owner, the maintenance of all stormwater management facilities, the establishment of any contract services required implementing the program and the keeping of records and maintenance log book will be the responsibility of Edgewood Retirement Community. Notwithstanding any other schedule noted below, general inspections should be conducted by facilities staff monthly during wet weather conditions from March to November.

Housekeeping Practices

Housekeeping practices should be conducted year round on an as needed basis. This includes but is not limited to the follow:

- Remove litter and debris from fields area weekly so as to prevent these materials from entering the stormwater system.
- Maintain grass or mulch cover in landscaped areas to prevent soil erosion into the stormwater system.
- Repair erosion within landscape areas in a timely manner.

Provisions for Storing Materials

No materials or waste products should be stored in any outdoor/uncovered areas. Any waste materials removed from the site should be disposed of according to local and state regulations.

Requirements for Routine Inspections and Maintenance of Stormwater BMPs

Please see the attached Operations, Inspection and Maintenance Plan for inspection requirements for the site's BMPs.

Spill Prevention and Response Plans

We do not anticipate the outdoor handling of chemicals that may require a spill prevention and response plan.

Provisions for Maintenance of Lawns, Gardens, and other Landscaped Areas.

Plantings and lawns will require periodic maintenance, which will include occasional cropping and removal of excess growth and weeding. Fertilizers, herbicides and pesticides should be used as needed on a minimal basis.

Requirements for Storage and Use of Fertilizers, Herbicides and Pesticides

All storage of fertilizers, herbicides and pesticides shall be inside, under cover away from exposure to the elements.

Pet Waste Management Provisions

Any pet waste should be collected and disposed of properly so as to not allow it to enter the stormwater system.

Provisions for Solid Waste Management

Solid waste management is not included as part of this project.

Provisions for Prevention of Illicit discharges to the Stormwater Management System

Due to the nature of the project there is minimal potential for an illicit discharge to the stormwater management system.

Documentation that Stormwater BMP's are Designed to Provide for Shutdown and Containment in the Event of a Spill.

Due to the nature of the proposed project, the BMP's have not been designed for shutdown.

Training for Staff or Personnel Involved in with Implementing the Long Term Pollution Prevention Plan

Winchendon School will be responsible for training the personnel responsible for implementing and maintaining the Long Term Pollution Prevention Plan.