

Limited Stormwater Hydrology Report

Under the DEP Stormwater Management Standards

**Proposed Dining Hall
& Site Improvements**

**285 Pine Nook Road
Deerfield, MA**

March 8, 2023

Submitted To:

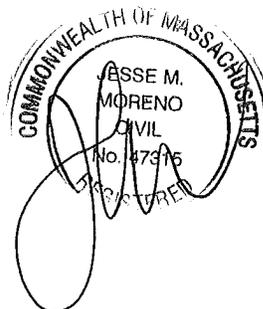
Town of Deerfield
Conservation Commission
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Applicant:

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Section 1

Narrative, Figures, & Checklist

***Stormwater Narrative for
Proposed Dining Hall & Site Improvements
285 Pine Nook Road
Deerfield, MA***

EXECUTIVE SUMMARY

Eaglebrook School is an independent boarding and day school for boys in grades six, seven, eight, and nine. The school was founded in 1922 by Howard Gibbs and currently educates over 250 students from 23 countries and 19 states with approximately 75 faculty and staff on an 800-acre campus. The Eaglebrook School (“Applicant”) proposes to construct a new dining hall facility including site improvements and redevelopment of the Baines Classroom Building and Gibbs Dining Hall on land located in the central part of the campus. The project will be constructed on a parcel owned by the school containing approximately 86 acres known as Map 62 Parcel 13 in the Residential Agricultural (RA) zone. Once constructed the new dining hall will be assigned an address as 283 Pine Nook Road in Deerfield, Massachusetts (See Section 1.2 Figures – Orthophoto Map Fig. 1.)

The subject property is located on land on the western side slopes of the Pocumtuck Range centrally located on the Eaglebrook campus south of Pine Nook Road. To the East lies classroom, dormitory, and administrative buildings, to the West are athletic fields and the Sports Center. Further West is Old County Road that parallels rail road tracks and State Route 5 & 10. Further South are additional playing fields, maintenance facilities, a ski slope, maintenance facility, and a hockey rink.

The project proposes a series of drainage improvements including open and closed-conveyance systems, low impact design, rain garden/biofiltration, water quality swales, underground infiltration systems, a green roof system, and a water quality inlet in the spirit of conforming with the Town’s Best Development Practices Guidebook and Climate Resiliency Policy.

The proposed project will include construction of an approximate 38,000±sf two-story dining hall with multi-level basement including access drive turnaround & drop off area, sidewalks, utilities, site grading, common area improvements, and a stormwater management system. Work is generally outside of 50 feet of the resource area, except where culvert and sanitary utility improvements are needed. Level spreader outfalls are proposed to dissipate energy and encourage sheet flow discharge from stormwater management. Once the new dining hall is constructed, the existing Gibbs Hall dining building will be redeveloped into an assembly, health center, and learning area for students. An adjacent classroom building called Baines Hall will be demolished and reconstructed into a classroom building preserving views to the West and providing students with a state-of-the art classroom learning experience. A new dormitory building is also envisioned for the area South of the proposed dining hall building with footprint of approximately 4,000 sf.

The existing parking lot in the area of the Gibbs and Baines buildings will be converted into a vehicular drop-off, parking area, and delivery area for the new buildings. The stormwater management system includes the addition of swirl type water quality inlets to existing areas and a new underground

infiltration system in the area of the existing varsity field. The building and site feature many low impact development best management practices including cross-country drainage, raingardens, conventional green roofs, and “Purple-Roof” technologies that utilizes a honeycomb detention layer to optimize stormwater retention in vegetated and non-vegetated roof coverings. Various field, retaining wall, common area sitting and multipurpose areas will be constructed as part of the project.

The proposed site improvements are shown on the plans provided under separate cover entitled “Proposed Dining Hall & Site Improvements, 285 Pine Nook Road, Deerfield, MA” latest revision as prepared by ProTerra Design Group, LLC.

EXISTING SITE DESCRIPTION

The project parcel consists of approximately 86 acres of developed and forested land in the RA Residential Agricultural district that is generally bounded by Pine Nook Road to the North, forested land to the East and South, and developed wooded parcels of the Eaglebrook School to the West (See Section 1.2 Figures – USGS Map Fig. 2). The parcel contains numerous buildings and infrastructure as part of the campus of Eaglebrook School.

The existing parking lot area to the West of Baines Building and the existing Dining Commons currently collects stormwater in conventional catch basins and outlets to the varsity field area or towards the slope near the unnamed intermittent stream along Pine Nook Road. Other remaining portions of the new development area overlooks a grassed slope heading West towards existing baseball and softball playing fields adjacent to a ski slope as point sources. There are limited existing drainage systems including yard drains and catch basin outlets to the slope. There are some swales that convey runoff to the south towards existing catch basin structures at the base of the slope near the varsity football field. Along the base of slope beginning at the North and heading in the crease along the transition in slope is a French drain that ties into the other catch basins and outlets West towards the hockey rink. The varsity field is sub drained with outlets heading to the area of the slope adjacent to the power utility right of way.

Wetland resource areas were located within and adjacent to the property by SWCA and Lucas Environmental, LLC. A Notice of Intent will be filed with the Town of Deerfield Conservation Commission to permit the work within jurisdiction. Primarily, the work will be outside of 50 feet buffer zone except where existing storm and sewer infrastructure needed to be upgraded. The resources are generally described below.

An intermittent stream along Pine Nook Road flows west along the northern property line of the project parcel. Bordering Vegetated Wetland (BVW) consisting primarily of Palustrine Forested Wetland (PFO) and Palustrine Scrub-Shrub Wetland (PSS) are present along this stream, as well as within the western portion of the parcel where these wetlands are associated with groundwater seepage slopes and small intermittent streams (See Section 1.2 Figures – Wetlands Map Fig. 4, 5, & 6.)

A small BVW and a small Isolated Vegetated Wetland (IVW) are located south of the proposed dining hall. The campus pond (Whipple Pond) is located within the developed portion of the lot, several

hundred feet East and upgradient of the proposed dining hall building. A review of the current MassGIS data layer for the Massachusetts Natural Heritage Atlas (effective August 1, 2021) under the Natural Heritage and Endangered Species Program (NHESP) indicates that the site is not located within Estimated Habitat of Rare Wildlife or Priority Habitat of Rare Species (See Section 1.2 Figures – Priority & Estimated Habitats Fig. 9.) No certified vernal pools under the jurisdiction of the Wetlands Protection Act Regulations or the Massachusetts Endangered Species Act occur near the project site. The project parcel is not located within an Area of Critical Environmental Concern (ACEC), Outstanding Resource Water (ORW), or surface water protection area. However, there are several wells are in proximity to the subject parcel with work proposed in MassDEP Wellhead Protection Areas Zone II for two wells (See Section 1.2 Figures – MassDEP Wellhead Protection Map Fig. 8).

Erosion control will be provided between the improvements and the wetland resource areas. A long-term pollution prevention plan has been prepared and is contained in Section 2. The dining hall site is proposed to be permitted under “New Development” seeking compliance with State Stormwater Standards. The existing parking lot and access drive area will be permitted under “Redevelopment” including significant upgrades to TSS removal, conveyance, and reduction in impervious area over existing conditions.

PROPOSED IMPROVEMENTS

The Applicant proposes to construct a new state-of-the-art dining hall with site improvements including the redevelopment of playing fields and an underground basin system capable of recharge. The new building will have a multi-level tiered basement which will be constructed by excavating into the hillside approximately 15 to 25 feet deep. The proposed project includes construction of new sidewalks, reconstruction of a portion of a parking lot to a cul-de-sac access drive, site grading, and redevelopment of several playing fields. Portions of the proposed work are within the 100-Foot Buffer Zone to BVW and Inland Bank with a small area of temporary disturbance (< 500sf) to modernize and upgrade and existing culvert conveyance.

The access driveway to a parking area between Baines, Gibbs Hall, adjacent to the sports facility will be reused as access to the new dining hall. Water, communication, electric, and fire water utilities will be extended underground from the existing campus mains located in the vicinity of the development. A new sewer trunk will be installed down the existing access drive to upgrade an existing 6” line that traverses across the existing intermittent stream to the Pine Nook right-of-way with limited cover.

The existing parking lot area to the West of Baines Building and the existing Dining Commons currently collects stormwater in conventional catch basins and outlets to the field area or towards the slope near the unnamed intermittent stream along Pine Nook Road. For the purposes of stormwater management, this area will be considered “redevelopment”. This area of the site will in later phases become the vehicular turn around, drop off, pedestrian entrance, and maintenance/access loading dock for deliveries. The impervious in this area will be reduced. Catch basins will be connected to inlet or swirl type water quality inlets (Stormceptor® or equal) and the outlets will be improved with plunge pools and level spreaders for dissipation.

The area East of the new dining hall between the Eagles Nest and the administration building, known as the “Dell” will be re-imagined to create a pedestrian corridor and central campus pathways. In this area a series of pedestrian drain grates and depressed biofiltration areas will treat and direct runoff to the East side of the proposed Dining Hall. From this area, improvements to nearby buildings, including handicap parking near Eagles’ Nest will discharge to a vegetated depression and water quality swale flowing southerly. In this vicinity a roof drain conveyance system will carry excess runoff from the green roof, at grade planted roofs, and the ‘Kynar’ painted main metal roof structure of the facility. The North side of the building will feature pathways, hardscapes, and green roofs over basement and first floor of the building. Some drainage in this area will collect and flow West along the slope to collect into a series of conveyances that will pick up area drains, roof scuppers, pedestrian sheet flows, and the loading dock.

The East and West building storm conveyances will empty into a main trunk line that traverses the hill southerly across to the football field area. This area will be first utilized for a laydown and haul road before being raised approximately 6 feet from building foundation excavation spoils. Beneath this area, the main underground drainage system will be located. The bottom of the system will be open and pervious to allow infiltration and recharge of treated runoff and roof/foundation flow.

The project will require disturbance of 9.4± acres of land on the 86-acre parcel. Development and completion of a Notice of Intent (NOI) and Stormwater Pollution Prevention Plan (SWPPP) associated with the EPA’s National Pollutant Discharge Elimination System (NPDES) General Permit for Discharges from Construction Activities will be required. The contractor will be involved in the preparation of a SWPPP for review by the Applicant and obtain the NPDES permit coverage prior to starting construction activities.

The attached Pre & Post-Development Drainage Plans in Section 3 contains the sub-catchments for each tributary watershed. The study encompasses a total tributary watershed of approximately 47.4 acres split between Hydrologic Group A, B, & C soils. The project has been broken up into 3 contributory watersheds for study and comparison to downstream receptors (See Pre & Post Drain Subcatchment Plans in Section 3):

- DP1/DP10 is Northerly towards unnamed intermittent stream along Pine Nook Road
- DP2/DP20 is Westerly & Northerly towards County Road & Pine Nook Road
- DP3/DP30 is Southwesterly towards County Road

An open and closed-conveyance stormwater management system is proposed to route, detain, and control the release rates of stormwater generated by the proposed improvements including the Dining Hall and some allowance for future buildings. The building contains a conventional “Kynar” painted metal roof that will feature photovoltaic solar, conventional green roofs, and “Purple-Roof” BMP’s that contain a honeycomb structure to provide peak rate attenuation. The green roof areas surrounding the building will reduce the heat island effect, reduce runoff, extend flow paths by about 45 minutes, and in practice reduce peak rates by approximately 50% at small storm events over conventional roof structures. All green roof technologies were modeled in HydroCAD per direction in the DEP Stormwater manual Volume 2 Chapter 2 using a CN of 86.

Stormwater runoff around the building will sheet flow through the site to series of curb openings, rain gardens, vegetated swales, water quality swales, and yard drains prior to collecting within a 18-24" storm trunk line to the underground basin where it will pass through a stilling basin before entrance to the storage area. Limited paved areas near the loading dock will flow to swirl separators before discharge. Areas beneath the roof at the loading dock will have a trench drain that flows to an oil/water grit separator before outlet to the sanitary sewer system in accordance with the plumbing code.

Outlets for the underground system will allow exfiltration of up to the 2-year storm into the bottom of the structure with multi-staged outlets to meet 10, 25, and 100-yr design storm events with a 4 foot offset to estimated seasonal high groundwater. A level spreader with low flow outlet will encourage non-erosive flow to the West. The runoff eventually collects in a series of wetlands and weeps then to intermittent streams towards County Road where it eventually comes together near Depot and Wapping Road.

This unnamed tributary continues to flow West under Greenfield Road (Route 5 & 10) across farmland and natural floodplain meadows to the Deerfield River which is listed as a Class B Warm Water fishery in the Massachusetts Surface Water Quality Standards and a "Water requiring a TMDL" for E.coli in MassMapper's 2018 Integrated List of Rivers. The Stormwater Management Regulations do not further regulate discharge to a Class B Warm Water and in our opinion the proposed project will not adversely contribute to the E.coli TMDL. In review of the Deerfield Ecological Resilience Report, causes of degraded water quality could include nearby fertilizer runoff, manure runoff, and bank erosion that would appear to be primarily causes. As a result, in our opinion, if the project employs the recommended land use practices, "green" stormwater infrastructure, very limited clearing, first flush TSS treatment, and recharge it will be beneficial to the water shed.

OBJECTIVE OF CALCULATIONS & METHODOLOGY

The purpose of this stormwater design is to examine the stormwater runoff from the proposed dining hall and redevelopment of the "Dell" area, existing parking area, and varsity field based upon the applicable performance standards contained within the Massachusetts Department of Environmental Protection Stormwater Management Handbook and within the context of the Stormwater Regulations for the Town of Deerfield (as adopted by the Stormwater Authority) using the exemptions for those projects not subject to site plan review but within jurisdiction of the conservation commission and 310 CMR 10.00 Wetlands Protection Act.

The goal of the calculations is to mitigate for the proposed building and paved parking areas while making treatment and non-erosive flow improvements to the redeveloped areas. The hydrology calculations attached show that the addition of underground basin beneath the varsity fields are sufficient to ensure post-development peak runoff rates approximate pre-development peak flow and increase recharge. Type III 24-hour SCS design storms for the 2-year, 10-year, 25-year, and 100-year design storm events were compared for both pre-development and post-development drainage conditions.

The calculations provided herein intend to show the following:

- The post-development peak discharge rate from the 2-year storm event shall be equal to or less than the pre-development rate in order to prevent stream bank erosion and channel degradation. A significant portion of this runoff is directed to an underground basin with exfiltration to promote recharge;
- Provide capacity and storage for future development and phases while making significant improvements to the peak rates of discharge in Design Point 2/20.
- The calculations attached show that post-development peak discharge rate for the 10-year & 25-year, 24-hour frequency storm event are equal to or less than the pre-development rate in order to protect downstream property and in some cases showing significant improvement of peak rate mitigation;
- The post-development, peak discharge rate for the 100-year, 24-hour return frequency storm event is controlled to help prevent extreme flooding and protect public safety;

The HydroCAD Stormwater Modeling System computer program (version 10.00-26) by Applied Microcomputer Systems, Inc. is used to develop stormwater runoff rates and volumes for the existing and proposed conditions at the project site. The HydroCAD software is a hydrograph generation and routing program similar to TR-20. The software uses Soil Conservation Service (SCS) Unit Hydrograph Methodology. This drainage analysis was developed utilizing a Type III 24-hour storm as developed by the SCS. Information regarding the equations and calculation procedures utilized in HydroCAD will be made available upon request. Drainage area maps for both pre- and post-constructed conditions have been included in this submission (See Section 3.)

If the calculated time of concentration for a drainage basin was found to be less than six minutes, an assumed minimum time of concentration of six minutes was utilized to calculate peak flows. The Town Stormwater Bylaw dictates that sheet flow shall be limited to no more than 50 feet. This is conservative in many areas of the site including large grassed areas associated with the playing fields that are gently graded at 1-2%.

The design storm frequencies and corresponding rainfall depths were compiled from the worst case of Technical Paper No. 40, "Rainfall Frequency Atlas of the United States for Durations from 30 Minutes to 24 Hours and 1 to 100 Years" or the Extreme Precipitation Tables contained on the Northeast Regional Climate Control Center – Cornell Data based upon a more recent evaluation of rainfall over the last 60 years. The frequency and rainfall depth rates have been estimated as follows for the site using Extreme Precipitation for 72.594 degrees West, 42.541 degrees North in Deerfield, Massachusetts:

| <u>Storm Frequency (Years)</u> | <u>Rainfall Depth (Inches)</u> |
|--------------------------------|--------------------------------|
| 2 | 2.99 |
| 10 | 4.29 |

| | |
|-----|------|
| 25 | 5.28 |
| 100 | 7.24 |

SITE SURFACE HYDROLOGY & SOILS

The site will involve phased disturbance of 9.4± acres of the site in several phases. The woods, fringes, and grass slopes are considered in “good” condition. The playing fields with underdrains have been modeled with a CN=74 to reflect a 70-30 split of runoff to root uptake designed in the field drainage. Underdrains associated with the field will be directed into the underground basin for infiltration if excess exists. A review of soil maps indicates that the subject property soils in the area of proposed development contain primarily Udorthents (Hyd A), Canton (Hyd A), Yalesville-Holyoke (Hyd B), and Wethersfield soils (Hyd C). (See Section 1.2 Figures – Soils Map Fig. 7.) A description of NRCS soil groups and subsurface exploration is described herein. Based upon a study by GZA, groundwater flow from foundation and sub slab drains was estimated to be between 2-4 gallons per minute. This was reflected in baseflow added into the model of 0.1cfs or 4.5 gallons per minute and will be available for recharge.

Udorthents (smoothed) consists of areas from which soil material has been excavated, and nearby areas in which this material has been deposited. The original soil material is generally excessively drained to moderately well drained, and ranges from nearly level to very steep. Texture generally ranges from sand and gravel to fine sandy loam with some pockets and thin mantles of silt-loam. Gravel and cobblestones are abundant in areas of this map unit that are associated with glacial outwash soils; stones and boulders are abundant in areas that are associated with glacial till soils. The areas have poor potential for farming, for sanitary waste disposal facilities, and for woodland or wildlife habitat. They are in urban use for roads, highways, schools, shopping centers, and athletic fields.

The Canton soils are deep well drained soil formed in a loamy mantle underlain by sandy, loose-to-firm ablation till. Canton soils are on slopes of uplands, ground moraines, ice contact deposits, and adjacent to plains and stream terraces. There are no major limitations associated with Canton soils. Large surface and subsurface stones and boulders may hinder excavation. Canton soils are mapped in ice contact areas which generally consists of variable deposits. These areas may have a slowly permeable layer that may result in slow percolation rates for on-site sewage disposal systems.

The Yalesville-Holyoke series consists of moderately deep, well drained soils formed in a loamy till in a thin mantle derived mainly from basalt and red sandstone, conglomerate, and shale. They are nearly level to very steep soils on bedrock-controlled ridges and hills.

The Wethersfield series consists of very deep, well drained loamy soils formed in dense glacial till on uplands. The soils are moderately deep to dense basal till. They are nearly level to steep soils on till plains, low ridges, and drumlins.

The subsurface exploration program consisted of eighteen soil borings conducted by R.W. Gillespie & Associates, Inc. and are contained in a report entitled, “Geotechnical Evaluation Proposed Dining Hall Deerfield Massachusetts dated July 21 2022.” Ten borings, designated B-10, B-11, B-12, and B-14

through B-20, were drilled in the building area and additional test borings, designated SW-1 through SW-8, were drilled in planned stormwater management areas southwest of the planned building area and South of the baseball and softball fields. The explorations were advanced to depths of about 4.2 to 53 feet below local ground surface.

The subsurface conditions encountered in the building area consisted of about 6 to 12 inches of topsoil over fill underlain by naturally deposited medium dense to very dense silty sand with gravel and cobbles over very dense sandy silt. Boulders, cobbles, and gravel were encountered in several building borings at depths of about 15 to 20 feet below ground surface. Fill consisted of silty sand and extended to depths of about 5 to 21 feet below ground surface. The borings were extended to depths of 15 to 53 feet below ground surface; a refusal surface interpreted to be on bedrock was encountered in boring B-10 at a depth of about 53 feet below local ground surface.

The borings in proposed stormwater management areas generally consisted of sand with varying amounts of silt denoted as "SM" and "SP-SM" in the Unified Soil Classification System. At select locations, interbedded silt with sand was encountered within the sand with silt to silty sand. Fill was encountered in a few of the stormwater management area borings and consisted of sand with gravel and silt. The Massachusetts Stormwater Handbook indicates this soil is of Hydrologic Soil Group A for the SP-SM and SM and Hydrologic Soil Group C for the ML soils. A Rawl's rate for SM materials were recommended to be 2.4 inches per hour for a "Loamy Sand" NRCS textural class in the area of the underground system. (See Section 1.2 Figures – Surficial Geology Map Fig. 10.)

Free water was observed in most of the borings at depths of about 10.1 to 22 feet below ground surface (about elevation 384 to 396 feet NAVD) during drilling. The groundwater measurements made at borings B-10 through B-15 were taken about 24 hours after drilling. A groundwater observation well was installed in boring B-12. Seasonal high groundwater table (SHWT) levels were estimated using observed redoximorphic features of samples. Gradations were run on samples of naturally deposited soil from 4 to 6 feet below ground surface. The gradations indicate the material consists of poorly graded sand with silt, silty sand, and sandy silt (USCS Classification SP-SM, SM, and ML) depending on location.

Additional groundwater flow and consultation for foundation/subdrains was performed by GZA in a memo entitled, "Estimated Foundation Underdrain Flow Rate Proposed Dining Hall Eaglebrook School, Pine Nook Road, Deerfield MA dated December 15, 2022. To support GZA's groundwater evaluation, two additional test borings, GZ-1 and GZ-2 were drilled on October 18, 2022. Both supplemental borings were completed as monitoring wells to allow for measurement of stabilized groundwater levels after drilling to assist with evaluating groundwater characteristics at the site (groundwater flow direction and hydraulic gradients). Boring GZ-1 was drilled to a depth of approximately 27 feet bgs, with well screen installed between approximately 15 to 25 feet bgs; boring GZ-2 was terminated at approximately 15 feet bgs due to auger refusal, with well screen installed from approximately 5 to 15 feet bgs.

Subsurface conditions encountered in test borings GZ-1 and GZ-2 were consistent with those described in Gillespie's Geotechnical Report, and generally consisted of a thin layer of Topsoil overlying a surficial layer Fill (very loose to loose, fine to medium SAND and Silt, with less than 30 percent Gravel), overlying Glacial Till (dense to very dense fine to medium SAND and clayey Silt) and fine to medium Sand with varying percentages of coarse Sand and Gravel). Groundwater measurements were taken on November

11, 2022, with groundwater measured to be approximately 12.2 and 12.3 feet bgs, or El. 355 and 369, in borings GZ-1 and GZ-2, respectively.

For the assumed high groundwater conditions, a groundwater production rate of less than 4 gallons per minute (gpm) was estimated. For the assumed typical groundwater conditions, a groundwater production rate of less than 2 gpm was estimated. To manage groundwater and prevent the buildup of hydrostatic pressures on the building foundation walls and slab, a permanent underdrain system is recommended. The underdrain system would consist of a foundation drain around the perimeter of the proposed building and an underdrainage system beneath the proposed basement slab. This estimate was used as the basis for application of base flow to the stormwater system.

Refer to selected boring logs, NRCS descriptions, and findings of the above reports in Section 5 Soil Data.

DESCRIPTION OF STORMATER MANAGEMENT STANDARDS

The following is an explanation of how the proposed project meets the intent of the stormwater management practices using the applicable provisions of the 2008 Massachusetts Stormwater Regulations near the project area.

No New Untreated Discharges (Standard 1) - No new stormwater system conveyances in the area of “New Development” and “Redevelopment” will discharge untreated runoff into or aim cause erosion in the adjacent resource area. An appropriately designed level spreader with perforated low flow release aims to maintain low rates of runoff and sheet flow at the discharge to reduce the likelihood of erosive flow during major storm events.

Peak Rate Attenuation (Standard 2) - The peak discharge rates were calculated with the aid of a hydrograph routing program using TR-20 methodology for three design point areas. Calculations show that post levels are below the pre levels at the 2-year, 10-year, 25-year, and 100-year design storm events at the three (3) design points studied for the project.

Recharge (Standard 3) – The newly developed portions of the site will direct roof and pre-treated stormwater to an underground basin with integrated stilling basin and infiltration capable for up to the 2-year storm event through the bottom of the structure.

Water Quality (Standard 4) – The new development stormwater management system has been designed to provide the required calculated removal of the total suspended solids (TSS) on the proposed site per the Massachusetts DEP Stormwater Management Policy. A long-term pollution prevention plan has been developed and included with this report. The treatment train of vegetated filter strips, deep sump catch basins, and proprietary swirl separators as pre-treatment, green roofs and raingardens as treatment, and underground subsurface structure as an infiltration BMP’s. The site has will remove an average of 80% of the TSS from the new stormwater runoff. Storage below the primary outlet in the basin will exceed both the recharge volume and 1” water quality volume.

Land Uses with Higher Pollutant Loads (Standard 5) –The proposed use as a dining hall with sports fields in the central part of the campus is not considered a land use with high pollutant load.

Critical Areas (Standard 6) - The site is located within a Massachusetts DEP Zone II Wellhead Protection Area based upon MassGIS data resources (See Section 1.2 Figures – MassDEP Wellhead Protection Areas Fig. 8.) As such, a 1” treatment volume, and 44% pre-treatment were utilized in the design before discharge. According to MassMapper, Final 2018/2020 Integrated List of Waters, the Deerfield River is a Massachusetts Category 5 Water “Waters Requiring a TMDL” for E.coli. We are discharging to an unnamed tributary and our land use does not appear to adversely affect the TMDL. It would appear farm land, septic systems, and direct surface runoff would be contributors to this TMDL and that the project has significantly improved campus conditions over those that currently exist.

Redevelopment (Standard 7) – The redevelopment portion of the project is the entrance driveway, cul-de-sac turnaround area (formerly parking lot), and the area in and around Baines Hall & Gibbs Hall. This area will feature the addition of deep sump hooded catch basins, Stormceptor® swirl type water quality inlets, and discharge via a constructed level spreader. The area will result in reduction of impervious parking and the project strives to meet the applicable Stormwater Management Standards from 1, 2, 4, 5, 8, 9, 10. The existing buildings, geothermal wells in the parking area, infrastructure, steep slopes, and existing stormwater outfall location preclude the use of recharge in this area.

Construction Period Pollution Prevention Plan and Erosion and Sedimentation Control (Standard 8) – A combination of staked straw bales, mulch socks, filter-fabric fencing, mulching, constructed sediment traps and entrances be used during construction are outlined in the Operation & Maintenance Plan of Standard 9 and as shown on the accompanying plan set. Silt-laden runoff shall be directed towards vegetated areas, temporary sedimentation basins, and diversion berms/wood chip/stone berms. On steeper slopes double layer fencing and slope interceptors will be used to break up travel paths. Any dewatering activities will utilize a temporary stilling basin as required to promote infiltration and include methods for source control. A 20,000 gallon or greater frac tank may be employed as necessary to help settle additional suspended solids before discharge (as applicable).

Operation and Maintenance Plan (Standard 9) – An Operation and Maintenance (O&M) plan has been customized to fit the design of the Municipal Park and Fields site. Provisions to maintain runoff control devices have been assured through structural, non-structural, and construction management approaches. Please see the O&M plan appended to this report (See Section 2.)

Prohibition of Illicit Discharges (Standard 10) – The Operation and Maintenance plan required by Standard 9 includes measures to prevent illicit discharges. An Illicit Discharge Compliance Statement will be completed prior to the discharge of any stormwater to post-construction BMPs. A draft Illicit Discharge Compliance Statement is included in Section 2 for owner signature

BEST MANAGEMENT PRACTICES (BMPs)

The facility design was able to meet the existing drainage conditions by providing vegetated swales, water quality swales, sediment traps, and underground stormwater systems to increase infiltration and reduce erosion prior to discharging to the property near the wetland resources. A general description of the devices incorporated is indicated below.

1. Water Quality Swale

A water quality swale is proposed along the East side of the new building to capture, convey, and treat stormwater flows from the “Dell” and Eagles Nest dorm area prior to discharge. Vegetation in the channel will trap any particulates from the runoff prior to discharging. The channel will feature check dams and will utilize the vegetative cover to provide filtering and treatment of pollutants.

2. Deep Sump Hooded Catch Basin & Hooded Drain Inlets

Deep sump catch basins are modified versions of inlet structures typically installed on town streets. The deep sumps, usually 4x's the depth of the inlet with a 4 ft minimum, are most effective placed “off-line” that is they don't have inlet pipes. These basins contain traps or hoods on the outlet pipes and usually serve as pretreatment for other downstream BMP's. Other areas that have drain inlets in grassed areas can have similar effectiveness with shallower sumps and hoods on the outlets.

3. Sediment Stilling Basin (forebay)

Integrated sediment basins are proposed for stormwater pretreatment at the inlet side of the constructed underground detention system in the form of a stilling basin. This area is constructed of concrete units with solid bases approximately 1,200 cf designed to slow incoming stormwater runoff and facility the gravity separation of suspended solids prior to discharging into the open bottom structure.

4. Level Spreaders

Level spreaders are sharp crested outlets constructed at zero grade across the slope consisting of a vegetated or mechanical structure used to disperse or spread concentrated flow thinly over a receiving area. These are generally used with drainage areas 1-5 acres (10-20 ft widths) or areas where concentrated water is dispersed in buffers or fields adjacent to ponds or wetlands. Sizing is based on the order of providing a flow with 2”-3” depth for the 25-year mitigated event with a 10' minimum width. Plunge pool energy dissipaters are proposed adjacent to the level spreaders near the outlet to calm the outflow before dispersing over the crest.

5. Energy Dissipaters/Culvert Outlets

These BMPs are proposed to disperse concentrated stormwater runoff before discharging to the woodland or resource areas. Stone energy dissipaters are proposed near the culvert outlet to calm the outflow before dispersing from the site into the wetland resource areas.

6. Outlet Structures

These structures are utilized to provide controlled release of stormwater runoff. Outlet structures are features within stormwater basins containing a series of orifices, weirs, or grates that regulate discharge rates for different design storm events. For proper operation of a stormwater system, these structures must be kept clear of sediment, debris, ice, snow, or other obstructions.

7. Water Quality Inlets

Hydrodynamic separators are stormwater management devices that use cyclonic separation (swirl action) to settle out solids and help control water pollution. They are designed as flow-through structures with a settling or separation unit to remove sediment and other pollutants. Part of the entrance drive, cul-de-sac turnaround, and loading dock ramp will discharge to these water quality inlets prior to discharge.

8. Rain Garden/Biofiltration System

A rain garden is a common type of stormwater BMP consisting of a low-lying vegetated area underlain by a sand and peat bed filter with an underdrain system. The underdrain system is surrounded by washed stone wrapped in a separation mesh to prevent mitigation of soil into the void spaces. During a storm, the rain garden will intercept surface runoff from the paved walking area. Accumulated runoff ponds in the vegetated zone and gradually infiltrates into the underlying sand and peat bed, filling the void spaces. The rain garden provides for filtering, adsorption, and biological uptake of constituents in stormwater. An emergency 8" overflow outlet structure has been incorporated into the rain garden to convey the larger design storm events.

9. Green Roofs

A green roof is a vegetative layer grown on a rooftop. Green roofs provide shade, remove heat from the air, and reduce temperatures of the roof surface, and filter runoff. A green roof acts like a sponge during rainstorms, absorbing about 50 percent of the rainwater. The plants, soil and root system then filter out many of the pollutants the rainwater has pulled from the air, making the eventual runoff much cleaner. Further, green roofs delay the flow of rainwater into the municipal sewer system by about 45 minutes, which helps overburdened sewer systems cope with sometimes-large amounts of rainwater.

10. Underground Stormwater Basin with Infiltration

An underground basin system with infiltration capability for in excess of the 1-year storm has been provide in chambers beneath the Varsity field. Control for higher storm events is provided and includes a maintenance valve for drawdown. Approximately 1.5 acre-feet of open storage is provided with a proposed offset to seasonal high groundwater of 4 feet. Exfiltration was not allowed in the model after the 2-year event. The basin contains a multi-stage outlet structure to reduce discharge over pre-existing conditions. The plans currently show the StormTrap Single Trap 2'-6" tall concrete chamber. This type of chamber was chosen due to the manufacturer having experience with the product below sports fields and will support heavy loads associated with snow making operations at the base of the ski hill. The modular design installs quickly and accommodates existing utilities, light pole foundations, football/soccer goal uprights, and other job site constraints. This type of open void structure maximizes storage volume while minimizing project footprint and cost. This is intended to be further value engineered once a contractor is selected.

SUMMARY OF HYDROLOGIC CALCULATIONS

The results of the pre- and post-construction hydrology calculations provided are summarized in the following tables. The tables correspond to the design point or study area as indicated on the drainage area maps and hydrograph routing calculations. The project aim was to study pre and post runoff for the proposed building and redevelopment to meet MassDEP Stormwater Standards which include but are not limited to: adding stormwater treatment facilities, increasing recharge, and providing peak flow mitigation to reduce drainage levels to pre-development levels or better.

TOTAL RUNOFF PEAK (CFS) FROM THE SITE TO DESIGN POINT 1/10 (Northerly towards unnamed intermittent stream along Pine Nook Road)

| Type III SCS 24-HR STORM | EXISTING (DP#1) | PROPOSED (DP#10) | DIFFERENCE |
|--------------------------|-----------------|------------------|------------|
| 2 - YEAR | 1.05 | 0.77 | -0.28 |
| 10 - YEAR | 2.61 | 2.07 | -0.54 |
| 25 - YEAR | 3.97 | 3.25 | -0.72 |
| 100 - YEAR | 6.93 | 5.82 | -1.11 |

**TOTAL RUNOFF PEAK (CFS) FROM THE SITE
TO DESIGN POINT 2/20 (Westerly & Northerly towards County Road & Pine Nook Road)**

| Type III SCS 24-HR STORM | EXISTING (DP#2) | PROPOSED (DP#20) | DIFFERENCE |
|-------------------------------------|----------------------------|-----------------------------|-------------------|
| 2 - YEAR | 5.29 | 0.88 | -4.41 |
| 10 - YEAR | 18.00 | 5.62 | -12.38 |
| 25 - YEAR | 30.05 | 9.83 | -20.22 |
| 100 - YEAR | 57.29 | 20.83 | -36.46 |

**TOTAL RUNOFF PEAK (CFS) FROM THE SITE
TO DESIGN POINT 3/30 (Southwesterly towards County Road)**

| Type III SCS 24-HR STORM | EXISTING (DP#3) | PROPOSED (DP#30) | DIFFERENCE |
|-------------------------------------|----------------------------|-----------------------------|-------------------|
| 2 - YEAR | 4.88 | 4.86 | -0.02 |
| 10 - YEAR | 17.02 | 16.94 | -0.08 |
| 25 - YEAR | 28.84 | 28.70 | -0.14 |
| 100 - YEAR | 56.14 | 55.87 | -0.27 |

DESIGN ASSUMPTIONS & STIPULATIONS

The following design assumptions are contained in this drainage analysis:

- Careful attention, inspection, and regular maintenance of the stormwater drainage system within the project including the existing ditches and conveyances through the property shall occur. Drainage structures, inlets, pass-throughs, and pipes shall be maintained to keep snow, ice, and sediment clear from creating any blockage that may affect the drainage features from properly functioning.
- A NPDES Construction General Permit for land disturbance greater than 1 acre shall be completed prior to construction.
- Other existing campus outfalls and drainage systems on site or upgradient were not evaluated unless specifically addressed in the narrative or plans as redevelopment.
- Any addition of buildings, changes of surface cover (e.g., landscaping to gravel or pavement), or future development of the site in excess of the existing impervious area and future development impervious of 4,000 sf will require re-analysis of the drainage system and/or additional improvements.
- The plans submitted to the Conservation Commission are permitting level plans. Certain construction level details will be created along with specifications for competitive bidding that will provide additional details to build.

CONCLUSION

The project has provided mitigation in peak runoff and increased recharge to groundwater to offset the impervious impacts associated with the Dining Hall, Gibbs Hall, Baines, and associated site improvements. The infrastructure planned will provide conveyance, treatment, and enhancement to encourage infiltration and reduce the potential for erosion through Best Management Practices (BMPs). Many “green” infrastructure and low-impact development approaches are proposed including conventional green roof, Purple-Roof systems, and geothermal HVAC systems. Storm runoff flows will be maintained or improved over existing conditions for the 2-year, 10-year, 25-year design storm events. The 100-year design flow has been evaluated and the calculations show no adverse increase flooding over existing conditions and the design provides further opportunity to mitigate and treat flows leaving the site future buildout.

EAGLEBROOK SCHOOL CAMPUS MAP

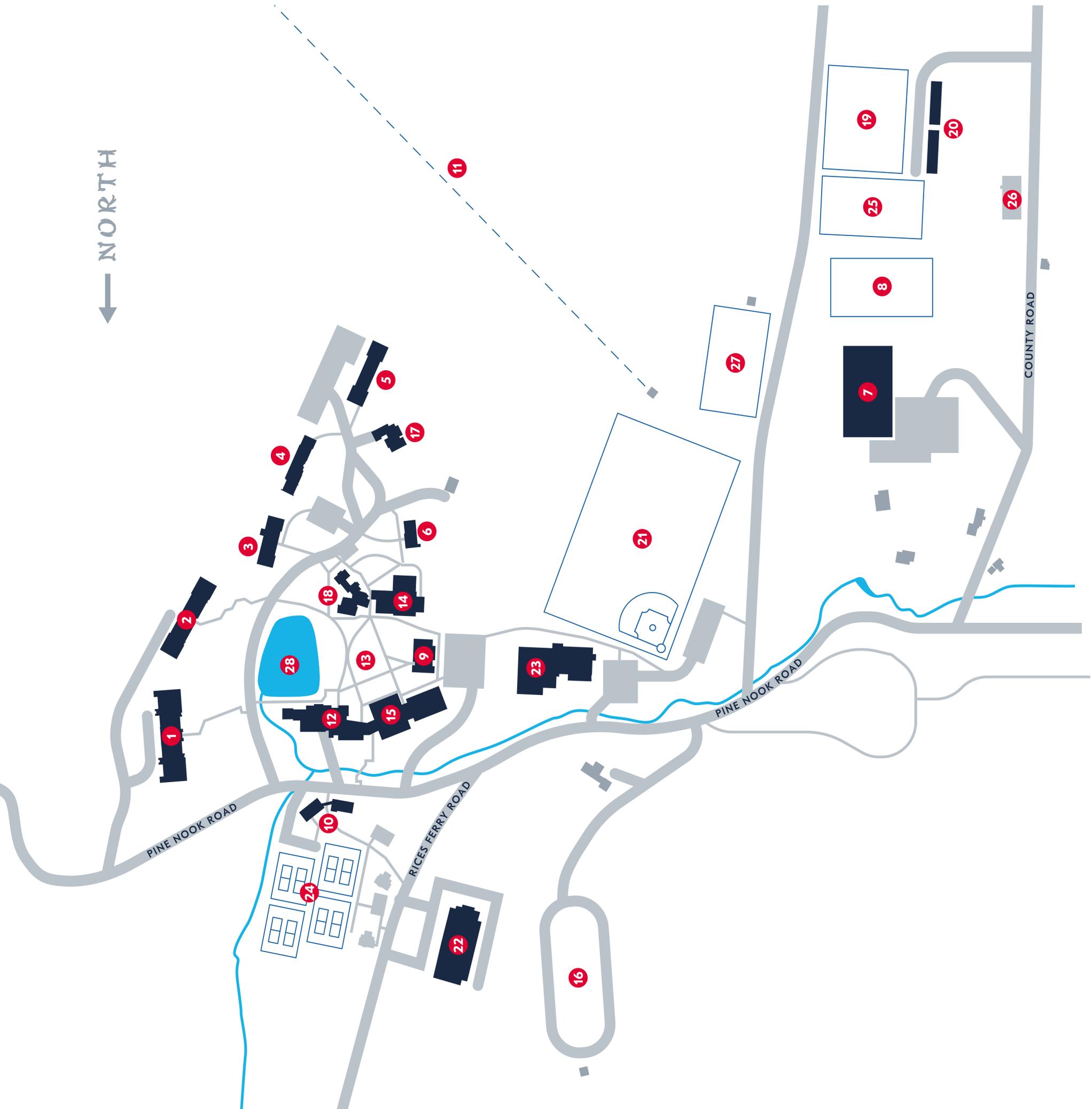
← NORTH

DORMITORIES

- 1 Mayer
- 2 Kravis
- 3 Flagler
- 4 Taylor
- 5 Halsted
- 6 Eagles Nest

CAMPUS FACILITIES

- 7 Alfond Arena
- 8 Arrowhead Field
- 9 Baines/Health Center
- 10 Doubleday Print Shop
- 11 Easton Ski Area
- 12 Edward P. Evans Academic Center
- 13 Gates Quad
- 14 Gibbs Dining Hall
- 15 Learning Center
- 16 Lewis Track & Field
- 17 Little Hundridge, Head of School's House
- 18 Lodge
- 19 Lower Uppvall Field
- 20 Maintenance Garage & Office
- 21 Memorial Field
- 22 Schwab Family Pool
- 23 Sports Center
- 24 Tennis Courts
- 25 Upper Uppvall Field
- 26 Uppvall Field Parking
- 27 Varsity Field
- 28 Whipple Pond





REF: OFFICE OF GEOGRAPHIC AND ENVIRONMENTAL INFORMATION (MASSGIS), COMMONWEALTH OF MASSACHUSETTS EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS; 2021 ORTHOPHOTO



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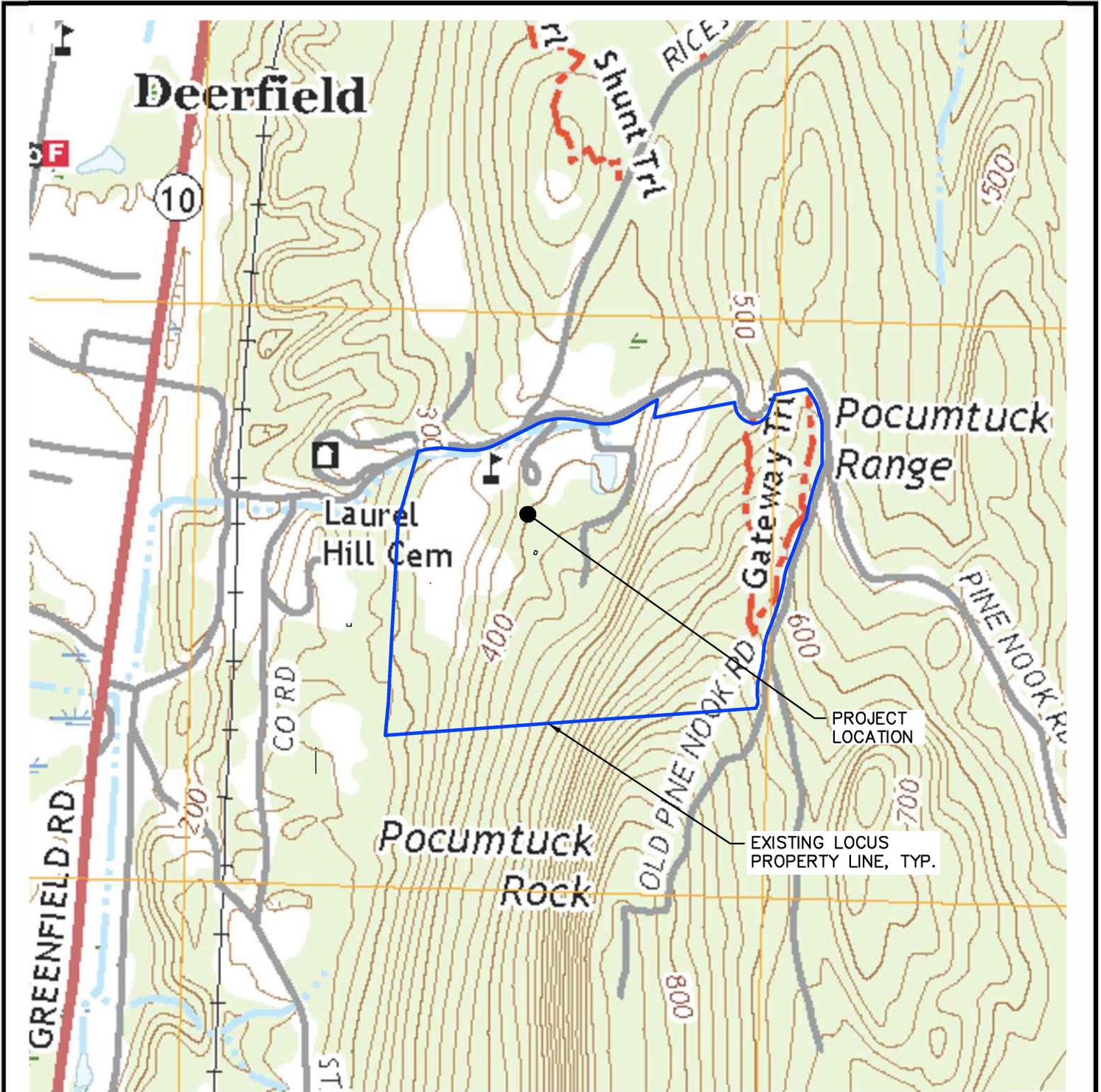
ORTHOPHOTO
MAP

PROPOSED DINING HALL
EAGLEBROOK SCHOOL
285 PINE NOOK ROAD
DEERFIELD, MA 01342

SCALE: 1" = 600'

DATE: MARCH 8, 2023

FIG. 1



REF: UNITED STATES GEOLOGICAL SURVEY, GREENFIELD QUADRANGLE (2021)



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USGS
 TOPOGRAPHIC
 MAP

PROPOSED DINING HALL
 EAGLEBROOK SCHOOL
 285 PINE NOOK ROAD
 DEERFIELD, MA 01342
 SCALE: 1" = 800'
 DATE: MARCH 8, 2023

FIG. 2



REF: FEMA FLOOD INSURANCE RATE MAPS; COMMUNITY PANELS 2501175 0007B & 250115 0008B BOTH DATED (7/2/1980)

- 

ZONE C — AREAS OF MINIMAL FLOODING (NO SHADING)
- 

ZONE B — AREAS BETWEEN LIMITS OF THE 100 YEAR & 500 YEAR FLOOD
- 

ZONE A10 — AREAS OF 100 YEAR FLOOD; BASE FLOOD ELEVATIONS AND FLOOD HAZARD FACTORS DETERMINED.

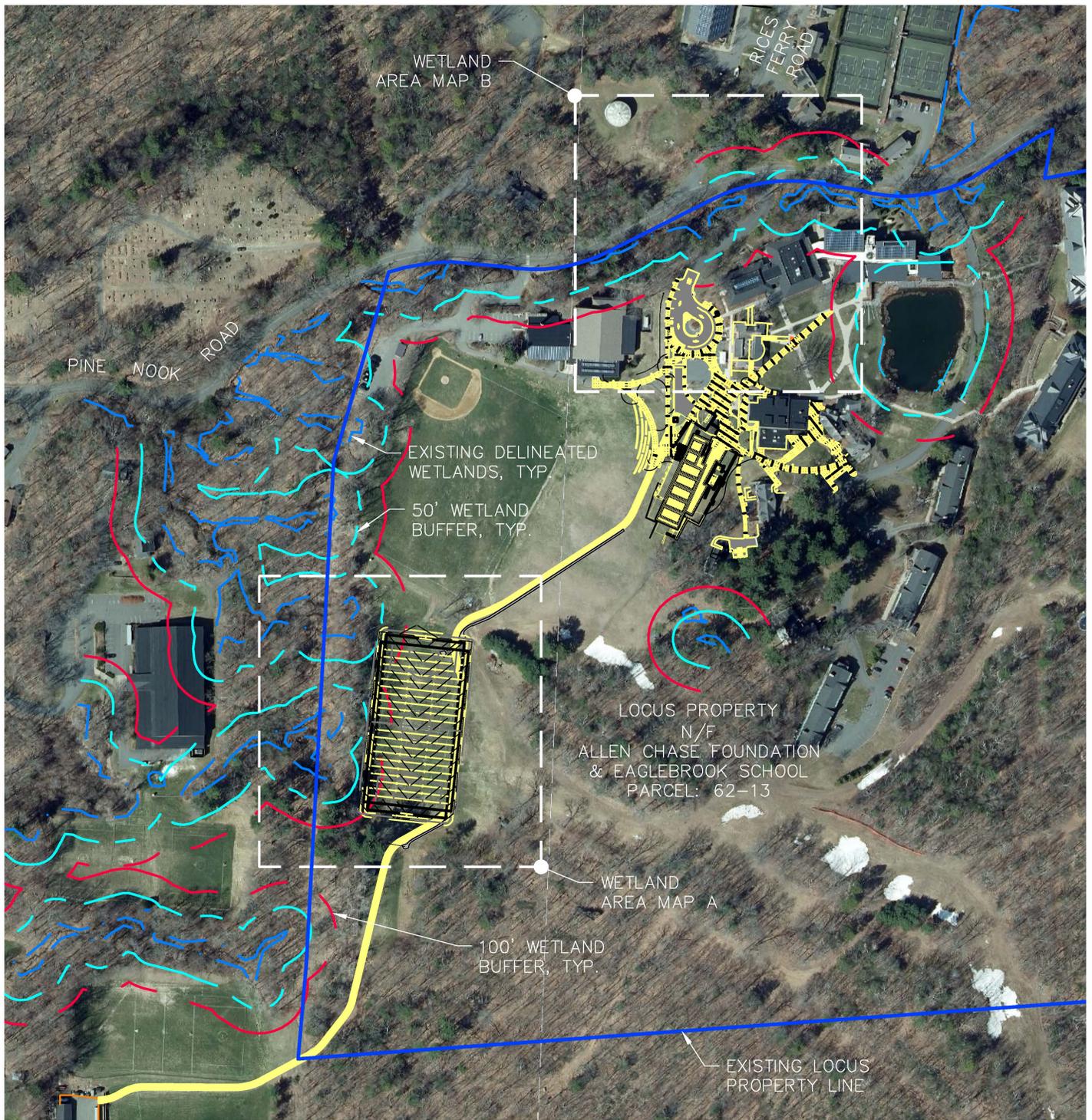


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FEMA FLOOD
 MAP

PROPOSED DINING HALL
 EAGLEBROOK SCHOOL
 285 PINE NOOK ROAD
 DEERFIELD, MA 01342
 SCALE: 1" = 800'
 DATE: MARCH 8, 2023

FIG. 3



REF: WETLANDS DELINEATED BY LUCAS ENVIRONMENTAL, LLC ON AUGUST 31, 2022, SEPTEMBER 1, 2022, DECEMBER 15, 2022, DECEMBER 21, 2022, DECEMBER 22, 2022 AND DECEMBER 28, 2022.



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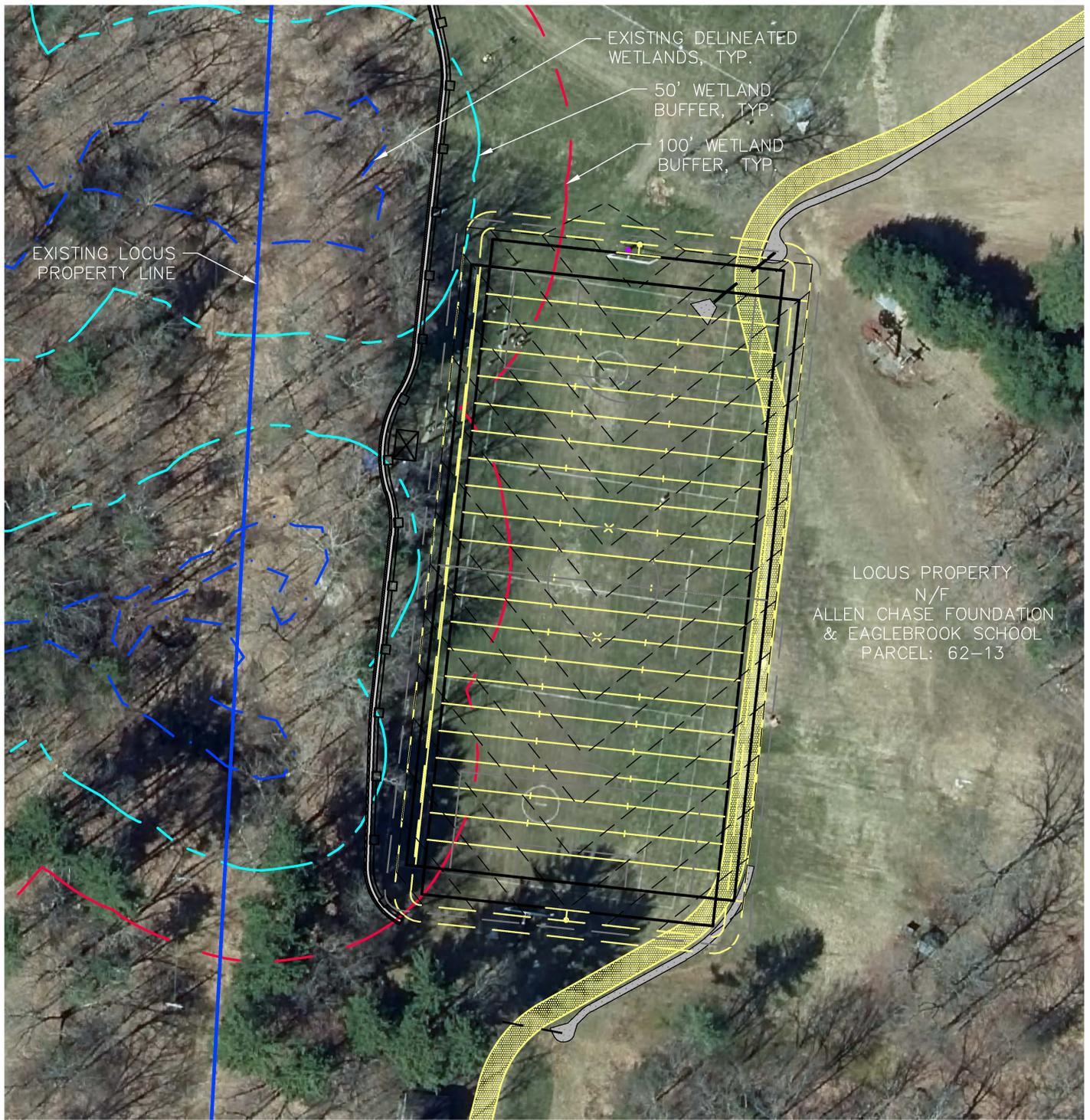
DETAILED
WETLAND AREA
MAP

PROPOSED DINING HALL
EAGLEBROOK SCHOOL
285 PINE NOOK ROAD
DEERFIELD, MA 01342

SCALE: 1" = 300'

DATE: MARCH 8, 2023

FIG. 4



EXISTING LOCUS
PROPERTY LINE

EXISTING DELINEATED
WETLANDS, TYP.

50' WETLAND
BUFFER, TYP.

100' WETLAND
BUFFER, TYP.

LOCUS PROPERTY
N/F
ALLEN CHASE FOUNDATION
& EAGLEBROOK SCHOOL
PARCEL: 62-13

REF: WETLANDS DELINEATED BY LUCAS ENVIRONMENTAL, LLC ON AUGUST 31, 2022, SEPTEMBER 1, 2022, DECEMBER 15, 2022, DECEMBER 21, 2022, DECEMBER 22, 2022 AND DECEMBER 28, 2022.

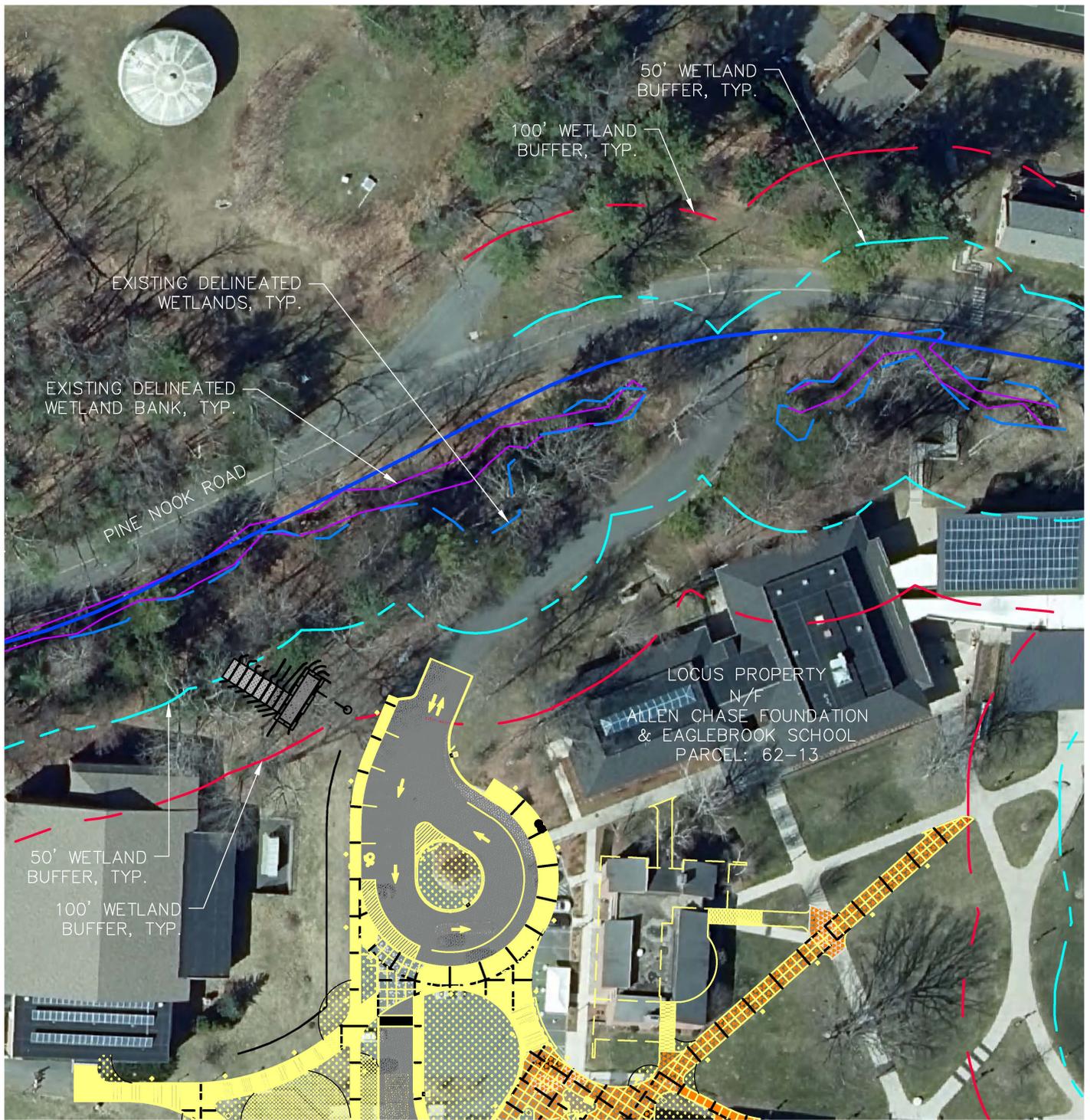


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DETAILED
WETLAND AREA
MAP A

PROPOSED DINING HALL
EAGLEBROOK SCHOOL
285 PINE NOOK ROAD
DEERFIELD, MA 01342
SCALE: 1" = 80' DATE: MARCH 8, 2023

FIG. 5



REF: WETLANDS DELINEATED BY LUCAS ENVIRONMENTAL, LLC ON AUGUST 31, 2022, SEPTEMBER 1, 2022, DECEMBER 15, 2022, DECEMBER 21, 2022, DECEMBER 22, 2022 AND DECEMBER 28, 2022.



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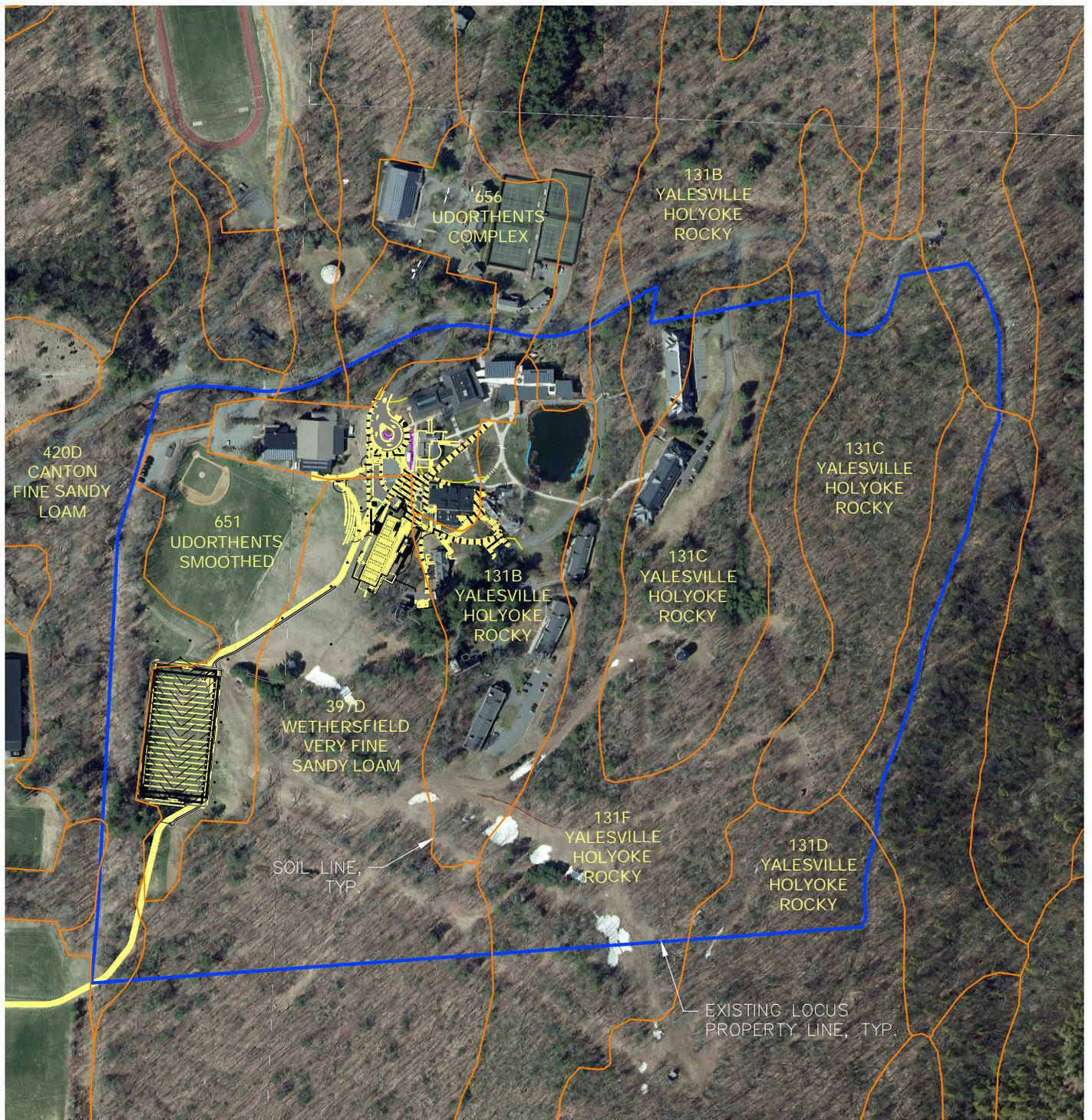
DETAILED
WETLAND AREA
MAP B

PROPOSED DINING HALL
EAGLEBROOK SCHOOL
285 PINE NOOK ROAD
DEERFIELD, MA 01342

SCALE: 1" = 80'

DATE: MARCH 8, 2023

FIG. 6



REF: OFFICE OF GEOGRAPHIC AND ENVIRONMENTAL INFORMATION (MASSGIS), COMMONWEALTH OF MASSACHUSETTS EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS; 2021 ORTHOPHOTO
 SOILS REF: NRCS (NATURAL RESOURCES CONSERVATION SERVICE) CUSTOM SOIL RESOURCE REPORT FOR FRANKLIN COUNTY, MASSACHUSETTS.



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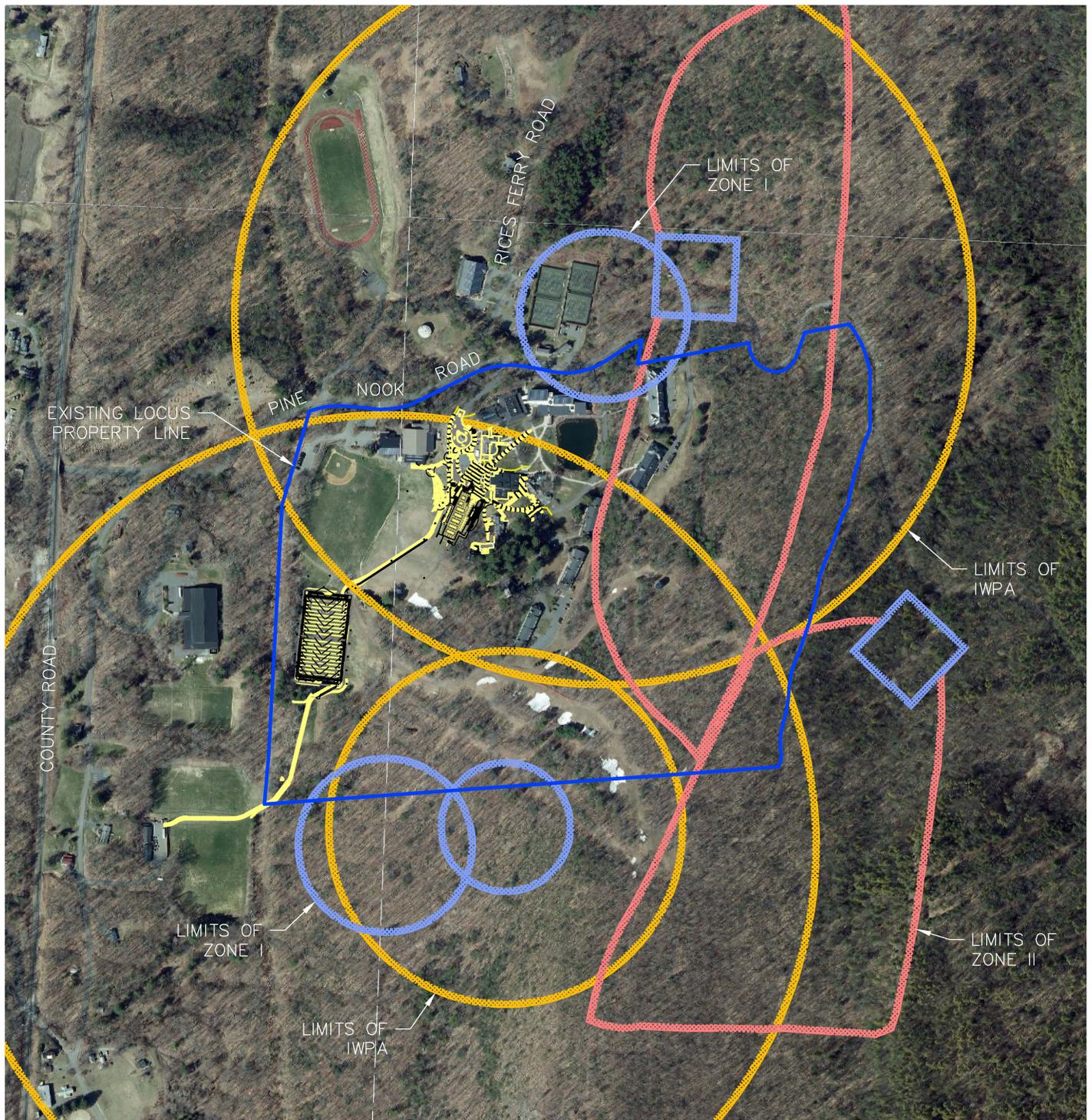
SOILS MAP

PROPOSED DINING HALL
 EAGLEBROOK SCHOOL
 285 PINE NOOK ROAD
 DEERFIELD, MA 01342

FIG. 7

SCALE: 1" = 400'

DATE: MARCH 9, 2023



REF: OFFICE OF GEOGRAPHIC AND ENVIRONMENTAL INFORMATION (MASSGIS), COMMONWEALTH OF MASSACHUSETTS EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS; 2021 ORTHOPHOTO, & MASSDEP WELLHEAD PROTECTION AREAS (ZONE II, ZONE I, IWPA) NOVEMBER 2022.



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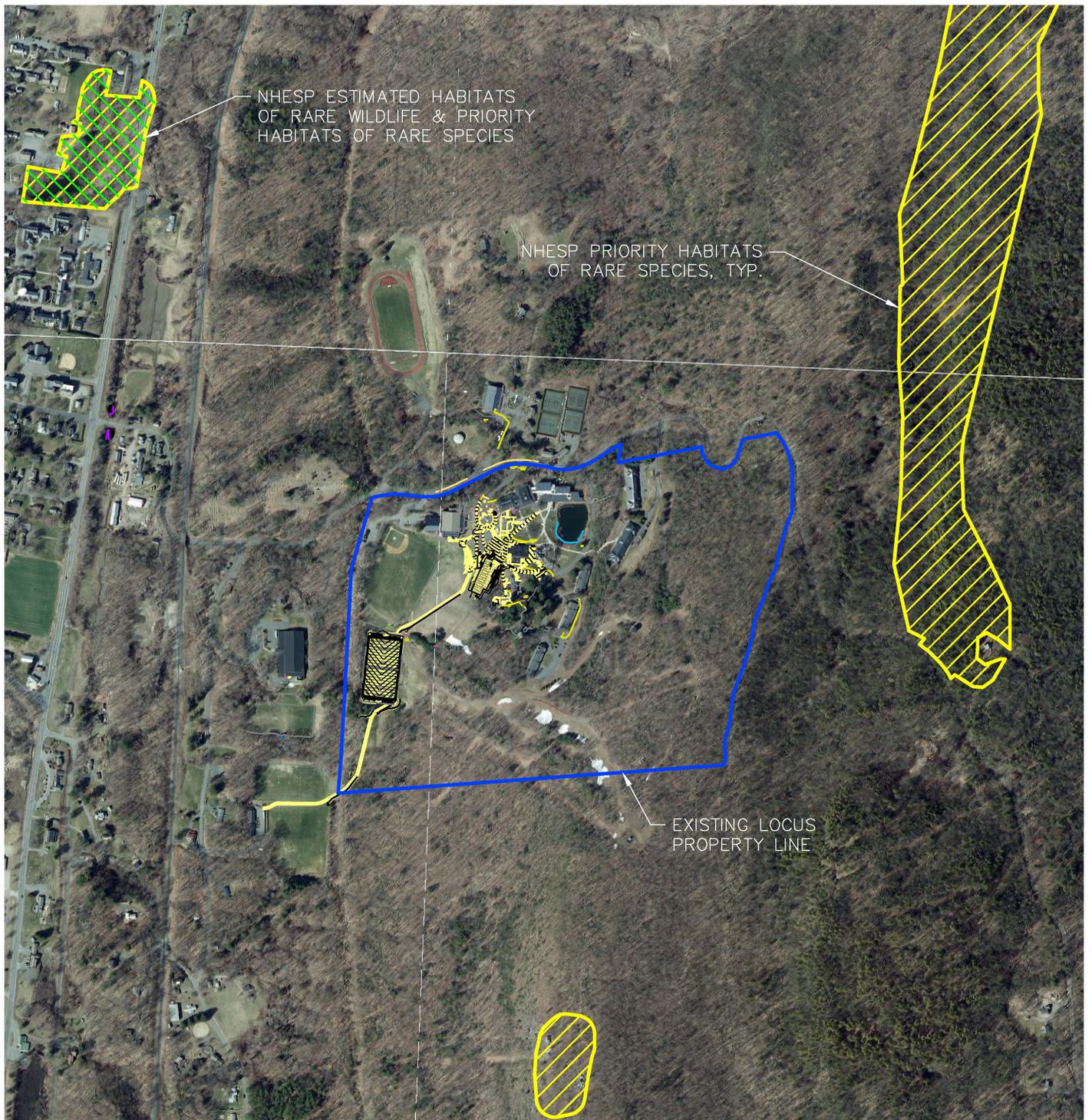
MASSDEP
WELLHEAD
PROTECTION
AREAS

PROPOSED DINING HALL
EAGLEBROOK SCHOOL
285 PINE NOOK ROAD
DEERFIELD, MA 01342

SCALE: 1" = 600'

DATE: MARCH 8, 2023

FIG. 8



NHESP ESTIMATED HABITATS OF RARE WILDLIFE & PRIORITY HABITATS OF RARE SPECIES

NHESP PRIORITY HABITATS OF RARE SPECIES, TYP.

EXISTING LOCUS PROPERTY LINE

REF: OFFICE OF GEOGRAPHIC AND ENVIRONMENTAL INFORMATION (MASSGIS), COMMONWEALTH OF MASSACHUSETTS EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS; 2021 ORTHOPHOTO
 NHESP PRIORITY HABITATS OF RARE SPECIES (AUGUST 2021)
 NHESP ESTIMATED HABITATS OF RARE WILDLIFE (AUGUST 2021)

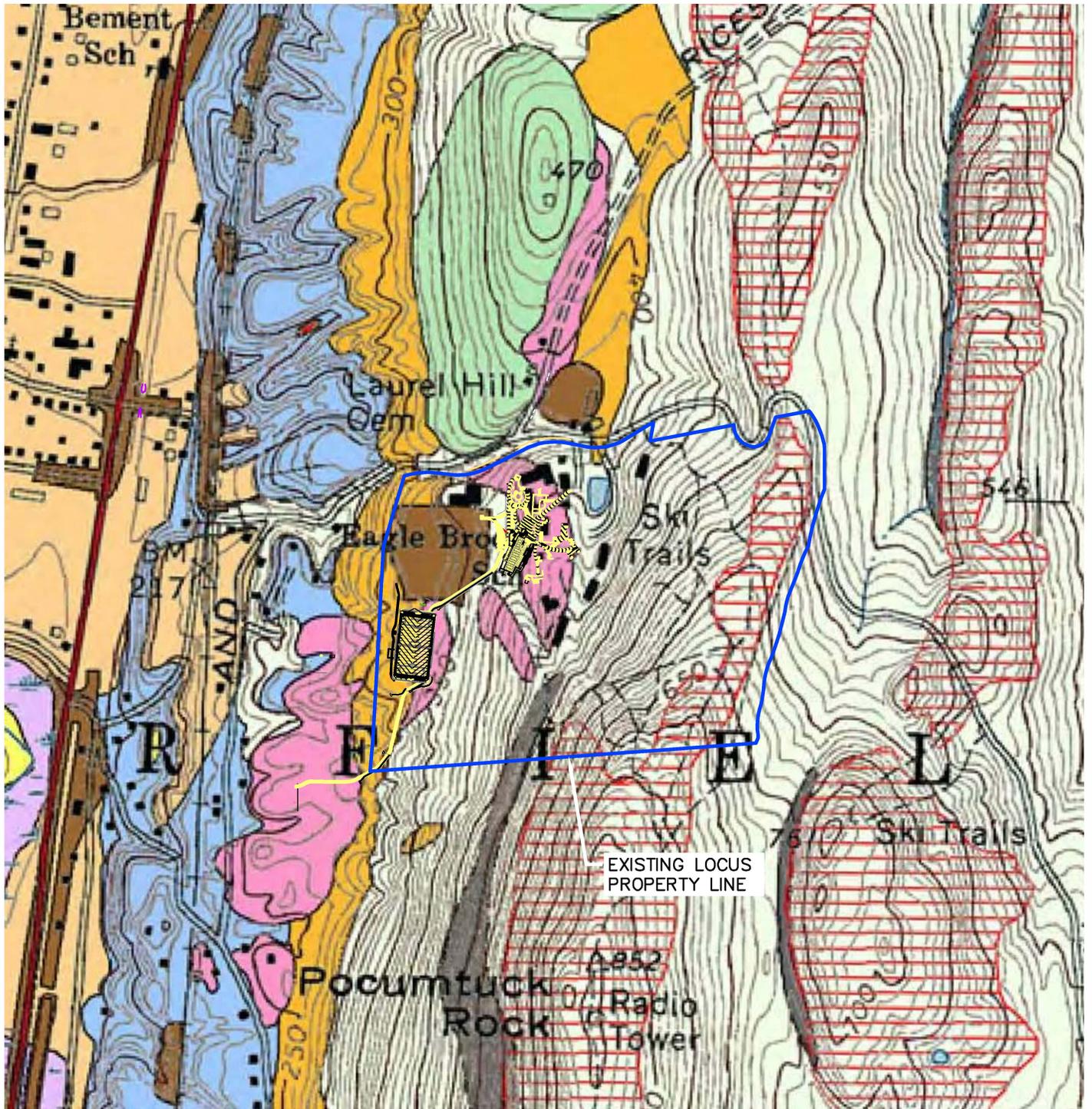


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PRIORITY AND ESTIMATED HABITATS

PROPOSED DINING HALL
 EAGLEBROOK SCHOOL
 285 PINE NOOK ROAD
 DEERFIELD, MA 01342
 SCALE: 1" = 800' DATE: MARCH 8, 2023

FIG. 9



REF: SURFICIAL MATERIALS MAP OF THE GREENFIELD QUADRANGLE, MASSACHUSETTS, COMPILED 2018.



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SURFICIAL
GEOLOGY MAP

PROPOSED DINING HALL
EAGLEBROOK SCHOOL
285 PINE NOOK ROAD
DEERFIELD, MA 01342

FIG.10

SCALE: 1" = 800'

DATE: MARCH 8, 2023



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.

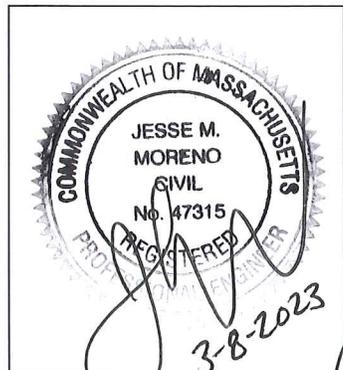
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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

3-8-2023

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 (**Existing parking lot/access, Baines & Gibbs Hall, & playing field area is considered redevelopment; proposed Dining Hall area is new development.**)



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): Water Quality Inlet, sediment basin, and outlet level spreader

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 Field¹
- 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.

1.4 REFERENCES

1. Commonwealth of Massachusetts, Department of Environmental Protection, Stormwater Management Standards Handbook. Volumes 1-3 February 2008 (DEP Stormwater Management Policy 2008).
2. Commonwealth of Massachusetts, Department of Environmental Protection. 310 CMR 10.00: Massachusetts Wetlands Protection Act Regulations. October 2017.
3. Commonwealth of Massachusetts, Department of Environmental Protection. 314 CMR 4.00: Massachusetts Surface Water Quality Standards. January 2022.
4. Commonwealth of Massachusetts, Department of Environmental Protection. 314 CMR 9.00: Massachusetts Water Quality Regulations. October 2014.
5. United States Department of Agriculture, Natural Resources Conservation Services Urban Hydrology for Small Watersheds, Technical Release 55 (TR-55). June 1986.
6. United States Department of Agriculture, Natural Resources Conservation Services Project Formulation Hydrology Program System, Technical Release 20 (TR-20). Oct. 2004.
7. Tetra Tech, Inc., United States EPA – Region 1, Stormwater Best Management Practices (BMP) Performance Analysis. Dec 2008.
8. PVPC, MA DEP, & USEPA – Region 1, Artificial Recharge: Evaluation and Guidance to Municipalities. Nov 1996.
9. Town of Deerfield, Massachusetts. Stormwater Regulations. Adopted April 4, 2011
10. Town of Deerfield, Massachusetts. Article 22 Zoning Bylaw. Amended June 12, 2021.

Section 2

Long-Term Pollution Prevention and Operation & Maintenance Plan

March 8, 2023

**RECOMMENDED LONG-TERM STORMWATER POLLUTION
PREVENTION PLAN and STORMWATER OPERATION & MAINTENANCE (O&M) PLAN
TO COMPLY WITH STORMWATER STANDARDS 4, 8, 9 & 10
FOR THE PROPOSED DINING HALL & SITE IMPROVEMENTS**

PROJECT OVERVIEW

Eaglebrook School is an independent boarding and day school for boys in grades six, seven, eight, and nine and was founded in 1922 by Howard Gibbs. Today it educates over 250 students from 23 countries and 19 states with about 75 faculty and staff. The Eaglebrook School (“Applicant”) proposes to construct a new dining hall facility including site improvements and redevelopment of the Baines Classroom Building and Gibbs Dining Hall on land located in the central part of the campus. The project will be constructed on land owned by the school containing approximately 86 acres.

The subject property is located on land on the side slopes of the Pocumtuck Range centrally located on the Eaglebrook campus south of Pine Nook Road. To the East lies classroom, dormitory, and administrative buildings, to the West are athletic fields and the field house. Further West is County Road that parallels rail road tracks and State Route 5 & 10. Further South are additional playing fields, maintenance facilities, a ski slope, and a hockey rink.

The project proposes a series of drainage improvements including open and closed-conveyance systems, low impact design, rain garden/biofiltration, water quality swales, underground infiltration, a green roof system, geothermal HVAC, and water quality inlets in accordance with the Town’s Best Development Practices Guidebook, Green Infrastructure, and Climate Resiliency Policy.

The access driveway to a parking area between Baines, Gibbs, all, adjacent to the sports facility will be reused as access to the new dining hall. The existing parking lot area to the West of Baines Building and the existing Dining Commons currently collects stormwater in conventional catch basins and outlets to the field area or towards the slope near the unnamed intermittent stream along Pine Nook Road. For the purposes of stormwater management, this area will be considered redevelopment. This area of the site will become in later phases the vehicular turn around, drop off, and maintenance/access loading dock for deliveries. The impervious in this area will be reduced. Catch basins will be connected to inlet or singular swirl type water quality separators and the outlets will be improved with plunge pools and level spreaders for dissipation. A centrifugal “swirl” type water quality inlet (Stormceptor® or equal) is proposed to treat the balance of the parking and access area.

The area East of the new dining hall between the Eagles Nest and the administration building, known as the “Dell” will be re-imagined to create a pedestrian corridor and central campus pathways. In this area a series of pedestrian drain grates and depressed biofiltration areas will treat and direct runoff to the East side of the proposed Dining Hall. From this area, improvements to nearby buildings, including handicap parking near Eagles’ Nest will discharge to a vegetated depression and water quality swale flowing Southerly. In this area a conveyance system will carry excess runoff from the green roof, at grade planted roofs, and the ‘Kynar’ painted main metal roof structure of the facility. The North side of the building will feature pathways, hardscapes, and green roofs over basement and first floor building.

Some drainage in this area will collect and flow West along the slope to collect into a series of conveyances that will pick up area drains, roof scuppers, patio sheet flows, and the loading dock.

The East and West building storm conveyances will empty into a main trunk line that traverses the hill southerly across to the football field area. This area will be first utilized for a laydown and haul road before being raised approximately 6 feet from building foundation excavation spoils. Beneath this area, the main underground detention system will be located. The bottom of the system will be open and pervious to allow infiltration and recharge of treated runoff and roof/foundation drain flow.

The project will require disturbance of 9.4± acres of land on the 86-acre parcel. Development and completion of a Notice of Intent (NOI) and Stormwater Pollution Prevention Plan (SWPPP) associated with the EPA's National Pollutant Discharge Elimination System (NPDES) General Permit for Discharges from Construction Activities will be required. The contractor shall prepare the SWPPP for review by the Applicant and obtain the NPDES permit coverage prior to starting construction activities.

The proposed site improvements are shown on the plans provided under separate cover entitled "Proposed Dining Hall & Site Improvements" 285 Pine Nook Road; Deerfield, MA 01342" latest edition as prepared by ProTerra Design Group, LLC (ProTerra) with Northeast Survey Consultants, PC (Northeast) and Fuss & O'Neill Landscape Architects (F&O).

OWNER AND RESPONSIBLE PARTY

Land Owner:

Allen Chase Foundation
Eaglebrook School
PO Box 7
Deerfield, MA 01342

Responsible Parties:

Eaglebrook School
Maintenance Department & Physical Plant
270 Pine Nook Road
Deerfield, MA 01342

The Land Owner and Responsible Party are cooperative entities. The Eaglebrook School is part of a campus containing over 700 acres of land and many buildings. The facilities department will be responsible for maintenance of the new Dining Hall and associated site improvements.

CONSTRUCTION MANAGEMENT

Contractor: _____

Address: _____

Phone Number: _____

A Construction Manager, Engineer, and/or Clerk-of-the-Works with adequate knowledge and experience on projects of similar size and scope shall be employed to oversee all site work related construction. The contractor shall incorporate appropriate techniques to control sediment and erosion pollution during construction in accordance with the Massachusetts Erosion and Sediment Control Guidelines for Urban

and Suburban Areas. It is recommended that this document and any required NPDES CGP be incorporated into contracts with the site and general contractor.

Care should be taken when constructing stormwater control structures and dewatering (if required) to install foundations. Light earthmoving equipment shall be used to excavate in the vicinity of the areas of stormwater infiltration. Use of heavy-equipment causes excessive compaction of the soils resulting in reduced infiltration capacity. At no time, shall temporary settling basins be constructed in the vicinity of the proposed infiltration areas in order to prevent the soils from becoming clogged with sediment.

Dewatering activities (if required) shall be directed towards a berm and filter sack to promote infiltration into the ground. Other more intense activities during drilling of wells for geothermal heating will require treatment in temporary settling basins. If silt-laden sediment is encountered, a frac tank or temporary sediment trap approximately 15,000-20,000 gallons in size or greater may be employed to settle pumped groundwater before discharge to the land surface for recharge.

WHAT TYPES OF CONSTRUCTION ACTIVITIES ARE REGULATED

A NPDES Clean Water Act permit is required for stormwater discharges from any construction activity disturbing:

- 1 acre or more of land, or
- Less than 1 acre of land, but that is part of a common plan of development or sale that will ultimately disturb 1 or more acres of land.

Construction activity includes earth-disturbing activities such as clearing, grading, and excavating land and other construction-related activities that could generate pollutants.

MINIMUM CONSTRUCTION & DEVELOPMENT LIMITATIONS (C&D RULE)

All NPDES permits for construction stormwater must address the minimum federal effluent limitation guidelines for the construction and development point source category (referred to as “the C&D rule”).

The C&D rule found in 40 CFR 450.21 establishes minimum NPDES effluent limitations, such as:

1. Design, install, and maintain effective erosion and sediment controls, and pollution prevention measures, to minimize the discharge of pollutants;
2. Stabilize disturbed areas immediately when construction has ceased and will not resume for more than 14 days;
3. Prohibit the dewatering discharges unless managed by appropriate controls;
4. Prohibit the discharge of:
 - Wastewater from concrete washout (unless managed by appropriate control), or washout/cleanout of stucco, paint, form release oils, other wastewater materials;
 - Fuels, oils, or other pollutants used for vehicles; and
 - Soaps or solvents to wash vehicles and equipment.

A. Erosion and Sediment Controls Operators must design, install, and maintain effective erosion controls and sediment controls to minimize the discharge of pollutants. At a minimum, such controls must be designed, installed, and maintained to:

1. Control stormwater volume and velocity to minimize soil erosion in order to minimize pollutant discharges
2. Control stormwater discharges, including both peak flowrates and total stormwater volume, to minimize channel and streambank erosion and scour in the immediate vicinity of discharge points.
2. Minimize the amount of soil exposed during construction activity;
3. Minimize the disturbance of steep slopes;
4. Minimize sediment discharges from the site. The design, installation and maintenance of erosion and sediment controls must address factors such as the amount, frequency, intensity and duration of precipitation, the nature of resulting stormwater discharge, and soil characteristics, including the range of soil particle sizes expected to be present on the site;
5. Provide and maintain natural buffers around waters of the United States, direct stormwater to vegetated areas and maximize stormwater infiltration to reduce pollutant discharges, unless infeasible;
6. Minimize soil compaction unless required where the intended function of a specific area of the site dictates that it be compacted; and
7. Unless infeasible, preserve topsoil. Preserving topsoil is not required where the intended function of a specific area of the site dictates that the topsoil be disturbed or removed.

B. Soil Stabilization Requirements: at a minimum, Contractors must initiate soil stabilization measures immediately whenever any clearing, grading, excavating or other earth disturbing activities have permanently ceased on any portion of the site, or temporarily ceased on any portion of the site and will not resume for a period exceeding 14 calendar days. In limited circumstances, stabilization may not be required if the intended function of a specific area of the site necessitates that it remains disturbed.

C. Dewatering Requirements: Operators must minimize the discharge of pollutants from dewatering trenches and excavations. Discharges are prohibited to surface waters and must be managed by appropriate controls to infiltrate into the ground.

D. Pollution Prevention Measures: Operators must design, install, implement, and maintain effective pollution prevention measures to minimize the discharge of pollutants. At a minimum, such measures

must be designed, installed, implemented, and maintained to: i. Minimize the discharge of pollutants from equipment and vehicle washing, wheel wash water, and other wash waters. Wash waters must be treated in a sediment basin or alternative control that provides equivalent or better treatment prior to discharge; ii. Minimize the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste, and other materials present on the site to precipitation and to stormwater. Minimize the discharge of pollutants from spills and leaks and implement chemical spill and leak prevention and response procedures.

E. Prohibited Discharges The following discharges from C&D sites are prohibited: Wastewater from washout of concrete, unless managed by an appropriate control; Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds and other construction materials; Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance; and Soaps or solvents used in vehicle and equipment washing.

F. Surface Outlets When discharging from basins and impoundments, operators must utilize outlet structures that withdraw water from the surface, unless infeasible.

CONSTRUCTION PHASING

The phasing of construction for construction of the dining hall, turn round area, replacement varsity field, site improvements, and associated infrastructure shall generally follow the following sequence to keep maximum disturbed areas in each phase below 5 acres. Items may be completed concurrently or separately depending on their location.

- Installation of temporary erosion and sediment control measures along the perimeter of the site (i.e., inlet protection, silt fence, temporary BMP's & sediment traps etc.)
- Installation of temporary sediment basins with diversion swales directing stormwater into the temporary basins.
- Installation of tree/protection and fencing at limit of work. Install tree trunk protection where equipment could reach nearby trees.
- Establishment of schedules for good housekeeping BMPs, locations for trash stockpile/removal, porta-potty installation, and a construction trailer as necessary
- Clearing and grubbing of vegetation within limits of work. Chip slash, trees, and branches to create mulch for use as temporary soil cover. Do not remove stumps until excavation begins in the phase or area.
- Construction of temporary construction exit point and haul road
 - Installation of stabilized construction entrance
 - Construction of level area for frac tank and discharge to the ground of geothermal well water during boring activities
- Reroute of water, sewer, electric, and all other underground utilities in the area of the proposed drilling and excavation operations.
- Excavation/Fill for building construction to sub-grade and construction of temporary shoring along the Eastern edge.
- Construction and stabilization of varsity field area to allow deposit of excavated soils and stockpiles.

- Construct walls and outlet level spreaders at outlets.
- Construction of mitigation areas, parking areas, fields, buildings and underground utility trenches and over-lot rough grading
- Installation of permanent water, sewer, electric, and all other underground utilities
- Installation of long-term stormwater features, piping, conveyances, etc.
- Final backfill operations for fields and utility trenches
- Construction of curb, drives, and parking areas
- Installation of new asphalt pavement and walkways
- Final grading
- Re-vegetation in disturbed areas for final stabilization
 - Installation of replication areas
 - Installation of landscaping per landscape plan
 - Planting of stormwater features
 - Planting or sodding of sports fields
- Remove temporary BMPs that are no longer required after a good vegetative cover is established.

EROSION & SEDIMENT CONTROL PHASING

The phasing of erosion and sediment control during construction of project shall generally follow the following sequence.

- Pre-Disturbance/Site Preparation
 - Install stabilized construction entrance and temporary access
 - Install perimeter BMPs (i.e., silt fence, inlet protection)
 - Prepare stabilized staging area including concrete washout pit & dewatering basins/tanks
 - Prepare construction fencing, pedestrian, and vehicular detours
 - Limit access to areas that are not to be disturbed
 - Install tree protection and/or fencing at limit of work to protect areas not to be disturbed.
 - Installation of temporary sediment basins with diversion swales directing stormwater into the temporary basins.
- Construction
 - Locate stockpiles in work areas upstream of temporary sediment basins and outside of tree root zones/drip lines
 - Leave disturbed area of site in a surface roughened condition when feasible
 - Install support of excavation and shoring
 - Close excavations as soon as possible
 - Protect and repair BMPs, as necessary
 - Perform street sweeping, as needed
 - Seed or surround stockpiles to prevent loss of material.

- Dewatering operations
 - The common process of dewatering involves the following phases: collection of water, pumping, filtering/removing silt, and discharge to the ground.
 - This will be accomplished by open pits with sumps, well points, deep construction wells, or vacuum ejector systems by the Contractor. This is dependent on the type of excavation shoring deployed by the Contractor.
 - Sediment traps and frac tanks will be deployed to decant water and infiltrate clean groundwater to the ground.
- Backfill and Compacting
 - Remove temporary BMPs where appropriate
 - Remove limited stored materials and equipment from the site
- Final Stabilization
 - Install seed/mulch/sod or landscaping as shown on the landscape plan
 - Remove all non-biodegradable temporary BMPs when stable

EROSION CONTROL BEST MANAGEMENT PRACTICES (BMPs)

During construction, silt-laden runoff, or discharge from dewatering operations (if necessary) will be prevented from exiting the construction area untreated. Siltation barriers consisting of a filter fabric silt fence, straw bales, stone filter berms, or silt socks will be erected in advance of construction along the down-gradient edge of all disturbed areas and maintained throughout the construction period. The control of dust and erosion during the construction period will be managed using several Best Management Practices (BMPs) described below and as shown on the erosion control plans of the referenced plan set.

Stabilized Construction Entrance

An apron constructed of coarse aggregate over a geotextile fabric shall cover the transition between the existing public roadway and the haul road in the first phase and altered parking/turn around area in subsequent phases. The size and construction of the entrance is shown on the plan detail sheets. This entrance shall be inspected weekly and maintained throughout construction activities and removed after completion.

Temporary Haul Road

A temporary haul road is a road that is designed and built along a temporary alignment, solely for use during construction. Temporary roads focus the ground disturbance of equipment and vehicles along a certain path, so that erosion and sediment movement can be planned and mitigated. Beyond focusing the disturbance, the location and design of temporary roads can actively aid in controlling erosion. The primary use of the haul road on this project is to facilitate access to the site when school is in session and to provide a path to move excavated material from the foundation to the varsity field area. The haul road will incorporate water bars, stone construction entrance, culverts, ditches, and slope interceptors as part of the route.

Storm Sewer Inlet Protection

Storm sewer inlet protection is a sediment filter or an excavated impounding area around a storm drain drop inlet or curb inlet. Its purpose is to prevent sediment from entering storm drainage systems prior to permanent stabilization of the disturbed area. This practice shall be used where the drainage area to an inlet is disturbed, it is not possible to temporarily divert the storm drain outfall into a trapping device, and watertight blocking of the inlets is not advisable. It is not to be used in place of sediment trapping devices.

Temporary Sediment Traps (During Construction)

Small depressions that have stormwater runoff directed into them for increased retention time that promotes settling out of suspended solids. Tributary drainage area shall be under 1 acre. The storage volumes should be 1,800 cubic feet per acre of tributary area. During construction, total storage within the temporary sediment traps of 9,000 cubic feet is required for a 5-acre limit of disturbance areas. The temporary sediment traps shall be divided into at least (2) small areas to accommodate to required volume. At no time, shall temporary settling basins be constructed in the vicinity of the proposed stormwater infiltration areas in order to prevent the soils from becoming clogged with sediment. Skimmers shall be employed to discharge water on the surface of the trap to limit

Silt Fence, Reinforced with Straw Bales as Required (Compost Berms & Socks can be used as alternatives)

Silt fence or silt sock is installed at the down gradient limit of work. It should be trenched into the ground 6" and staked without drooping. The woven fabric will allow the passage of stormwater while filtering out suspended solids. Straw bales give added filtering and erosion control. Every 100' two bales or silt socks shall be placed and staked perpendicular to the fence. Straw bales shall be inert straw or salt hay type.

Filter Berm

A filter berm is a temporary ridge of loose coarse gravel, stone, or crushed rock. It slows, filters, and diverts flow from an area exposed to traffic or use to retain sediment from getting into traffic areas. Berm material should be ¾" to 3" in size and free from fines (<5%) Spacing would be approximately every 300 feet on slopes less than 5%.

Chip/Mulch Berm

Wood chip or mulch filter berms are created from trees, branches, and slash on the site. If the trees do not have value for boards or other use it can be ground on site to produce media that can be used in place of silt fence to control erosion. The berms are a minimum of 1 foot high by 3 feet wide. The berms would be installed to follow contour lines and would be spaced about 100 feet apart for less than 5% slopes. Where possible berms should be placed at least 10 feet from toe of slopes to allow for energy dissipation.

Dewatering

If dewatering is required, small discharges shall be directed through a settling pool or filter bag prior to discharge and infiltration into the ground. Outflow of silt-laden runoff shall not be permitted to flow directly into resource areas. Larger flows will require a well point or sump system to a settling tank/frac tank before decanting and discharge to the soil. Upon completion of site stabilization, the BMP's and conveyance systems shall be thoroughly cleaned of silt and sediment and made ready for the proposed operation. Discharge points shall be set back from the edge of the resource areas and monitored by qualified personnel to ensure no impacts to resource areas and compliance with applicable federal and state regulations. Discharges shall be free from visible floating, suspended, and settleable solids that would impair the functions of the nearby wetlands and downstream rivers.

Concrete Washout Pit

A concrete washout pit/area must be designated to receive wash water from washing of tools and concrete mixer chutes, liquid concrete waste from dump trucks, mobile batch mixers, or pump trucks. Concrete washout activities must be conducted in a manner that does not contribute pollutants to surface waters or stormwater runoff. Concrete washout areas may be lined or unlined excavated pits in the ground, commercially manufactured prefabricated washout containers, or aboveground holding areas constructed of berms, sandbags, or straw bales with a plastic liner. Although un-lined washout areas may be used, lined pits will be required to protect groundwater.

Slope Interceptors or Interception Ditch

The purpose of an Interception Ditch is to intercept run-on and direct it to a stabilized area where it can be safely discharged. The ditch can be a berm of compacted soil or an excavated swale, or combination berm and swale constructed across a slope. Interceptor Ditch, Crown Ditch, Interceptor Swale, Interceptor Dike, Water Bars are other names for this BMP. This measure should be used in construction areas where run-off can be intercepted and disposed of properly to control erosion, sedimentation, or flood damage. Interception Ditches may be either temporary or permanent and are used in variety of situations to provide storm water protection. When used above disturbed existing slopes or above cut or fill slopes, an Interception Ditch prevents run-off over the slope. Across unprotected slopes, it acts as slope breaks to reduce slope length. When used below slopes, it diverts excess run-off to stabilized outlets. It can also be used to divert sediment-laden water to sediment traps, to divert water around buildings or areas that are subject to damage from run-off, and at or near the perimeter of the construction area to prevent sediment from leaving the site.

FINAL STABILIZATION

Final stabilization includes those measures taken to control pollutants in stormwater after soil disturbing activities are complete. Practices implemented to achieve final stabilization include:

- Installation of asphalt, stone, pavers, and concrete pavement
- Installation of landscaping per the landscape plan
- Installation of wetland seeding and loam/seed on exposed loam

- Installation of turf on playing fields
- Maintenance of appropriate erosion and sediment control BMPs until final stabilization is achieved
- Removal of temporary BMPs once work is completed and final stabilization achieved

ON-GOING MAINTENANCE

The Owner / Responsible Party shall hire appropriate staff, contract with a maintenance company, or designate qualified in-house staff to complete ongoing maintenance.

LIVING DOCUMENT PROVISIONS

Due to the difficulty of identifying all sources of potential stormwater contamination and maintenance activities, this document shall be updated as necessary to reflect new procedures, technologies, or requirements. Ultimately, the Responsible Party will have the authority to implement a plan and frequency of maintenance as required.

MAINTENANCE LOG

The Owner / Responsible Party shall develop and maintain a log of inspections, maintenance, repairs, and disposal (including location of disposal) during the life of the project. Records shall be maintained for at least three years and be made available to the Massachusetts Department of Environmental Protection in accordance with the provisions of the Massachusetts Stormwater Handbook. A sample of such a maintenance log is provided.

GOOD HOUSEKEEPING PRACTICES DURING CONSTRUCTION & BEYOND

The Owner / Responsible Party shall maintain good housekeeping practices by maintaining a clean and orderly facility to prevent potential pollution sources from meeting stormwater and degrading water quality. This includes establishing protocols to reduce the possibility of mishandling materials or equipment and training employees in good housekeeping techniques.

Common areas where good housekeeping practices should be followed shall include: material storage areas, vehicle, and equipment maintenance areas, and loading areas. Good housekeeping practices must include a designated and secure location for garbage and fertilizers. A schedule for regular pickup and disposal of garbage and waste materials during construction and routine inspections of containers for leaks and structural integrity shall be developed.

After construction, no trash shall be kept on-site and shall be removed by service technicians or contractors when they leave. Portable toilets shall be installed on site and maintained throughout construction. Excess concrete and cleanout water from red-mix vehicles shall be directed towards small excavations or constructed boxes for cleanup. Catch basins and drainage conveyance systems shall not be used for this purpose.

Dust Control (Seeding and Topsoiling)

Construction traffic must enter and exit the site at the stabilized construction entrance. The purpose is to trap dust and mud that would otherwise be carried off-site by construction traffic. Large areas of soil that are denuded of vegetation and have no protection from particles being picked up and carried by wind should be protected with a temporary cover or kept under control with water or other soil adhering products to limit wind transported particles existing the site perimeter. Water trucks or other dust control agents will be used, as needed, during construction to reduce dust generated on the site that may cause off-site damage, health hazards, and traffic safety problems.

Material Storage

Areas designated for temporary materials storage shall be surrounded on the downhill side by an erosion control barrier. This area shall be inspected daily for erosion and runoff of stored materials. At the completion of construction, the area shall be stabilized with vegetation or stone product. The areas should be located away from trees to be saved including root areas and drip lines. Because of the proximity to the school, laydown and material storage areas shall be fenced or cordoned off to prevent unauthorized access.

Waste Disposal

A secure location shall be designated for waste storage. Regular pickup and disposal of materials shall be scheduled. Containers shall be inspected daily for leaks and structural integrity. Portable toilets shall be installed on site and maintained throughout construction.

Sanitary Facilities

Portable restroom facilities “sani-cans” or other means for construction and maintenance workers to use the lavatory shall be provided on site. Handwashing stations are encouraged especially during the pandemic and other times of the year where influenza and other communicable viruses can be spread.

Stockpiles

Cover all stockpiles that will remain open in excess of 7-14 days with either temporary vegetation or tarps to prevent erosion. Surround all stockpiles with barrier BMP’s when not in use such as compost filter socks to prevent escaped sediment from washing away. Stockpiles should be stabilized at the end of each day.

Snow & Ice Removal

Parts of the drainage system, such as inlets, outlets, and culverts are susceptible from clogging and freezing during the winter months. To retain effectiveness of drains, snow and ice shall be removed from the inlets and outlets during cold months where ice and snow buildup may clog conveyance paths. Plowing shall not be directed towards inlets or outlets where clogging or freezing of the conveyance path may occur.

MINIMIZING EXPOSURE

The Owner / Responsible Party shall minimize exposure of potential pollutant sources from coming into contact with precipitation and being picked up by stormwater and carried into drains and surface waters. All materials shall be plainly labeled and stored in an appropriate container in an appropriate location. All activities which can generate sources of contaminants shall be contained.

LONG-TERM BMPS: MAINTENANCE

Prior to final completion and full occupancy of the development, a representative of the contractor and/or Engineer at the owner / responsible party's request shall properly instruct the user of the required maintenance responsibilities to maintain the effectiveness of the drainage system. The Owner / Responsible Party will implement the procedures and frequencies as they see fit above and beyond the minimums under their current plan and inspect the systems as needed to maintain effectiveness.

Deep sump catch basins, yard drains, and trench drains

Catch basins shall be cleaned, in dry weather, when half of the sump capacity is filled or at a minimum four times per year or as required through periodic inspection. Cleaning will take place at the completion of construction and in early spring after sanding of roadways has ceased or as needed depending on the frequency of major storm events (> 1" of rainfall). All manholes shall be inspected at least once annually or as dictated by the responsible party. Any obstructions, sediment, and debris that could potentially cause clogs shall be removed within the conveyance system as necessary. Inverts, grates, and hoods shall be checked and replaced as necessary to maintain hydraulic effectiveness.

Sediment Traps/Stilling Basin (permanent)

After construction phases, these structures should be cleaned and inspected at a minimum of twice per year in the early spring and fall or as needed after major storm events >1". Inspections shall include: differential settlement, cracking, erosion, leakage, condition of riprap, excessive growth, sediment accumulation, health of vegetation, and sediment capacity.

Vegetated Filter Strip

During the construction phases of the project, the vegetated filter strip shall be inspected monthly to monitor the vegetation growth and as necessary after storm events with 1" of rainfall or greater. Thereafter, the vegetated filter strip shall be inspected every six months during the first year and at least once per year as needed during the owner's regular maintenance of the grounds. Maintenance shall include regularly mowing the grass, cleaning sediment buildup, and reseeding bare spots.

Rain Garden/Biofiltration

During the construction phases of the project, the lined rain garden system with underdrain shall be inspected monthly and cleaned as necessary after storm events with 1" of rainfall or greater. Once the

system goes online, inspections shall occur after each storm event over ½” for the first six months to ensure proper stabilization, function, and to ensure that the inlets and outlets remain free of obstructions. Thereafter, these structures shall be inspected and cleaned at least twice per year. To retain effectiveness of the rain garden, snow and ice shall be removed from the overflow outlet during cold months and snow storage shall not be placed directly within the basin. Cleanings shall include removal of accumulated sediment, inspection of the filter media, and monitoring of groundwater to ensure proper operation of the system. Important items to check for include differential settlement, cracking, breakout, clogging of outlets, and root infestation. Should the rain garden system become clogged with sediment beyond the ability to clean, the rain garden area shall be excavated of all clogged material and reconstructed as shown on the Construction Drawings.

Underground Basins with Infiltration

The underground basin facilities have been designed with riser structures at grade to aid the removal of sediment and debris accumulating in the structure. Once the system goes online, inspections should occur after each storm event for the first few months to ensure proper stabilization, function, and to ensure that the outlets remain free of obstructions. Thereafter, this structure shall be inspected and cleaned at least twice per year or as needed during the owner’s regular maintenance of the grounds. Cleanings shall include removal of accumulated sediment, inspection of the detention structure, and monitoring groundwater and infiltration rates to ensure proper operation of the systems. Items to note during inspections include differential settlement, cracking, break-out, clogging of outlets and vents, and root infestation. Water levels should be checked and recorded against rainfall amounts to verify the drainage system is working properly. See attached manufacturer’s recommendations.

Outlet Structures & Maintenance Skimmers/Orifices to Drawdown Basins (as needed)

During the construction phases of the project, the diversion manholes and outlet structures shall be inspected monthly to monitor the sediment accumulation and sediment removed as necessary after storm events with 1” of rainfall or greater. Thereafter, the diversion manholes and outlet structures shall be inspected every three months or as needed during the owner’s regular maintenance of the grounds. Maintenance shall include cleaning the units during dry weather when half of the sump capacity is filled. Any obstructions, sediment, and debris that could potentially cause clogs shall be removed within the stormwater conveyance system. Inverts and orifices shall be checked and replaced as necessary to maintain hydraulic effectiveness. Any screens, trash racks, or outlet protection racks shall be cleaned of debris to maintain hydraulic effectiveness.

Broad Crested Weirs / Energy Dissipaters

During the construction phases of the project, the rip-rap broad crested weirs / energy dissipaters shall be inspected monthly and cleaned as necessary and/or after storms events with 1” of rainfall or greater. Thereafter, these structures shall be cleaned at least once per year or as needed during the owner’s regular maintenance of the grounds. Cleanings shall include removal of vegetation, removal of excess sediment accumulation and inspection of condition of stone and energy dissipaters.

Curb Inlets/Stormwater Scuppers/ Pass-throughs

In addition to sediment/debris removal & street sweeping, the project is designed with cross-country drainage inlets/scuppers/pass-throughs that go through curbs and sidewalks to convey stormwater to water quality swales, zero-curbs at rain gardens, and flumes/channels to sediment traps. These areas need to be kept clean of debris and shall be monitored and maintained against snow and ice accumulation that may hinder proper function in the winter months.

Street Sweeping and Regenerative Air Cleaning

Soils deposited on paved surfaces shall be swept or cleaned as needed to reduce the potential of sediment transport and tracking. Sweeping operations consist of scraping large quantities of sediment from pavement and/or sweeping, via hand or mechanical means to remove as much deposited sediment as possible. During construction, all streets within and immediately surrounding the construction site shall be cleaned of earth material when sediment has been deposited on the roadway and is being tracked off-site. After construction, driveways and parking areas within the site shall be swept with mechanical brush with vacuum assist and/or regenerative air type systems at least twice per year to remove sediment that potentially could clog infiltration systems or stormwater systems.

Water Quality Inlets

Swirl type hydrodynamic separators shall be inspected and accumulated debris removed by vacuum truck or clam-shell bucket in accordance with manufacturer recommended frequencies and direction. The units shall be inspected a minimum of twice per year in the fall and spring once installed for the first year and no less than once a year thereafter or as dictated by the Town's current catch basin cleaning program.

Green Roofs

Green roofs generally require very little maintenance, but a green roof does contain vegetation requiring care after cold winter. Remove the winter debris such as rotting leaves/stems and keep the roof cleared of rubbish and old plant material. It is also critical that you ensure that the drainage outlets are clear to safeguard the stormwater functionality of the roof as well as achieving a proper water balance for optimal plant health. Without drains, the roof becomes saturated over unhealthy lengths of time which drowns the plants. A green roof that has been optimized for the climate doesn't require a lot of added nutrients. However, in some cases, this is needed, in low doses. Inspect your green roof and repair areas that look bare, i.e., where the plant coverage appears to have been lost.

Vegetated Channels/Banks/Water Quality Swales

During the construction phases of the project, the vegetated channels/banks/swales shall be inspected monthly to monitor the vegetation growth and as necessary after storm events with 1" of rainfall or greater. Thereafter, this structure shall be inspected every six months during the first year and at twice once per year as needed during the owner's regular maintenance of the grounds. Maintenance shall

include regularly (3-4 times a year or as necessary) mowing the grass (in dry swales no less than 4-6” height – wet swales may not need to be mowed based upon established vegetation), cleaning sediment buildup (at least once per year), and reseeding bare spots. Check for signs of rilling/gullyng and repair with soil and vegetation as needed.

Culvert Outlet Protection

A scour transition /geotechnical anchored mat or large river stone with filter fabric shall be inspected and accumulated sediment/debris removed in accordance with recommended frequencies and manufacturer direction as applicable. The mats shall be inspected a minimum of once per year. Vegetation growing through the mat shall be mowed to a minimum height of 4” during the owner’s regular maintenance of the grounds; however, mowing is not recommended were soft, saturated soil exist. The anchors shall be inspected and re-tightened as needed. Any stone surfaces shall be cleaned of accumulated sediment and any deleterious materials of thick vegetation shall be removed by hand.

ANNUAL STORMWATER MAINTENANCE COST ESTIMATE

| BMP | Frequency | Unit Cost | Subtotal |
|---|-------------------|------------------|-----------------|
| Catch Basins & Drain Inlets | 4 visits per year | \$250 | \$1000 |
| Sediment Traps | 2 visits per year | \$500 | \$1000 |
| Vegetated Filter | 1 visit per year | \$350 | \$350 |
| Rain Garden System | 2 visits per year | \$500 | \$1000 |
| Green Roof System | 2 visit per year | \$500 | \$1000 |
| WQI Cleanout | 2 visit per year | \$750 | \$1500 |
| Scuppers/Pass-Throughs | 2 visits per year | \$350 | \$700 |
| Outlet Protection / Dissipaters / Culvert | 1 visit per year | \$500 | \$500 |
| Vacuum Assist Street Sweeping | 4 visits per year | \$700 | \$2800 |
| Vegetated Channels/ WQ Swales | 4 visit per year | \$250 | \$1000 |
| Underground Detention Basin | 2 visit per year | \$750 | \$1500 |
| Outlet Structure/Stilling Basin | 4 visits per year | \$250 | \$1000 |
| | | Total: | \$13,350 |

The annual maintenance cost does not include the owner’s regular maintenance of the grounds that would consist of mowing & debris pickup.

Adjustment of the Stormceptor can be performed by lifting the upper sections free of the excavated area, re-leveling the base and re-installing the sections. Damaged sections and gaskets should be repaired or replaced as necessary. Once the Stormceptor has been constructed, any lift holes must be plugged with mortar.

12. Maintenance

12.1. Health and Safety

The Stormceptor System has been designed considering safety first. It is recommended that confined space entry protocols be followed if entry to the unit is required. In addition, the fiberglass insert has the following health and safety features:

- Designed to withstand the weight of personnel
- A safety grate is located over the 24 inch (600 mm) riser pipe opening
- Ladder rungs can be provided for entry into the unit, if required

12.2. Maintenance Procedures

Maintenance of the Stormceptor system is performed using vacuum trucks. No entry into the unit is required for maintenance (in most cases). The vacuum service industry is a well-established sector of the service industry that cleans underground tanks, sewers and catch basins. Costs to clean a Stormceptor will vary based on the size of unit and transportation distances.

The need for maintenance can be determined easily by inspecting the unit from the surface. The depth of oil in the unit can be determined by inserting a dipstick in the oil inspection/cleanout port.

Similarly, the depth of sediment can be measured from the surface without entry into the Stormceptor via a dipstick tube equipped with a ball valve. This tube would be inserted through the riser pipe. Maintenance should be performed once the sediment depth exceeds the guideline values provided in the Table 4.

Table 4. Sediment Depths Indicating Required Servicing*

| Particle Size | Specific Gravity |
|--|----------------------------|
| Model | Sediment Depth inches (mm) |
| 450i | 8 (200) |
| 900 | 8 (200) |
| 1200 | 10 (250) |
| 1800 | 15 (381) |
| 2400 | 12 (300) |
| 3600 | 17 (430) |
| 4800 | 15 (380) |
| 6000 | 18 (460) |
| 7200 | 15 (381) |
| 11000 | 17 (380) |
| 13000 | 20 (500) |
| 16000 | 17 (380) |
| * based on 15% of the Stormceptor unit's total storage | |

Although annual servicing is recommended, the frequency of maintenance may need to be increased or reduced based on local conditions (i.e. if the unit is filling up with sediment more quickly than projected, maintenance may be required semi-annually; conversely once the site has stabilized maintenance may only be required every two or three years).

Oil is removed through the oil inspection/cleanout port and sediment is removed through the riser pipe. Alternatively oil could be removed from the 24 inches (600 mm) opening if water is removed from the lower chamber to lower the oil level below the drop pipes.

The following procedures should be taken when cleaning out Stormceptor:

1. Check for oil through the oil cleanout port
2. Remove any oil separately using a small portable pump
3. Decant the water from the unit to the sanitary sewer, if permitted by the local regulating authority, or into a separate containment tank
4. Remove the sludge from the bottom of the unit using the vacuum truck
5. Re-fill Stormceptor with water where required by the local jurisdiction

12.3. Submerged Stormceptor

Careful attention should be paid to maintenance of the Submerged Stormceptor System. In cases where the storm drain system is submerged, there is a requirement to plug both the inlet and outlet pipes to economically clean out the unit.

12.4. Hydrocarbon Spills

The Stormceptor is often installed in areas where the potential for spills is great. The Stormceptor System should be cleaned immediately after a spill occurs by a licensed liquid waste hauler.

12.5. Disposal

Requirements for the disposal of material from the Stormceptor System are similar to that of any other stormwater Best Management Practice (BMP) where permitted. Disposal options for the sediment may range from disposal in a sanitary trunk sewer upstream of a sewage treatment plant, to disposal in a sanitary landfill site. Petroleum waste products collected in the Stormceptor (free oil/chemical/fuel spills) should be removed by a licensed waste management company.

12.6. Oil Sheens

With a steady influx of water with high concentrations of oil, a sheen may be noticeable at the Stormceptor outlet. This may occur because a rainbow or sheen can be seen at very small oil concentrations (<10 mg/L). Stormceptor will remove over 98% of all free oil spills from storm sewer systems for dry weather or frequently occurring runoff events.

The appearance of a sheen at the outlet with high influent oil concentrations does not mean the unit is not working to this level of removal. In addition, if the influent oil is emulsified the Stormceptor will not be able to remove it. The Stormceptor is designed for free oil removal and not emulsified conditions.



SUPPORT

Drawings and specifications are available at www.ContechES.com.

Site-specific design support is available from our engineers.

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ILLICIT DISCHARGE COMPLIANCE STATEMENT

Standard 10: Massachusetts Stormwater Standards Handbook

Illicit discharges are defined as discharges into waters of the State or municipal separate stormwater system (MS4) that are not entirely comprised of stormwater. A significant portion of dry weather flows are from illicit and/or inappropriate discharges and connections. Illicit discharges enter the system through either direct connection (e.g., wastewater piping either mistakenly or deliberately connected to the storm drains) or indirect connection (e.g., infiltration from cracked sanitary systems, spills collected by drain outlets, or paint or used oil dumped directly into a drain). The result is untreated discharges that contribute high levels of pollutants, including heavy metals, toxics, oil and grease, solvents, nutrients, viruses, and bacteria to receiving waterbodies.

Exclusions for non-stormwater discharges into drainage systems include activities or facilities for firefighting, water line flushing, landscape irrigation, uncontaminated groundwater discharge, potable water sources, foundation drains, air conditioning condensation, footing drains, individual resident car washing, water used to clean residential buildings without detergents, water used for street washing, and flows from riparian habitats/wetlands. These exclusions are subject to change and are under the discretion of the local governing authority.

To the best of our knowledge and belief no illicit discharges to the stormwater system, surface waters, or wetland resource areas exist or will remain within the proposed dining hall site development area located on approximately 9.4± acres of Map 62 Parcel 13 to be known as 285 Pine Nook Road. The Owner/Applicant agrees to review existing discharges and implement a pollution prevention plan to help locate and prevent future illicit discharges from the property. The design of the site is based on the plans, "Proposed Dining Hall & Site Improvements" 285 Pine Nook Road Deerfield, MA" as prepared by ProTerra Design Group, LLC (ProTerra) with Northeast Survey Consultants, and Fuss O'Neill Landscape Architects.

All new stormwater discharges within the site are proposed to be treated with vegetated filter strips, raingardens, deep sump hooded catch basins, water quality inlets, area drain inlets, water quality swales, green roofs, bioretention, French drain, and/partial exfiltration underground detention systems with outlet structures between the stormwater management systems and the existing downgradient resource areas. A portion of the project in front of the existing Baines Building and Dining Hall contains a parking lot. This area is proposed to be redeveloped in later development stages of the project and will be improved with deep sump hooded catch basins and water quality inlets to treat existing stormwater from impervious surfaces. New water, drainage, and sanitary sewer service will connect the new building to existing public and private sources on campus. Basement drain, loading docks, and kitchen fixtures will be pretreated through oil/water separators and grease interceptors before discharge to the sanitary sewer. Irrigation of planting beds, landscaping, and playing fields will be via private well water sources. Storage of refuse and recyclables will be contained within lidded bins or dumpsters with scheduled removal by a waste management contractor. The maintenance of the site and campus will continue to be performed by Eagle brook facility staff and supervised by the school facilities director. The site has been designed to incorporate low impact development techniques to limit and eliminate entry of illicit discharges into the stormwater management system by covering and separating potential contaminants from precipitation and through long-term maintenance of Best Management Practices (BMP's.)

By promoting proper site design with low impact features, employing proper Best Management Practices (BMP's) , and agreeing to maintain these devices with the aid of professionals as warranted in accordance with the manufacturer's recommendations and the stormwater long-term pollution prevention plan, the Applicant and/or it's representatives hereby acknowledge that this site will have no known or planned illicit discharges.

Eaglebrook/Director Name: _____
(please print)

Eaglebrook/Director's Signature: _____ Date: _____

Engineer's Name: Jesse Moreno, PE

Engineer's Signature: _____ Date: _____
Company: ProTerra Design Group, LLC

Section 3

Hydrology Model Using HydroCAD

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

| | |
|-----------|---------------------------------|
| Smoothing | Yes |
| State | Massachusetts |
| Location | |
| Longitude | 72.594 degrees West |
| Latitude | 42.541 degrees North |
| Elevation | 0 feet |
| Date/Time | Wed, 18 Jan 2023 15:40:22 -0500 |

Extreme Precipitation Estimates

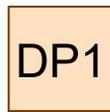
| | 5min | 10min | 15min | 30min | 60min | 120min | | 1hr | 2hr | 3hr | 6hr | 12hr | 24hr | 48hr | | 1day | 2day | 4day | 7day | 10day | |
|-------|------|-------|-------|-------|-------|--------|-------|------|------|------|------|------|-------|-------|-------|------|-------|-------|-------|-------|-------|
| 1yr | 0.29 | 0.44 | 0.55 | 0.72 | 0.89 | 1.12 | 1yr | 0.77 | 1.04 | 1.29 | 1.60 | 1.99 | 2.47 | 2.76 | 1yr | 2.19 | 2.66 | 3.07 | 3.71 | 4.31 | 1yr |
| 2yr | 0.34 | 0.53 | 0.66 | 0.87 | 1.09 | 1.37 | 2yr | 0.94 | 1.24 | 1.58 | 1.96 | 2.42 | 2.99 | 3.34 | 2yr | 2.65 | 3.21 | 3.71 | 4.42 | 5.06 | 2yr |
| 5yr | 0.41 | 0.64 | 0.80 | 1.07 | 1.37 | 1.73 | 5yr | 1.18 | 1.55 | 1.99 | 2.46 | 3.01 | 3.67 | 4.19 | 5yr | 3.25 | 4.03 | 4.68 | 5.44 | 6.20 | 5yr |
| 10yr | 0.46 | 0.73 | 0.92 | 1.25 | 1.63 | 2.07 | 10yr | 1.41 | 1.83 | 2.38 | 2.93 | 3.56 | 4.29 | 4.98 | 10yr | 3.80 | 4.79 | 5.59 | 6.36 | 7.22 | 10yr |
| 25yr | 0.56 | 0.88 | 1.12 | 1.55 | 2.05 | 2.61 | 25yr | 1.77 | 2.28 | 3.01 | 3.69 | 4.44 | 5.28 | 6.27 | 25yr | 4.67 | 6.03 | 7.06 | 7.84 | 8.85 | 25yr |
| 50yr | 0.63 | 1.01 | 1.30 | 1.82 | 2.45 | 3.14 | 50yr | 2.11 | 2.69 | 3.62 | 4.40 | 5.25 | 6.18 | 7.47 | 50yr | 5.47 | 7.18 | 8.44 | 9.19 | 10.33 | 50yr |
| 100yr | 0.72 | 1.17 | 1.50 | 2.14 | 2.92 | 3.75 | 100yr | 2.52 | 3.18 | 4.33 | 5.24 | 6.21 | 7.24 | 8.90 | 100yr | 6.41 | 8.56 | 10.09 | 10.77 | 12.05 | 100yr |
| 200yr | 0.84 | 1.36 | 1.77 | 2.53 | 3.49 | 4.48 | 200yr | 3.01 | 3.77 | 5.16 | 6.23 | 7.33 | 8.48 | 10.62 | 200yr | 7.51 | 10.21 | 12.08 | 12.63 | 14.07 | 200yr |
| 500yr | 1.02 | 1.67 | 2.18 | 3.16 | 4.41 | 5.69 | 500yr | 3.81 | 4.71 | 6.54 | 7.83 | 9.14 | 10.47 | 13.41 | 500yr | 9.27 | 12.90 | 15.32 | 15.61 | 17.28 | 500yr |

Lower Confidence Limits

| | 5min | 10min | 15min | 30min | 60min | 120min | | 1hr | 2hr | 3hr | 6hr | 12hr | 24hr | 48hr | | 1day | 2day | 4day | 7day | 10day | |
|-------|------|-------|-------|-------|-------|--------|-------|------|------|------|------|------|------|------|-------|------|------|-------|------|-------|-------|
| 1yr | 0.23 | 0.35 | 0.43 | 0.58 | 0.71 | 0.85 | 1yr | 0.61 | 0.83 | 1.00 | 1.36 | 1.62 | 2.23 | 2.49 | 1yr | 1.98 | 2.39 | 2.61 | 3.21 | 3.71 | 1yr |
| 2yr | 0.33 | 0.51 | 0.63 | 0.85 | 1.05 | 1.23 | 2yr | 0.91 | 1.20 | 1.39 | 1.79 | 2.30 | 2.88 | 3.21 | 2yr | 2.55 | 3.09 | 3.58 | 4.24 | 4.89 | 2yr |
| 5yr | 0.37 | 0.57 | 0.71 | 0.98 | 1.24 | 1.44 | 5yr | 1.07 | 1.41 | 1.63 | 2.11 | 2.65 | 3.33 | 3.84 | 5yr | 2.95 | 3.69 | 4.30 | 5.00 | 5.68 | 5yr |
| 10yr | 0.41 | 0.63 | 0.78 | 1.10 | 1.42 | 1.59 | 10yr | 1.22 | 1.56 | 1.83 | 2.35 | 2.94 | 3.68 | 4.39 | 10yr | 3.26 | 4.23 | 4.94 | 5.63 | 6.36 | 10yr |
| 25yr | 0.47 | 0.71 | 0.89 | 1.26 | 1.66 | 1.81 | 25yr | 1.44 | 1.77 | 2.16 | 2.70 | 3.36 | 4.25 | 5.26 | 25yr | 3.76 | 5.06 | 5.95 | 6.60 | 7.40 | 25yr |
| 50yr | 0.52 | 0.78 | 0.98 | 1.40 | 1.89 | 1.99 | 50yr | 1.63 | 1.94 | 2.44 | 2.99 | 3.73 | 4.75 | 6.06 | 50yr | 4.21 | 5.82 | 6.89 | 7.47 | 8.30 | 50yr |
| 100yr | 0.57 | 0.86 | 1.08 | 1.56 | 2.15 | 2.18 | 100yr | 1.85 | 2.13 | 2.78 | 3.31 | 4.13 | 5.33 | 6.99 | 100yr | 4.72 | 6.72 | 7.97 | 8.47 | 9.35 | 100yr |
| 200yr | 0.63 | 0.96 | 1.21 | 1.75 | 2.44 | 2.38 | 200yr | 2.11 | 2.32 | 3.15 | 3.66 | 4.58 | 5.99 | 8.07 | 200yr | 5.30 | 7.76 | 9.28 | 8.11 | 10.54 | 200yr |
| 500yr | 0.74 | 1.10 | 1.42 | 2.06 | 2.92 | 2.67 | 500yr | 2.52 | 2.61 | 3.74 | 4.18 | 5.23 | 7.03 | 9.81 | 500yr | 6.22 | 9.43 | 11.38 | 9.18 | 12.41 | 500yr |

Upper Confidence Limits

| | 5min | 10min | 15min | 30min | 60min | 120min | | 1hr | 2hr | 3hr | 6hr | 12hr | 24hr | 48hr | | 1day | 2day | 4day | 7day | 10day | |
|-------|------|-------|-------|-------|-------|--------|-------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1yr | 0.32 | 0.50 | 0.61 | 0.81 | 1.00 | 1.18 | 1yr | 0.86 | 1.15 | 1.34 | 1.72 | 2.15 | 2.71 | 3.03 | 1yr | 2.40 | 2.92 | 3.33 | 4.00 | 4.72 | 1yr |
| 2yr | 0.36 | 0.56 | 0.68 | 0.93 | 1.14 | 1.35 | 2yr | 0.99 | 1.32 | 1.50 | 1.96 | 2.47 | 3.15 | 3.49 | 2yr | 2.78 | 3.36 | 3.88 | 4.69 | 5.28 | 2yr |
| 5yr | 0.45 | 0.70 | 0.87 | 1.19 | 1.52 | 1.72 | 5yr | 1.31 | 1.68 | 1.95 | 2.47 | 3.09 | 4.06 | 4.60 | 5yr | 3.59 | 4.42 | 5.15 | 5.91 | 6.74 | 5yr |
| 10yr | 0.55 | 0.84 | 1.04 | 1.45 | 1.88 | 2.09 | 10yr | 1.62 | 2.04 | 2.39 | 2.98 | 3.70 | 5.00 | 5.69 | 10yr | 4.42 | 5.47 | 6.37 | 7.16 | 8.13 | 10yr |
| 25yr | 0.70 | 1.06 | 1.32 | 1.89 | 2.49 | 2.71 | 25yr | 2.15 | 2.65 | 3.11 | 3.86 | 4.69 | 6.50 | 7.52 | 25yr | 5.75 | 7.23 | 8.46 | 9.20 | 10.41 | 25yr |
| 50yr | 0.85 | 1.29 | 1.60 | 2.30 | 3.10 | 3.30 | 50yr | 2.68 | 3.23 | 3.80 | 4.69 | 5.62 | 7.94 | 9.29 | 50yr | 7.03 | 8.94 | 10.46 | 11.11 | 12.54 | 50yr |
| 100yr | 1.03 | 1.56 | 1.95 | 2.82 | 3.86 | 4.04 | 100yr | 3.33 | 3.95 | 4.65 | 5.70 | 6.73 | 9.69 | 11.48 | 100yr | 8.57 | 11.03 | 12.92 | 13.42 | 15.10 | 100yr |
| 200yr | 1.25 | 1.88 | 2.38 | 3.44 | 4.80 | 4.94 | 200yr | 4.15 | 4.83 | 5.68 | 6.94 | 8.05 | 11.82 | 14.16 | 200yr | 10.46 | 13.62 | 15.94 | 18.44 | 18.16 | 200yr |
| 500yr | 1.62 | 2.41 | 3.10 | 4.51 | 6.41 | 6.46 | 500yr | 5.53 | 6.32 | 7.42 | 9.01 | 10.21 | 15.37 | 18.71 | 500yr | 13.60 | 17.99 | 21.01 | 24.36 | 23.20 | 500yr |



DP1



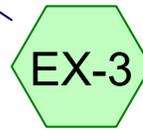
TRIB. TO WETLAND
SERIES 'A'



DP2



TRIB. TO WETLAND
SERIES 'C'



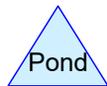
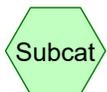
TRIB. TO WETLAND
SERIES 'D'



DP3



TRIB. TO WETLAND
SERIES 'E' & 'W1'



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Area Listing (selected nodes)

| Area (sq-ft) | CN | Description (subcatchment-numbers) |
|-----------------|----|--|
| 273,099 | 39 | >75% Grass cover, Good, HSG A (EX-1, EX-2, EX-3, EX-4) |
| 215,549 | 61 | >75% Grass cover, Good, HSG B (EX-1, EX-2, EX-3, EX-4) |
| 311,048 | 74 | >75% Grass cover, Good, HSG C (EX-1, EX-2, EX-3, EX-4) |
| 1,147 | 85 | Gravel roads, HSG B (EX-2) |
| 1,768 | 89 | Gravel roads, HSG C (EX-2) |
| 33,944 | 98 | Paved parking, HSG A (EX-1, EX-2) |
| 14,252 | 98 | Paved parking, HSG B (EX-1, EX-2) |
| 4,604 | 98 | Paved parking, HSG C (EX-1, EX-2) |
| 16,441 | 98 | Roofs, HSG A (EX-1, EX-2, EX-4) |
| 11,453 | 98 | Roofs, HSG B (EX-1, EX-2) |
| 2,381 | 98 | Roofs, HSG C (EX-2) |
| 101,602 | 74 | Sports Field, HSG A (EX-2, EX-3, EX-4) |
| 102,019 | 30 | Woods, Good, HSG A (EX-2, EX-3, EX-4) |
| 337,433 | 55 | Woods, Good, HSG B (EX-2, EX-3, EX-4) |
| 623,399 | 70 | Woods, Good, HSG C (EX-2, EX-3, EX-4) |

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Soil Listing (selected nodes)

| Area (sq-ft) | Soil Group | Subcatchment Numbers |
|-----------------|---------------|-------------------------|
| 527,105 | HSG A | EX-1, EX-2, EX-3, EX-4 |
| 579,834 | HSG B | EX-1, EX-2, EX-3, EX-4 |
| 943,200 | HSG C | EX-1, EX-2, EX-3, EX-4 |
| 0 | HSG D | |
| 0 | Other | |

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Ground Covers (selected nodes)

| HSG-A (sq-ft) | HSG-B (sq-ft) | HSG-C (sq-ft) | HSG-D (sq-ft) | Other (sq-ft) | Total (sq-ft) | Ground Cover | Sub Num |
|------------------|------------------|------------------|------------------|------------------|------------------|---------------------------|------------|
| 273,099 | 215,549 | 311,048 | 0 | 0 | 799,696 | >75% Grass cover, Good | |
| 0 | 1,147 | 1,768 | 0 | 0 | 2,915 | Gravel roads | |
| 33,944 | 14,252 | 4,604 | 0 | 0 | 52,800 | Paved parking | |
| 16,441 | 11,453 | 2,381 | 0 | 0 | 30,275 | Roofs | |
| 101,602 | 0 | 0 | 0 | 0 | 101,602 | Sports Field | |
| 102,019 | 337,433 | 623,399 | 0 | 0 | 1,062,851 | Woods, Good | |

EBS - Dining Hall - PRE

Type III 24-hr 2-Year Rainfall=2.99"

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Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 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 EX-1: TRIB. TO WETLAND Runoff Area=70,159 sf 48.57% Impervious Runoff Depth=0.66"
Flow Length=438' Tc=6.3 min CN=69 Runoff=1.05 cfs 3,884 cf

Subcatchment EX-2: TRIB. TO WETLAND Runoff Area=689,990 sf 7.02% Impervious Runoff Depth=0.46"
Flow Length=2,266' Tc=11.9 min CN=64 Runoff=4.82 cfs 26,702 cf

Subcatchment EX-3: TRIB. TO WETLAND Runoff Area=182,621 sf 0.00% Impervious Runoff Depth=0.33"
Flow Length=1,195' Tc=15.7 min CN=60 Runoff=0.65 cfs 5,018 cf

Subcatchment EX-4: TRIB. TO WETLAND Runoff Area=1,107,369 sf 0.05% Impervious Runoff Depth=0.39"
Flow Length=2,193' Tc=22.2 min CN=62 Runoff=4.88 cfs 36,387 cf

Reach DP1: DP1 Inflow=1.05 cfs 3,884 cf
Outflow=1.05 cfs 3,884 cf

Reach DP2: DP2 Inflow=5.29 cfs 31,720 cf
Outflow=5.29 cfs 31,720 cf

Reach DP3: DP3 Inflow=4.88 cfs 36,387 cf
Outflow=4.88 cfs 36,387 cf

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Type III 24-hr 2-Year Rainfall=2.99"

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Summary for Subcatchment EX-1: TRIB. TO WETLAND SERIES 'A'

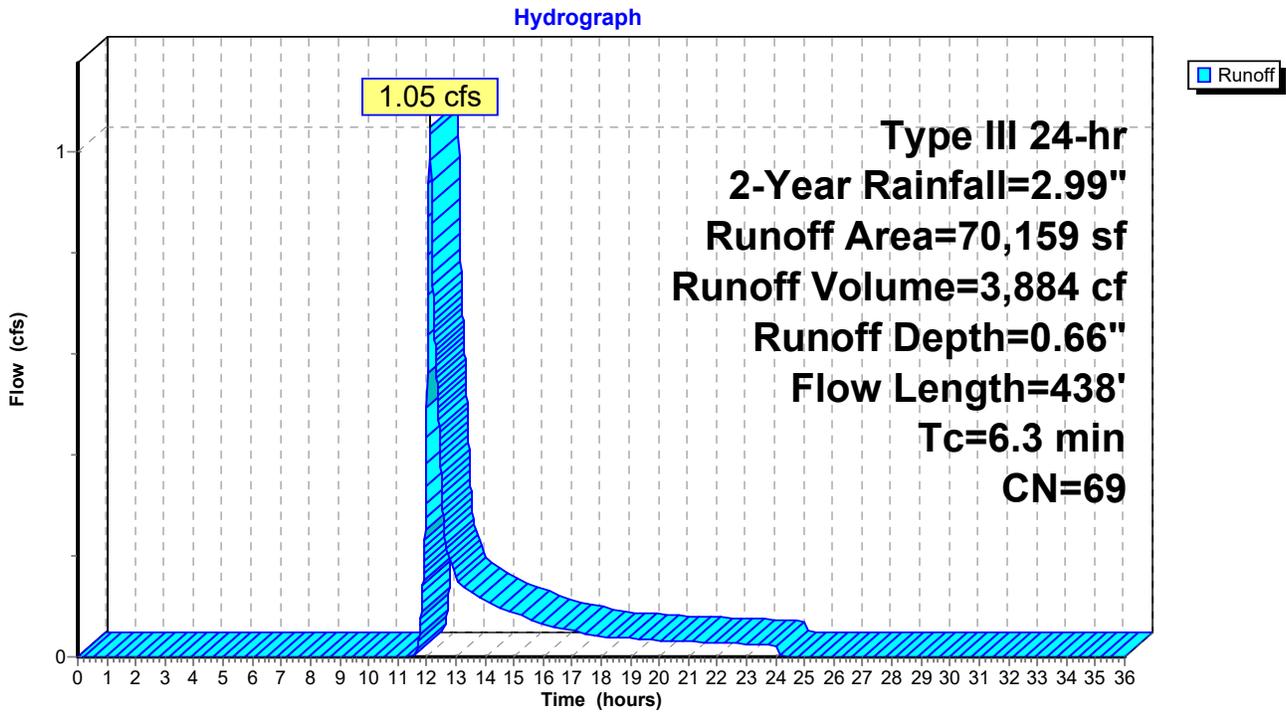
Runoff = 1.05 cfs @ 12.11 hrs, Volume= 3,884 cf, Depth= 0.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=2.99"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 5,963 | 98 | Roofs, HSG A |
| 24,410 | 98 | Paved parking, HSG A |
| 30,725 | 39 | >75% Grass cover, Good, HSG A |
| 2,745 | 98 | Roofs, HSG B |
| 912 | 98 | Paved parking, HSG B |
| 5,176 | 61 | >75% Grass cover, Good, HSG B |
| 47 | 98 | Paved parking, HSG C |
| 181 | 74 | >75% Grass cover, Good, HSG C |
| 70,159 | 69 | Weighted Average |
| 36,082 | | 51.43% Pervious Area |
| 34,077 | | 48.57% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|--|
| 4.2 | 50 | 0.1170 | 0.20 | | Sheet Flow, Grass: Dense n= 0.240 P2= 2.99" |
| 1.7 | 202 | 0.0820 | 2.00 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.1 | 26 | 0.0088 | 4.26 | 3.34 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 0.2 | 99 | 0.0280 | 7.59 | 5.96 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 0.1 | 61 | 0.0560 | 10.73 | 8.43 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 6.3 | 438 | Total | | | |

Subcatchment EX-1: TRIB. TO WETLAND SERIES 'A'



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Type III 24-hr 2-Year Rainfall=2.99"

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Summary for Subcatchment EX-2: TRIB. TO WETLAND SERIES 'C'

Runoff = 4.82 cfs @ 12.21 hrs, Volume= 26,702 cf, Depth= 0.46"

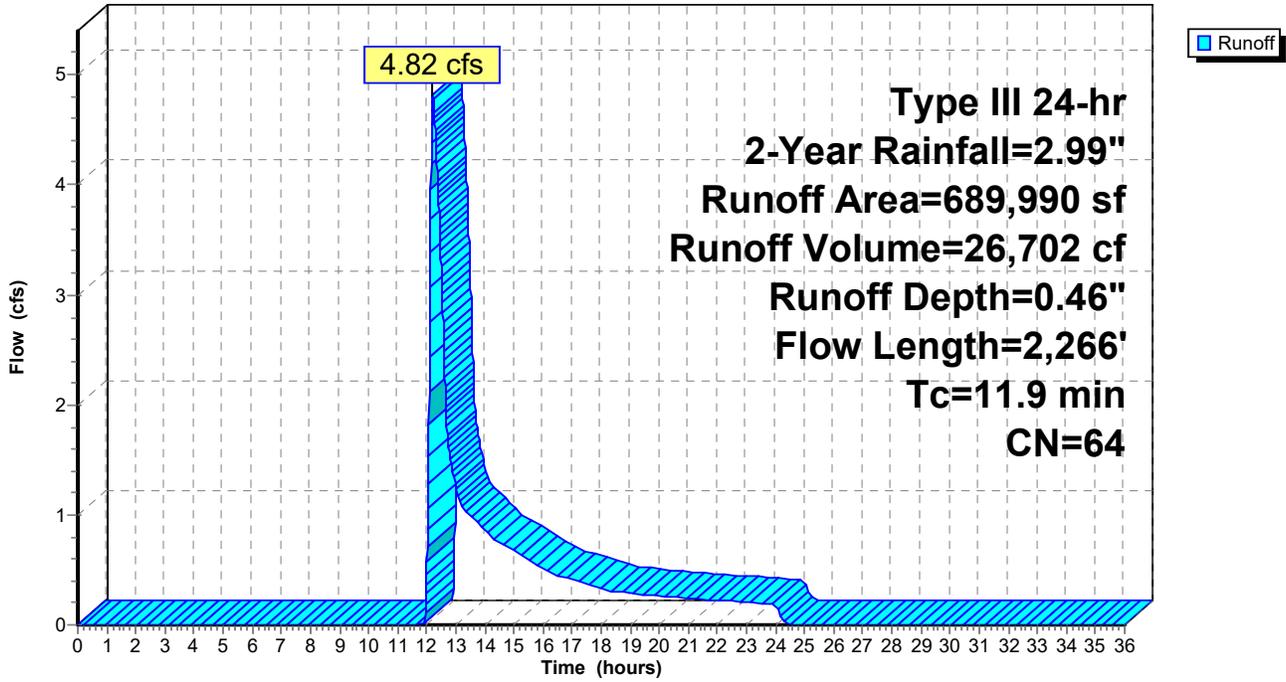
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=2.99"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 9,940 | 98 | Roofs, HSG A |
| 9,534 | 98 | Paved parking, HSG A |
| 118,153 | 39 | >75% Grass cover, Good, HSG A |
| * 53,904 | 74 | Sports Field, HSG A |
| 32,167 | 30 | Woods, Good, HSG A |
| 8,708 | 98 | Roofs, HSG B |
| 13,340 | 98 | Paved parking, HSG B |
| 116,266 | 61 | >75% Grass cover, Good, HSG B |
| 1,147 | 85 | Gravel roads, HSG B |
| 44,821 | 55 | Woods, Good, HSG B |
| 2,381 | 98 | Roofs, HSG C |
| 4,557 | 98 | Paved parking, HSG C |
| 200,348 | 74 | >75% Grass cover, Good, HSG C |
| 1,768 | 89 | Gravel roads, HSG C |
| 72,956 | 70 | Woods, Good, HSG C |
| 689,990 | 64 | Weighted Average |
| 641,530 | | 92.98% Pervious Area |
| 48,460 | | 7.02% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|--|
| 4.9 | 50 | 0.2180 | 0.17 | | Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.99" |
| 3.7 | 885 | 0.3200 | 3.96 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.4 | 273 | 0.1000 | 10.16 | 80.27 | Channel Flow, Area= 7.9 sf Perim= 12.0' r= 0.66' n= 0.035 Earth, dense weeds |
| 1.5 | 185 | 0.0860 | 2.05 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.7 | 295 | 0.1600 | 6.81 | 10.90 | Channel Flow, Area= 1.6 sf Perim= 6.3' r= 0.25' n= 0.035 Earth, dense weeds |
| 0.1 | 84 | 0.1600 | 18.15 | 14.25 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 |
| 0.4 | 245 | 0.0410 | 9.19 | 7.21 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 |
| 0.2 | 249 | 0.1840 | 17.38 | 215.52 | Channel Flow, Area= 12.4 sf Perim= 13.3' r= 0.93' n= 0.035 Earth, dense weeds |
| 11.9 | 2,266 | Total | | | |

Subcatchment EX-2: TRIB. TO WETLAND SERIES 'C'

Hydrograph



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Type III 24-hr 2-Year Rainfall=2.99"

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Summary for Subcatchment EX-3: TRIB. TO WETLAND SERIES 'D'

Runoff = 0.65 cfs @ 12.40 hrs, Volume= 5,018 cf, Depth= 0.33"

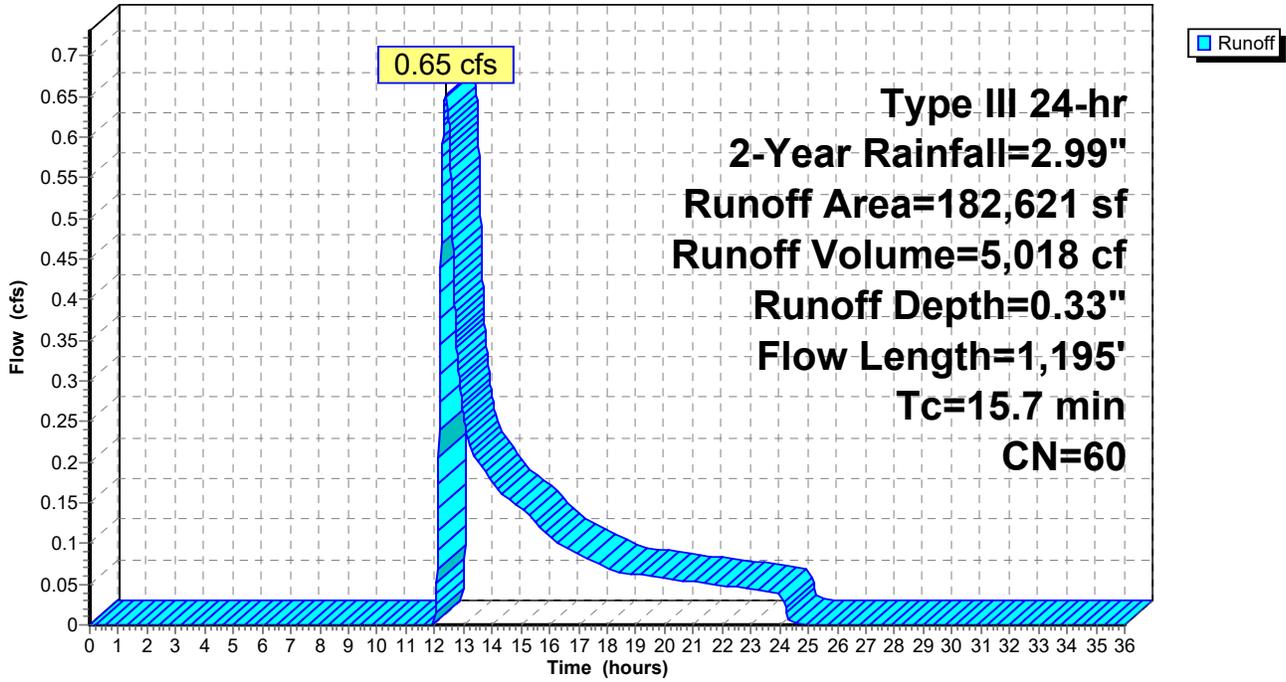
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=2.99"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 42,530 | 39 | >75% Grass cover, Good, HSG A |
| * 31,835 | 74 | Sports Field, HSG A |
| 18,582 | 30 | Woods, Good, HSG A |
| 1,198 | 61 | >75% Grass cover, Good, HSG B |
| 1,802 | 55 | Woods, Good, HSG B |
| 33,603 | 74 | >75% Grass cover, Good, HSG C |
| 53,071 | 70 | Woods, Good, HSG C |
| 182,621 | 60 | Weighted Average |
| 182,621 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|---|
| 4.6 | 50 | 0.2500 | 0.18 | | Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.99" |
| 5.0 | 725 | 0.2300 | 2.40 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 5.7 | 225 | 0.0089 | 0.66 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.2 | 37 | 0.5000 | 3.54 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 0.2 | 158 | 0.1650 | 12.49 | 96.14 | Channel Flow, Area= 7.7 sf Perim= 12.5' r= 0.62' n= 0.035 Earth, dense weeds |
| 15.7 | 1,195 | Total | | | |

Subcatchment EX-3: TRIB. TO WETLAND SERIES 'D'

Hydrograph



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Type III 24-hr 2-Year Rainfall=2.99"

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Summary for Subcatchment EX-4: TRIB. TO WETLAND SERIES 'E' & 'W1'

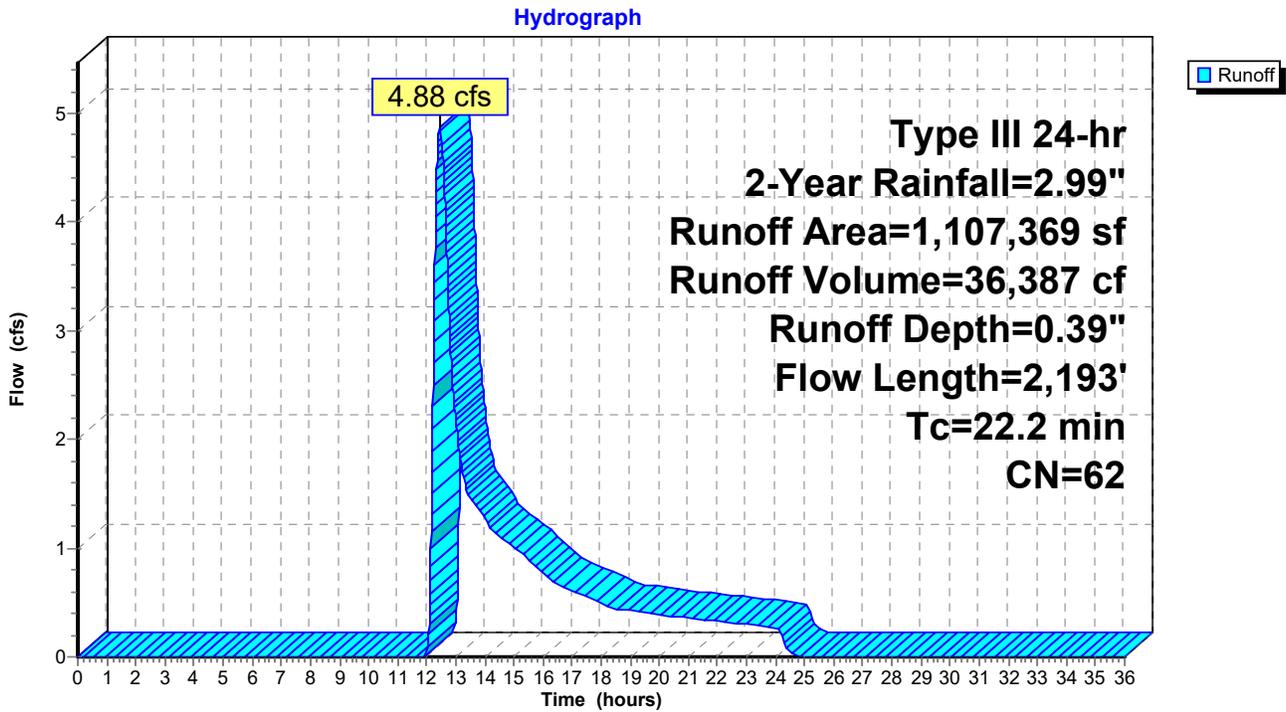
Runoff = 4.88 cfs @ 12.45 hrs, Volume= 36,387 cf, Depth= 0.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=2.99"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 538 | 98 | Roofs, HSG A |
| 81,691 | 39 | >75% Grass cover, Good, HSG A |
| * 15,863 | 74 | Sports Field, HSG A |
| 51,270 | 30 | Woods, Good, HSG A |
| 92,909 | 61 | >75% Grass cover, Good, HSG B |
| 290,810 | 55 | Woods, Good, HSG B |
| 76,916 | 74 | >75% Grass cover, Good, HSG C |
| 497,372 | 70 | Woods, Good, HSG C |
| 1,107,369 | 62 | Weighted Average |
| 1,106,831 | | 99.95% Pervious Area |
| 538 | | 0.05% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|--|
| 7.9 | 50 | 0.0660 | 0.11 | | Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.99" |
| 4.6 | 613 | 0.2000 | 2.24 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 2.1 | 431 | 0.4600 | 3.39 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 4.9 | 729 | 0.2500 | 2.50 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 1.7 | 99 | 0.0200 | 0.99 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.8 | 135 | 0.3000 | 2.74 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 0.2 | 136 | 0.0850 | 11.51 | 180.77 | Channel Flow, Area= 15.7 sf Perim= 17.5' r= 0.90' n= 0.035 Earth, dense weeds |
| 22.2 | 2,193 | Total | | | |

Subcatchment EX-4: TRIB. TO WETLAND SERIES 'E' & 'W1'



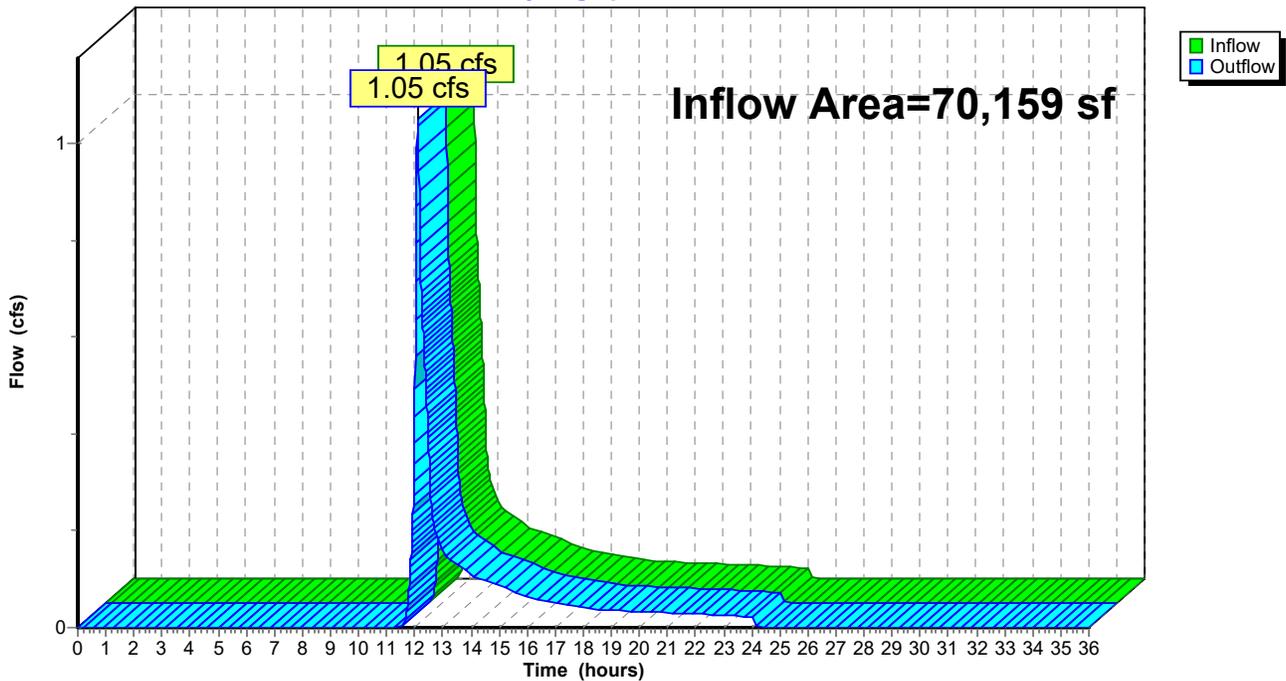
Summary for Reach DP1: DP1

Inflow Area = 70,159 sf, 48.57% Impervious, Inflow Depth = 0.66" for 2-Year event
Inflow = 1.05 cfs @ 12.11 hrs, Volume= 3,884 cf
Outflow = 1.05 cfs @ 12.11 hrs, Volume= 3,884 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach DP1: DP1

Hydrograph



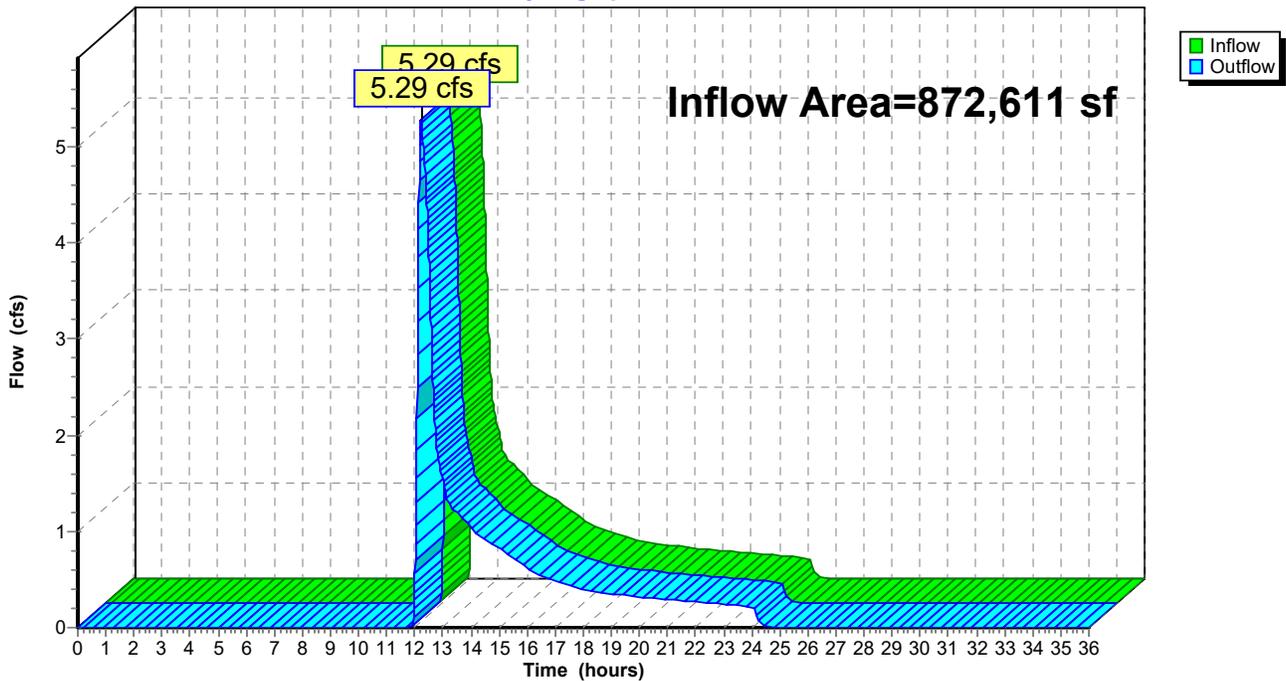
Summary for Reach DP2: DP2

Inflow Area = 872,611 sf, 5.55% Impervious, Inflow Depth = 0.44" for 2-Year event
Inflow = 5.29 cfs @ 12.23 hrs, Volume= 31,720 cf
Outflow = 5.29 cfs @ 12.23 hrs, Volume= 31,720 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach DP2: DP2

Hydrograph



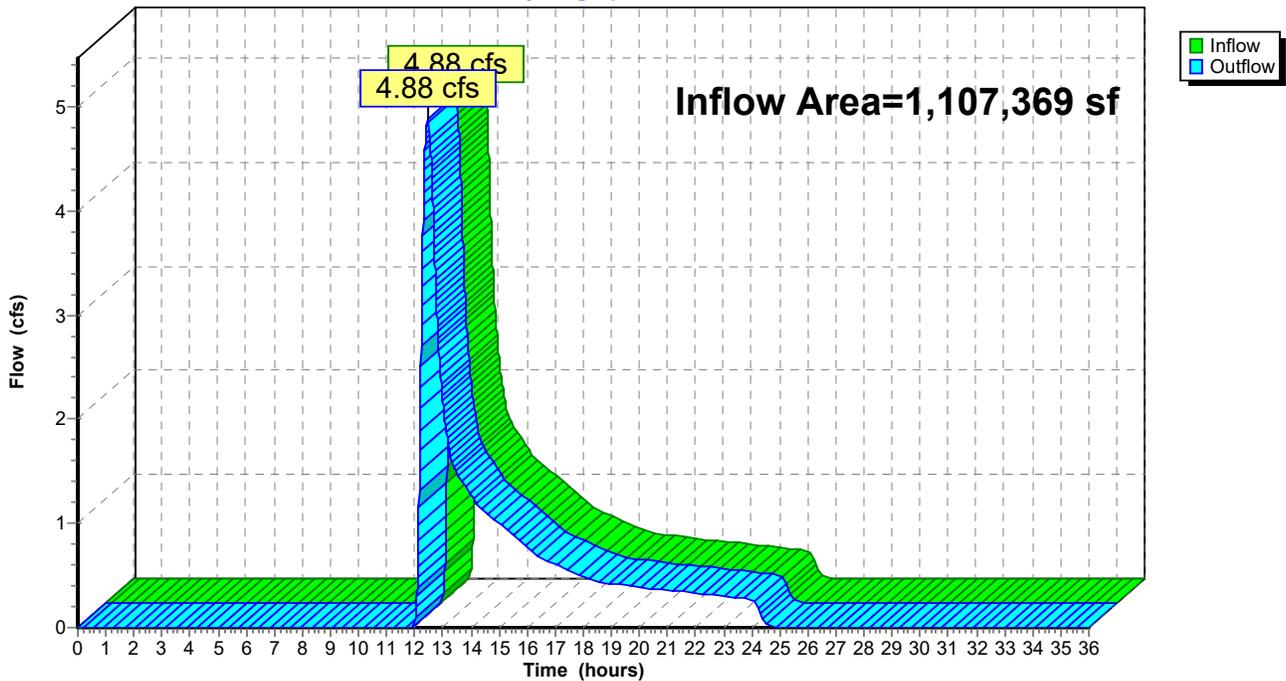
Summary for Reach DP3: DP3

Inflow Area = 1,107,369 sf, 0.05% Impervious, Inflow Depth = 0.39" for 2-Year event
Inflow = 4.88 cfs @ 12.45 hrs, Volume= 36,387 cf
Outflow = 4.88 cfs @ 12.45 hrs, Volume= 36,387 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach DP3: DP3

Hydrograph



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Type III 24-hr 10-Year Rainfall=4.29"

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Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 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 EX-1: TRIB. TO WETLAND Runoff Area=70,159 sf 48.57% Impervious Runoff Depth=1.46"
Flow Length=438' Tc=6.3 min CN=69 Runoff=2.61 cfs 8,529 cf

Subcatchment EX-2: TRIB. TO WETLAND Runoff Area=689,990 sf 7.02% Impervious Runoff Depth=1.14"
Flow Length=2,266' Tc=11.9 min CN=64 Runoff=15.58 cfs 65,527 cf

Subcatchment EX-3: TRIB. TO WETLAND Runoff Area=182,621 sf 0.00% Impervious Runoff Depth=0.91"
Flow Length=1,195' Tc=15.7 min CN=60 Runoff=2.72 cfs 13,824 cf

Subcatchment EX-4: TRIB. TO WETLAND Runoff Area=1,107,369 sf 0.05% Impervious Runoff Depth=1.02"
Flow Length=2,193' Tc=22.2 min CN=62 Runoff=17.02 cfs 94,249 cf

Reach DP1: DP1 Inflow=2.61 cfs 8,529 cf
Outflow=2.61 cfs 8,529 cf

Reach DP2: DP2 Inflow=18.00 cfs 79,351 cf
Outflow=18.00 cfs 79,351 cf

Reach DP3: DP3 Inflow=17.02 cfs 94,249 cf
Outflow=17.02 cfs 94,249 cf

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Type III 24-hr 10-Year Rainfall=4.29"

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Summary for Subcatchment EX-1: TRIB. TO WETLAND SERIES 'A'

Runoff = 2.61 cfs @ 12.10 hrs, Volume= 8,529 cf, Depth= 1.46"

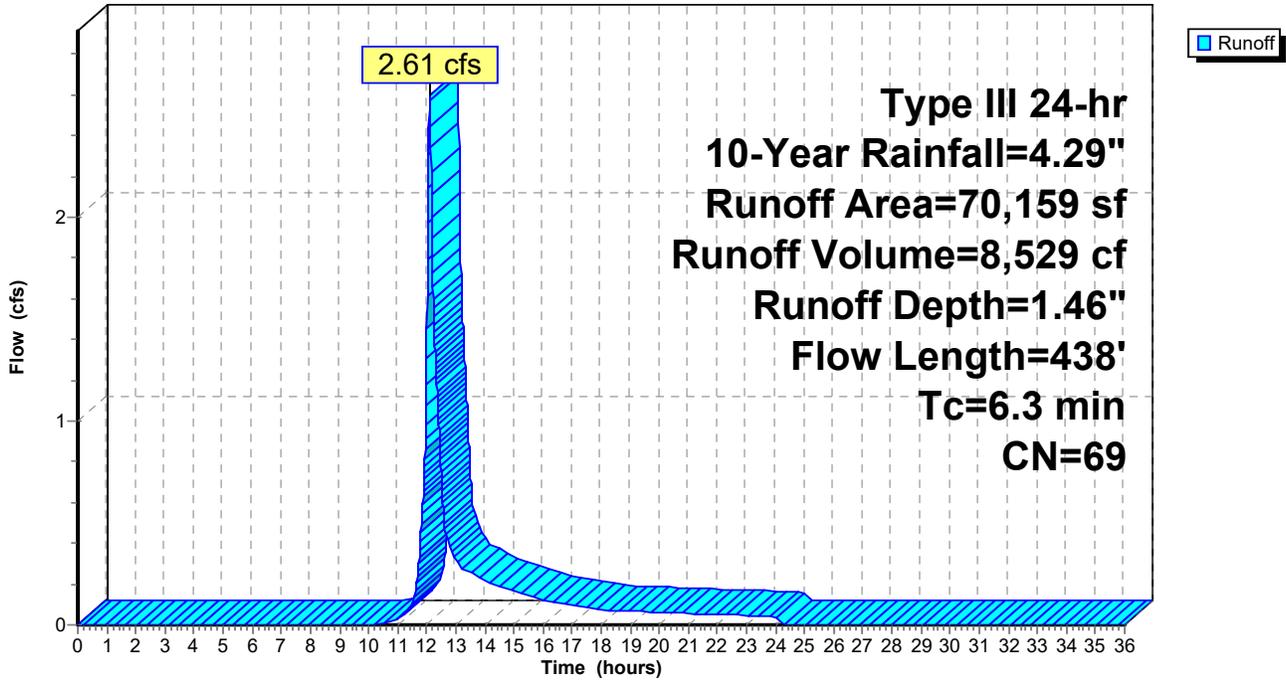
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.29"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 5,963 | 98 | Roofs, HSG A |
| 24,410 | 98 | Paved parking, HSG A |
| 30,725 | 39 | >75% Grass cover, Good, HSG A |
| 2,745 | 98 | Roofs, HSG B |
| 912 | 98 | Paved parking, HSG B |
| 5,176 | 61 | >75% Grass cover, Good, HSG B |
| 47 | 98 | Paved parking, HSG C |
| 181 | 74 | >75% Grass cover, Good, HSG C |
| 70,159 | 69 | Weighted Average |
| 36,082 | | 51.43% Pervious Area |
| 34,077 | | 48.57% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|--|
| 4.2 | 50 | 0.1170 | 0.20 | | Sheet Flow, Grass: Dense n= 0.240 P2= 2.99" |
| 1.7 | 202 | 0.0820 | 2.00 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.1 | 26 | 0.0088 | 4.26 | 3.34 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 0.2 | 99 | 0.0280 | 7.59 | 5.96 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 0.1 | 61 | 0.0560 | 10.73 | 8.43 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 6.3 | 438 | Total | | | |

Subcatchment EX-1: TRIB. TO WETLAND SERIES 'A'

Hydrograph



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Type III 24-hr 10-Year Rainfall=4.29"

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Summary for Subcatchment EX-2: TRIB. TO WETLAND SERIES 'C'

Runoff = 15.58 cfs @ 12.18 hrs, Volume= 65,527 cf, Depth= 1.14"

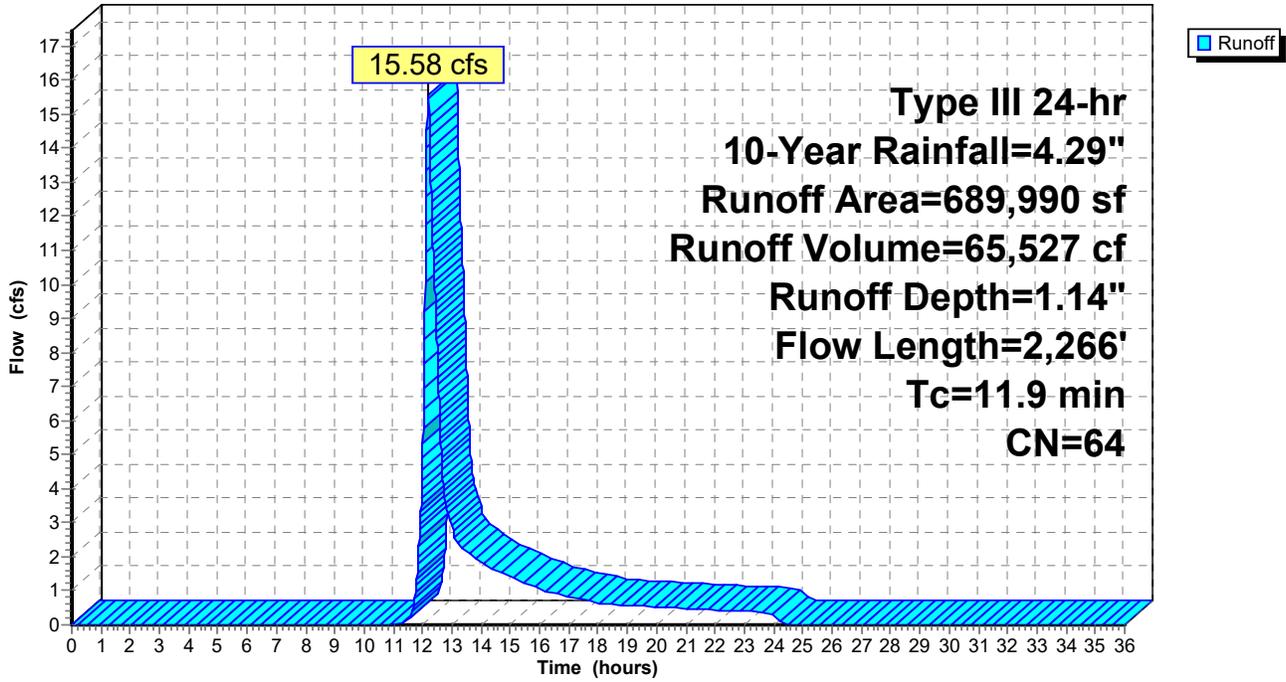
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.29"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 9,940 | 98 | Roofs, HSG A |
| 9,534 | 98 | Paved parking, HSG A |
| 118,153 | 39 | >75% Grass cover, Good, HSG A |
| * 53,904 | 74 | Sports Field, HSG A |
| 32,167 | 30 | Woods, Good, HSG A |
| 8,708 | 98 | Roofs, HSG B |
| 13,340 | 98 | Paved parking, HSG B |
| 116,266 | 61 | >75% Grass cover, Good, HSG B |
| 1,147 | 85 | Gravel roads, HSG B |
| 44,821 | 55 | Woods, Good, HSG B |
| 2,381 | 98 | Roofs, HSG C |
| 4,557 | 98 | Paved parking, HSG C |
| 200,348 | 74 | >75% Grass cover, Good, HSG C |
| 1,768 | 89 | Gravel roads, HSG C |
| 72,956 | 70 | Woods, Good, HSG C |
| 689,990 | 64 | Weighted Average |
| 641,530 | | 92.98% Pervious Area |
| 48,460 | | 7.02% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|--|
| 4.9 | 50 | 0.2180 | 0.17 | | Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.99" |
| 3.7 | 885 | 0.3200 | 3.96 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.4 | 273 | 0.1000 | 10.16 | 80.27 | Channel Flow, Area= 7.9 sf Perim= 12.0' r= 0.66' n= 0.035 Earth, dense weeds |
| 1.5 | 185 | 0.0860 | 2.05 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.7 | 295 | 0.1600 | 6.81 | 10.90 | Channel Flow, Area= 1.6 sf Perim= 6.3' r= 0.25' n= 0.035 Earth, dense weeds |
| 0.1 | 84 | 0.1600 | 18.15 | 14.25 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 |
| 0.4 | 245 | 0.0410 | 9.19 | 7.21 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 |
| 0.2 | 249 | 0.1840 | 17.38 | 215.52 | Channel Flow, Area= 12.4 sf Perim= 13.3' r= 0.93' n= 0.035 Earth, dense weeds |
| 11.9 | 2,266 | Total | | | |

Subcatchment EX-2: TRIB. TO WETLAND SERIES 'C'

Hydrograph



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Type III 24-hr 10-Year Rainfall=4.29"

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Summary for Subcatchment EX-3: TRIB. TO WETLAND SERIES 'D'

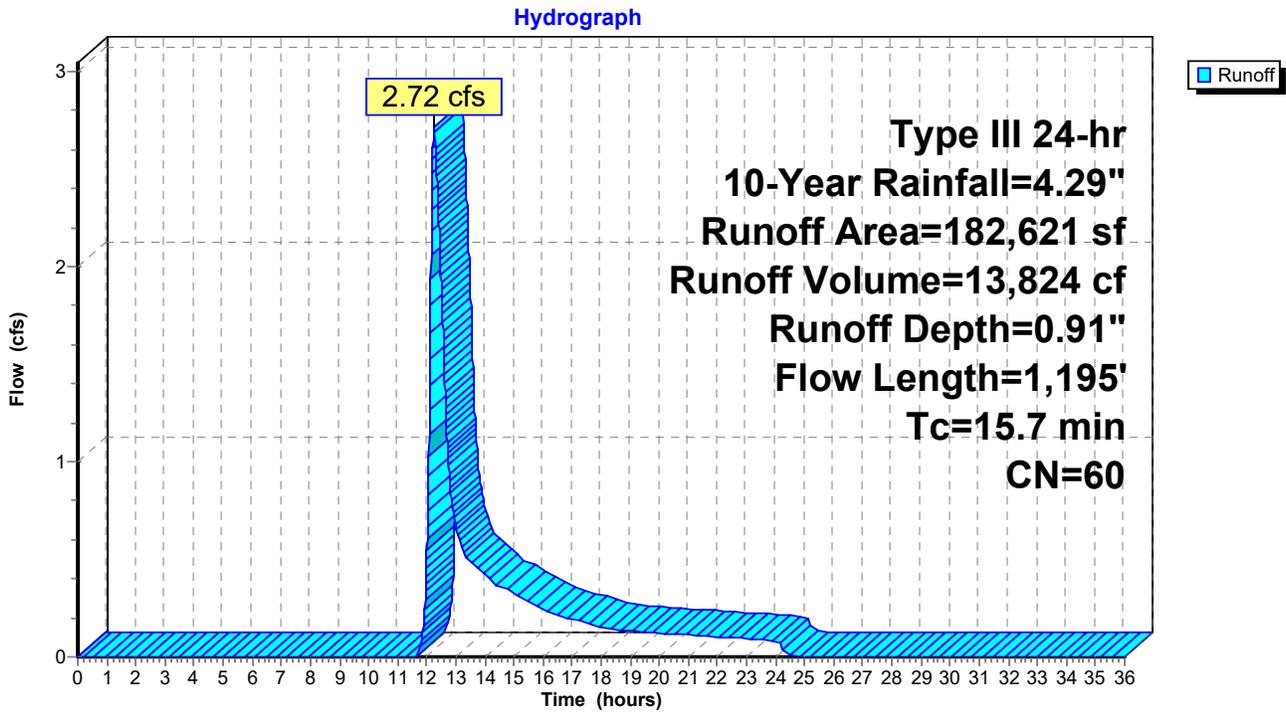
Runoff = 2.72 cfs @ 12.26 hrs, Volume= 13,824 cf, Depth= 0.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.29"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 42,530 | 39 | >75% Grass cover, Good, HSG A |
| * 31,835 | 74 | Sports Field, HSG A |
| 18,582 | 30 | Woods, Good, HSG A |
| 1,198 | 61 | >75% Grass cover, Good, HSG B |
| 1,802 | 55 | Woods, Good, HSG B |
| 33,603 | 74 | >75% Grass cover, Good, HSG C |
| 53,071 | 70 | Woods, Good, HSG C |
| 182,621 | 60 | Weighted Average |
| 182,621 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|---|
| 4.6 | 50 | 0.2500 | 0.18 | | Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.99" |
| 5.0 | 725 | 0.2300 | 2.40 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 5.7 | 225 | 0.0089 | 0.66 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.2 | 37 | 0.5000 | 3.54 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 0.2 | 158 | 0.1650 | 12.49 | 96.14 | Channel Flow, Area= 7.7 sf Perim= 12.5' r= 0.62' n= 0.035 Earth, dense weeds |
| 15.7 | 1,195 | Total | | | |

Subcatchment EX-3: TRIB. TO WETLAND SERIES 'D'



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Type III 24-hr 10-Year Rainfall=4.29"

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Summary for Subcatchment EX-4: TRIB. TO WETLAND SERIES 'E' & 'W1'

Runoff = 17.02 cfs @ 12.36 hrs, Volume= 94,249 cf, Depth= 1.02"

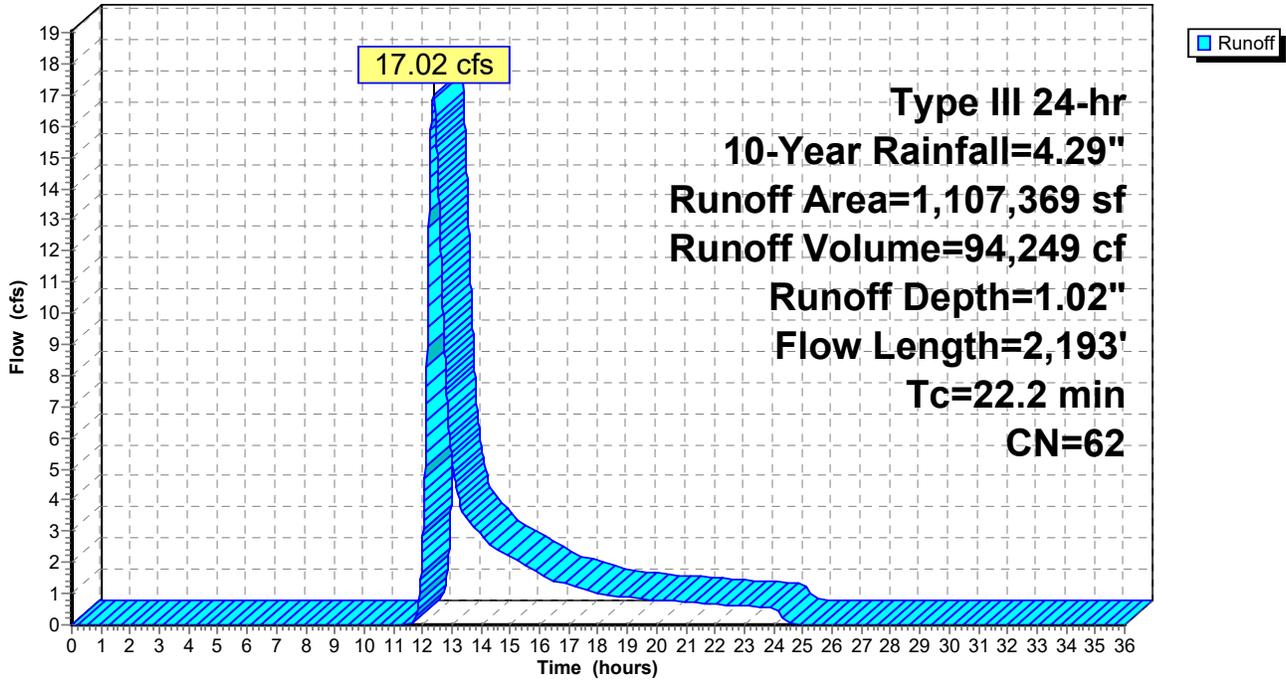
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.29"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 538 | 98 | Roofs, HSG A |
| 81,691 | 39 | >75% Grass cover, Good, HSG A |
| * 15,863 | 74 | Sports Field, HSG A |
| 51,270 | 30 | Woods, Good, HSG A |
| 92,909 | 61 | >75% Grass cover, Good, HSG B |
| 290,810 | 55 | Woods, Good, HSG B |
| 76,916 | 74 | >75% Grass cover, Good, HSG C |
| 497,372 | 70 | Woods, Good, HSG C |
| 1,107,369 | 62 | Weighted Average |
| 1,106,831 | | 99.95% Pervious Area |
| 538 | | 0.05% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|--|
| 7.9 | 50 | 0.0660 | 0.11 | | Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.99" |
| 4.6 | 613 | 0.2000 | 2.24 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 2.1 | 431 | 0.4600 | 3.39 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 4.9 | 729 | 0.2500 | 2.50 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 1.7 | 99 | 0.0200 | 0.99 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.8 | 135 | 0.3000 | 2.74 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 0.2 | 136 | 0.0850 | 11.51 | 180.77 | Channel Flow, Area= 15.7 sf Perim= 17.5' r= 0.90' n= 0.035 Earth, dense weeds |
| 22.2 | 2,193 | Total | | | |

Subcatchment EX-4: TRIB. TO WETLAND SERIES 'E' & 'W1'

Hydrograph



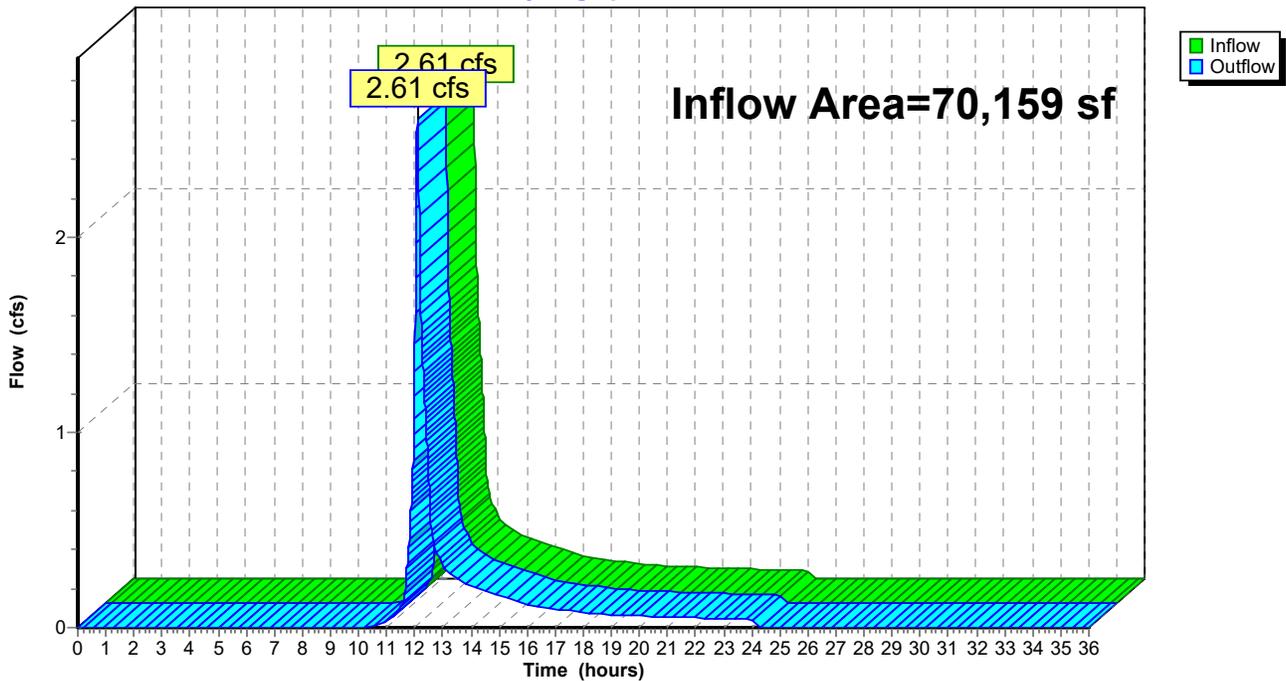
Summary for Reach DP1: DP1

Inflow Area = 70,159 sf, 48.57% Impervious, Inflow Depth = 1.46" for 10-Year event
Inflow = 2.61 cfs @ 12.10 hrs, Volume= 8,529 cf
Outflow = 2.61 cfs @ 12.10 hrs, Volume= 8,529 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach DP1: DP1

Hydrograph



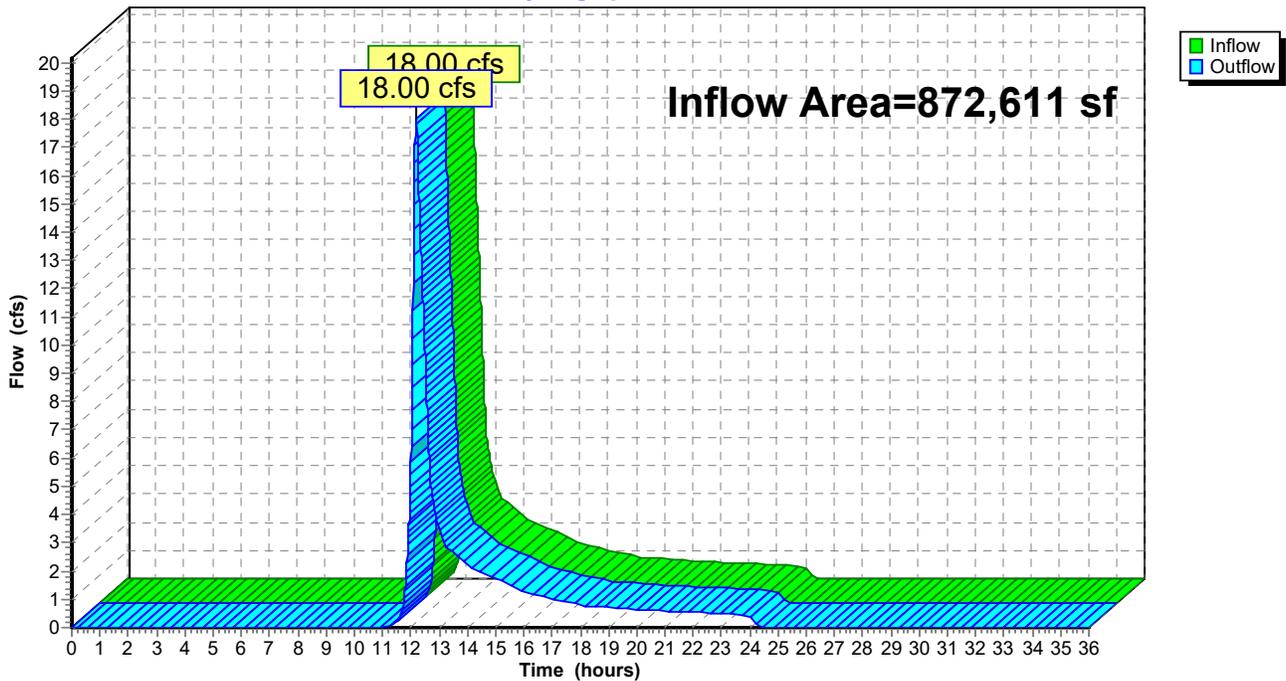
Summary for Reach DP2: DP2

Inflow Area = 872,611 sf, 5.55% Impervious, Inflow Depth = 1.09" for 10-Year event
Inflow = 18.00 cfs @ 12.19 hrs, Volume= 79,351 cf
Outflow = 18.00 cfs @ 12.19 hrs, Volume= 79,351 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach DP2: DP2

Hydrograph



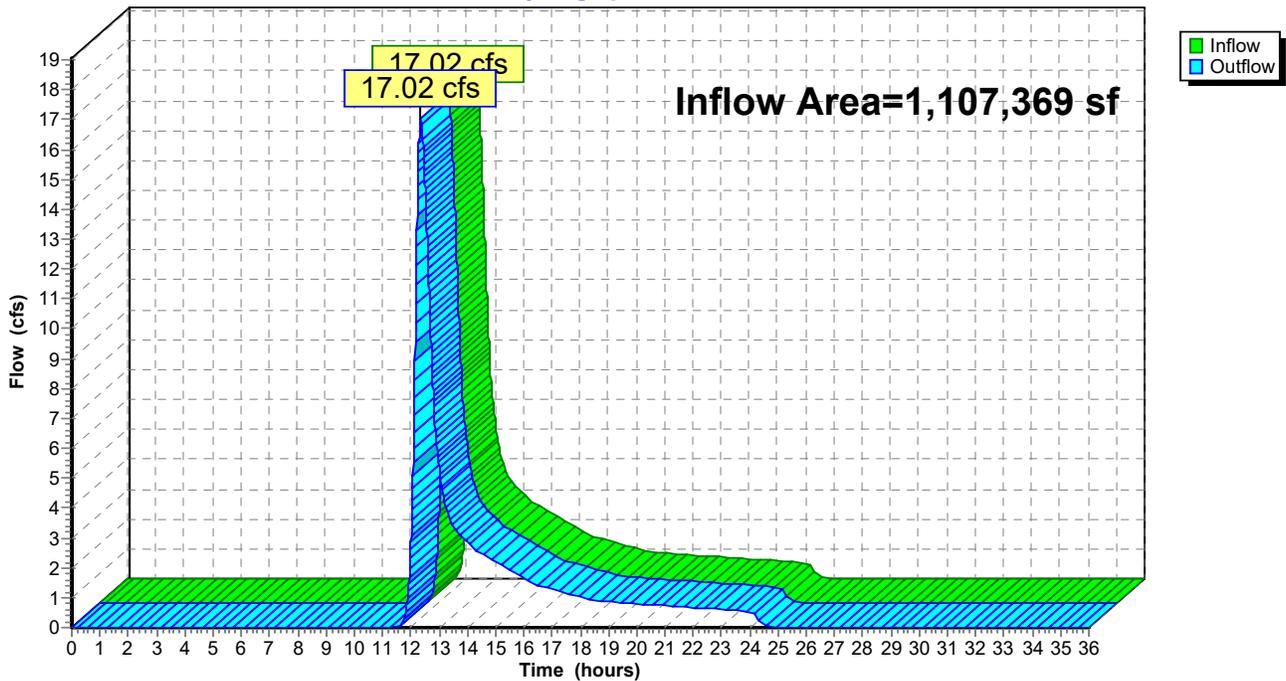
Summary for Reach DP3: DP3

Inflow Area = 1,107,369 sf, 0.05% Impervious, Inflow Depth = 1.02" for 10-Year event
Inflow = 17.02 cfs @ 12.36 hrs, Volume= 94,249 cf
Outflow = 17.02 cfs @ 12.36 hrs, Volume= 94,249 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach DP3: DP3

Hydrograph



EBS - Dining Hall - PRE

Type III 24-hr 25-Year Rainfall=5.28"

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Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 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 EX-1: TRIB. TO WETLAND Runoff Area=70,159 sf 48.57% Impervious Runoff Depth=2.16"
Flow Length=438' Tc=6.3 min CN=69 Runoff=3.97 cfs 12,648 cf

Subcatchment EX-2: TRIB. TO WETLAND Runoff Area=689,990 sf 7.02% Impervious Runoff Depth=1.77"
Flow Length=2,266' Tc=11.9 min CN=64 Runoff=25.59 cfs 101,500 cf

Subcatchment EX-3: TRIB. TO WETLAND Runoff Area=182,621 sf 0.00% Impervious Runoff Depth=1.47"
Flow Length=1,195' Tc=15.7 min CN=60 Runoff=4.85 cfs 22,335 cf

Subcatchment EX-4: TRIB. TO WETLAND Runoff Area=1,107,369 sf 0.05% Impervious Runoff Depth=1.61"
Flow Length=2,193' Tc=22.2 min CN=62 Runoff=28.84 cfs 148,948 cf

Reach DP1: DP1 Inflow=3.97 cfs 12,648 cf
Outflow=3.97 cfs 12,648 cf

Reach DP2: DP2 Inflow=30.05 cfs 123,834 cf
Outflow=30.05 cfs 123,834 cf

Reach DP3: DP3 Inflow=28.84 cfs 148,948 cf
Outflow=28.84 cfs 148,948 cf

EBS - Dining Hall - PRE

Type III 24-hr 25-Year Rainfall=5.28"

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Summary for Subcatchment EX-1: TRIB. TO WETLAND SERIES 'A'

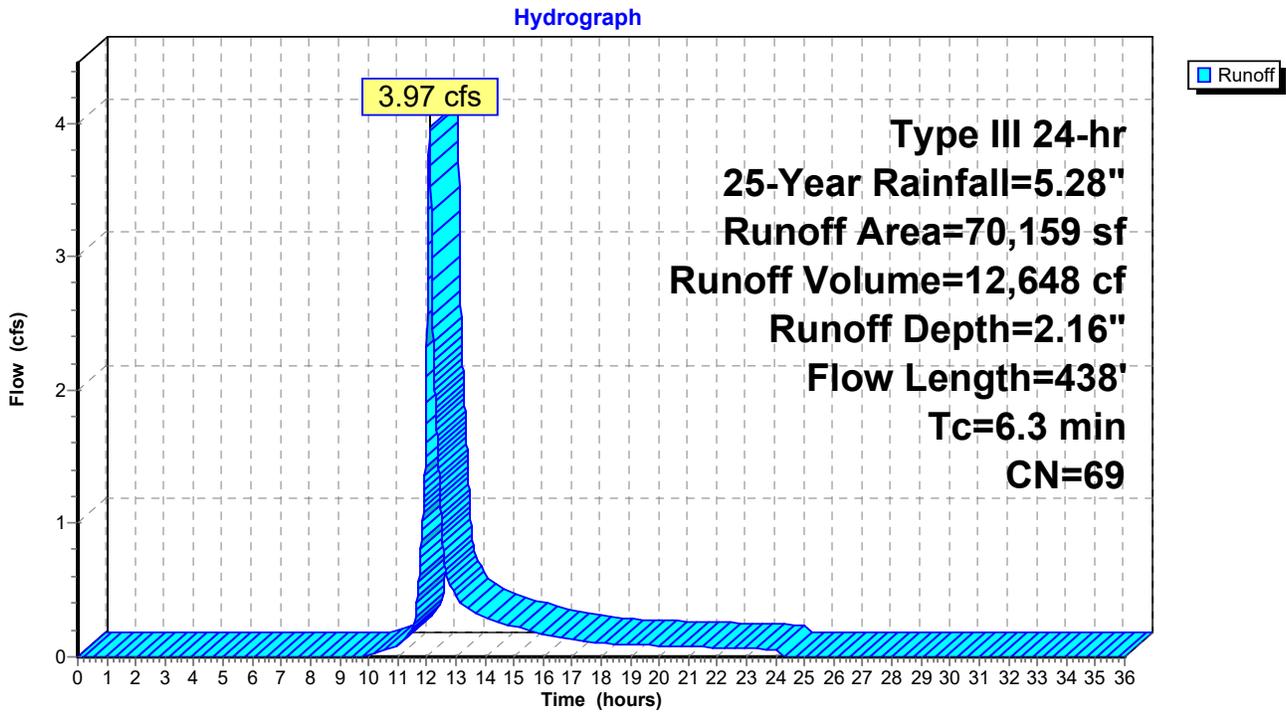
Runoff = 3.97 cfs @ 12.10 hrs, Volume= 12,648 cf, Depth= 2.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.28"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 5,963 | 98 | Roofs, HSG A |
| 24,410 | 98 | Paved parking, HSG A |
| 30,725 | 39 | >75% Grass cover, Good, HSG A |
| 2,745 | 98 | Roofs, HSG B |
| 912 | 98 | Paved parking, HSG B |
| 5,176 | 61 | >75% Grass cover, Good, HSG B |
| 47 | 98 | Paved parking, HSG C |
| 181 | 74 | >75% Grass cover, Good, HSG C |
| 70,159 | 69 | Weighted Average |
| 36,082 | | 51.43% Pervious Area |
| 34,077 | | 48.57% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|--|
| 4.2 | 50 | 0.1170 | 0.20 | | Sheet Flow, Grass: Dense n= 0.240 P2= 2.99" |
| 1.7 | 202 | 0.0820 | 2.00 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.1 | 26 | 0.0088 | 4.26 | 3.34 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 0.2 | 99 | 0.0280 | 7.59 | 5.96 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 0.1 | 61 | 0.0560 | 10.73 | 8.43 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 6.3 | 438 | Total | | | |

Subcatchment EX-1: TRIB. TO WETLAND SERIES 'A'



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Type III 24-hr 25-Year Rainfall=5.28"

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Summary for Subcatchment EX-2: TRIB. TO WETLAND SERIES 'C'

Runoff = 25.59 cfs @ 12.18 hrs, Volume= 101,500 cf, Depth= 1.77"

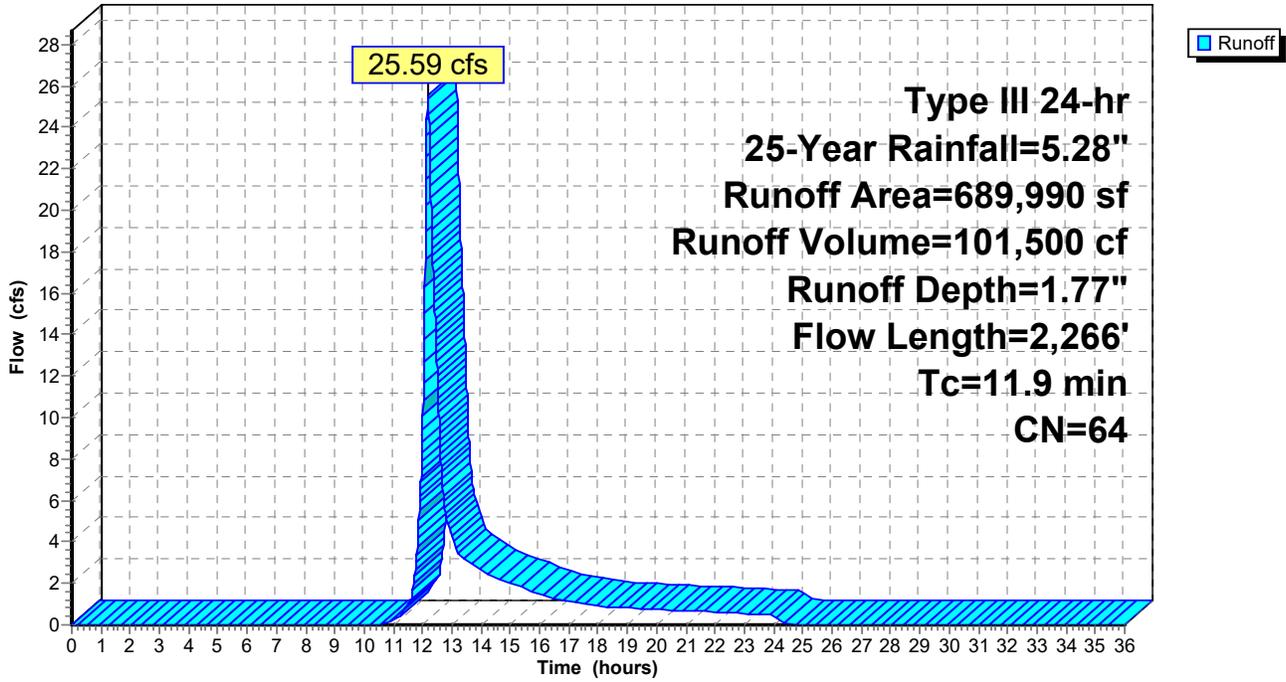
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.28"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 9,940 | 98 | Roofs, HSG A |
| 9,534 | 98 | Paved parking, HSG A |
| 118,153 | 39 | >75% Grass cover, Good, HSG A |
| * 53,904 | 74 | Sports Field, HSG A |
| 32,167 | 30 | Woods, Good, HSG A |
| 8,708 | 98 | Roofs, HSG B |
| 13,340 | 98 | Paved parking, HSG B |
| 116,266 | 61 | >75% Grass cover, Good, HSG B |
| 1,147 | 85 | Gravel roads, HSG B |
| 44,821 | 55 | Woods, Good, HSG B |
| 2,381 | 98 | Roofs, HSG C |
| 4,557 | 98 | Paved parking, HSG C |
| 200,348 | 74 | >75% Grass cover, Good, HSG C |
| 1,768 | 89 | Gravel roads, HSG C |
| 72,956 | 70 | Woods, Good, HSG C |
| 689,990 | 64 | Weighted Average |
| 641,530 | | 92.98% Pervious Area |
| 48,460 | | 7.02% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|--|
| 4.9 | 50 | 0.2180 | 0.17 | | Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.99" |
| 3.7 | 885 | 0.3200 | 3.96 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.4 | 273 | 0.1000 | 10.16 | 80.27 | Channel Flow, Area= 7.9 sf Perim= 12.0' r= 0.66' n= 0.035 Earth, dense weeds |
| 1.5 | 185 | 0.0860 | 2.05 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.7 | 295 | 0.1600 | 6.81 | 10.90 | Channel Flow, Area= 1.6 sf Perim= 6.3' r= 0.25' n= 0.035 Earth, dense weeds |
| 0.1 | 84 | 0.1600 | 18.15 | 14.25 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 |
| 0.4 | 245 | 0.0410 | 9.19 | 7.21 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 |
| 0.2 | 249 | 0.1840 | 17.38 | 215.52 | Channel Flow, Area= 12.4 sf Perim= 13.3' r= 0.93' n= 0.035 Earth, dense weeds |
| 11.9 | 2,266 | Total | | | |

Subcatchment EX-2: TRIB. TO WETLAND SERIES 'C'

Hydrograph



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Type III 24-hr 25-Year Rainfall=5.28"

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Summary for Subcatchment EX-3: TRIB. TO WETLAND SERIES 'D'

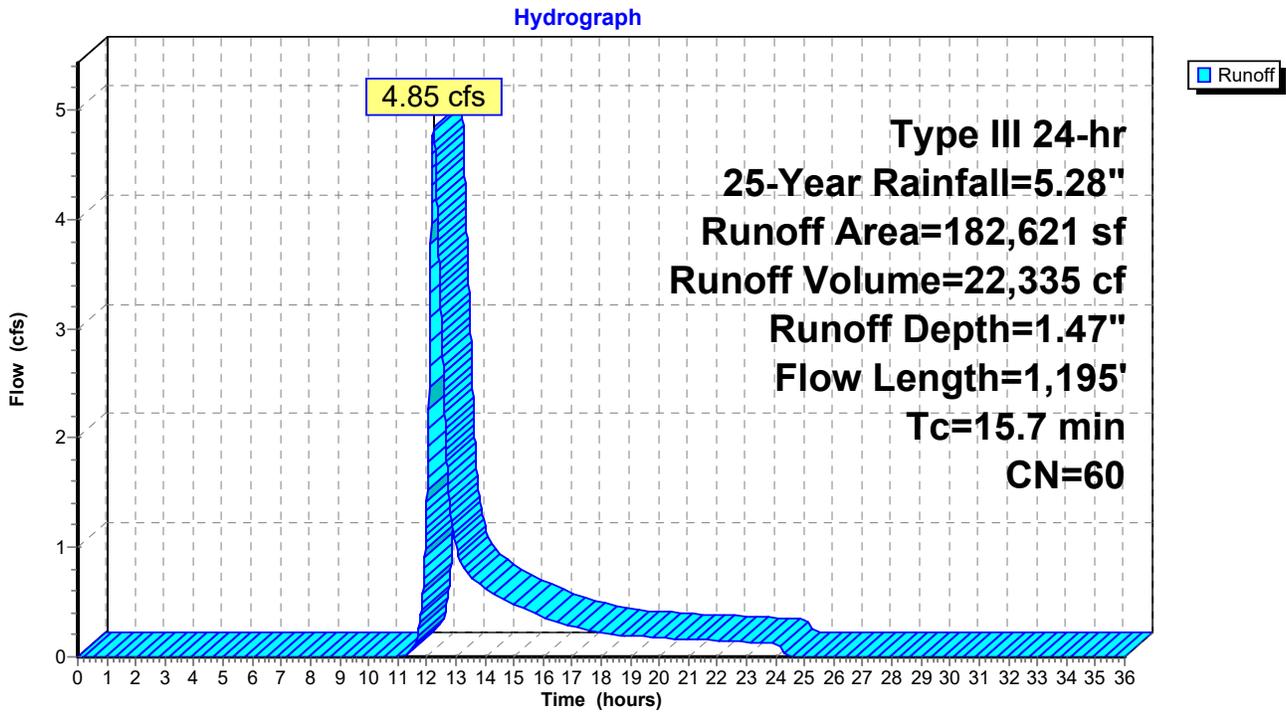
Runoff = 4.85 cfs @ 12.23 hrs, Volume= 22,335 cf, Depth= 1.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.28"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 42,530 | 39 | >75% Grass cover, Good, HSG A |
| * 31,835 | 74 | Sports Field, HSG A |
| 18,582 | 30 | Woods, Good, HSG A |
| 1,198 | 61 | >75% Grass cover, Good, HSG B |
| 1,802 | 55 | Woods, Good, HSG B |
| 33,603 | 74 | >75% Grass cover, Good, HSG C |
| 53,071 | 70 | Woods, Good, HSG C |
| 182,621 | 60 | Weighted Average |
| 182,621 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|---|
| 4.6 | 50 | 0.2500 | 0.18 | | Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.99" |
| 5.0 | 725 | 0.2300 | 2.40 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 5.7 | 225 | 0.0089 | 0.66 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.2 | 37 | 0.5000 | 3.54 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 0.2 | 158 | 0.1650 | 12.49 | 96.14 | Channel Flow, Area= 7.7 sf Perim= 12.5' r= 0.62' n= 0.035 Earth, dense weeds |
| 15.7 | 1,195 | Total | | | |

Subcatchment EX-3: TRIB. TO WETLAND SERIES 'D'



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Type III 24-hr 25-Year Rainfall=5.28"

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Summary for Subcatchment EX-4: TRIB. TO WETLAND SERIES 'E' & 'W1'

Runoff = 28.84 cfs @ 12.34 hrs, Volume= 148,948 cf, Depth= 1.61"

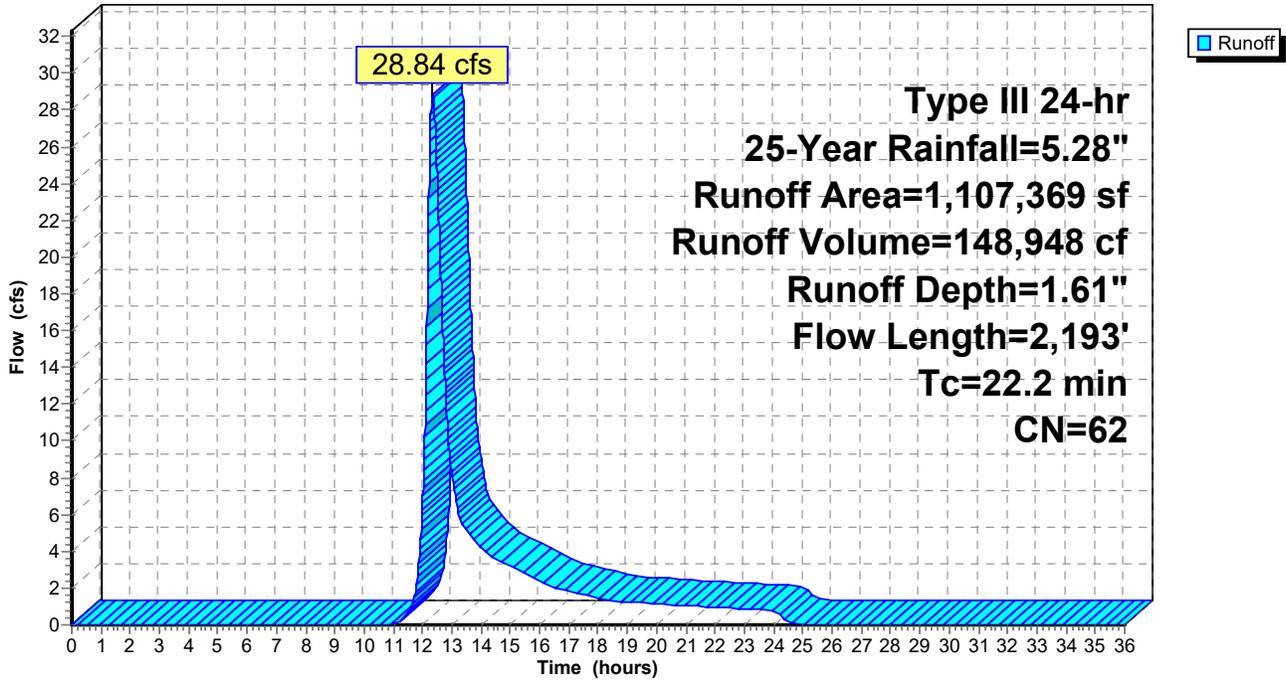
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.28"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 538 | 98 | Roofs, HSG A |
| 81,691 | 39 | >75% Grass cover, Good, HSG A |
| * 15,863 | 74 | Sports Field, HSG A |
| 51,270 | 30 | Woods, Good, HSG A |
| 92,909 | 61 | >75% Grass cover, Good, HSG B |
| 290,810 | 55 | Woods, Good, HSG B |
| 76,916 | 74 | >75% Grass cover, Good, HSG C |
| 497,372 | 70 | Woods, Good, HSG C |
| 1,107,369 | 62 | Weighted Average |
| 1,106,831 | | 99.95% Pervious Area |
| 538 | | 0.05% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|--|
| 7.9 | 50 | 0.0660 | 0.11 | | Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.99" |
| 4.6 | 613 | 0.2000 | 2.24 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 2.1 | 431 | 0.4600 | 3.39 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 4.9 | 729 | 0.2500 | 2.50 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 1.7 | 99 | 0.0200 | 0.99 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.8 | 135 | 0.3000 | 2.74 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 0.2 | 136 | 0.0850 | 11.51 | 180.77 | Channel Flow, Area= 15.7 sf Perim= 17.5' r= 0.90' n= 0.035 Earth, dense weeds |
| 22.2 | 2,193 | Total | | | |

Subcatchment EX-4: TRIB. TO WETLAND SERIES 'E' & 'W1'

Hydrograph



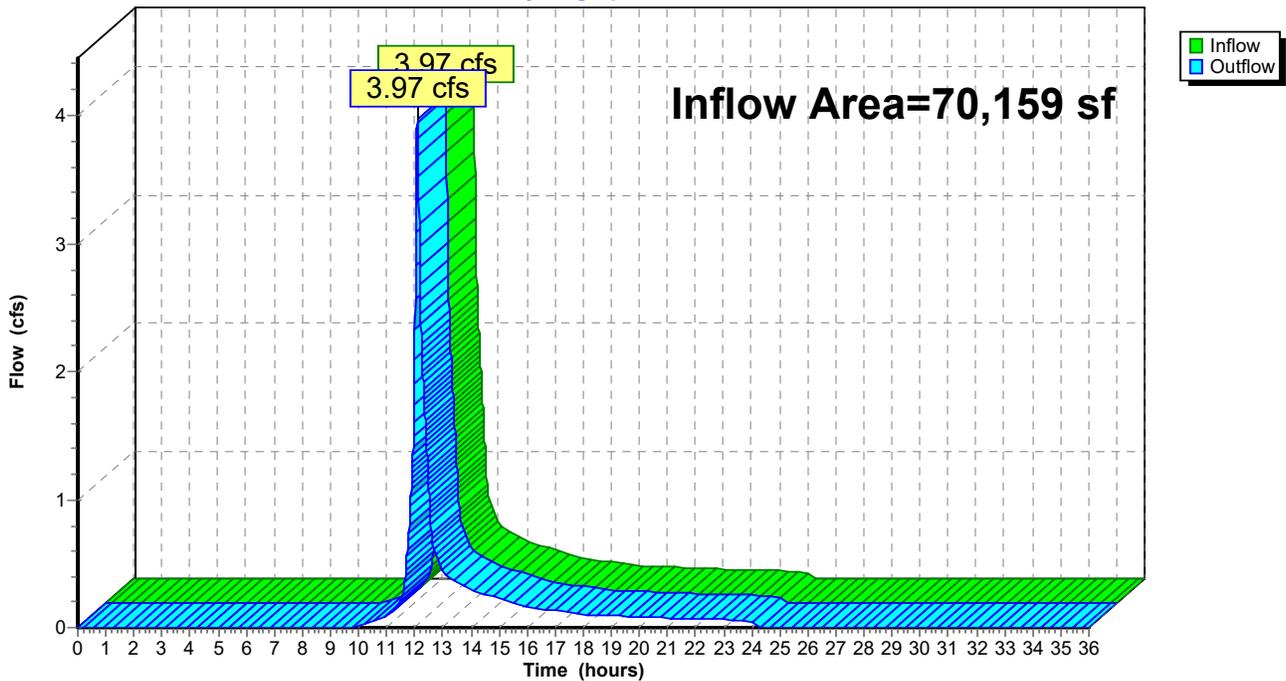
Summary for Reach DP1: DP1

Inflow Area = 70,159 sf, 48.57% Impervious, Inflow Depth = 2.16" for 25-Year event
Inflow = 3.97 cfs @ 12.10 hrs, Volume= 12,648 cf
Outflow = 3.97 cfs @ 12.10 hrs, Volume= 12,648 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach DP1: DP1

Hydrograph



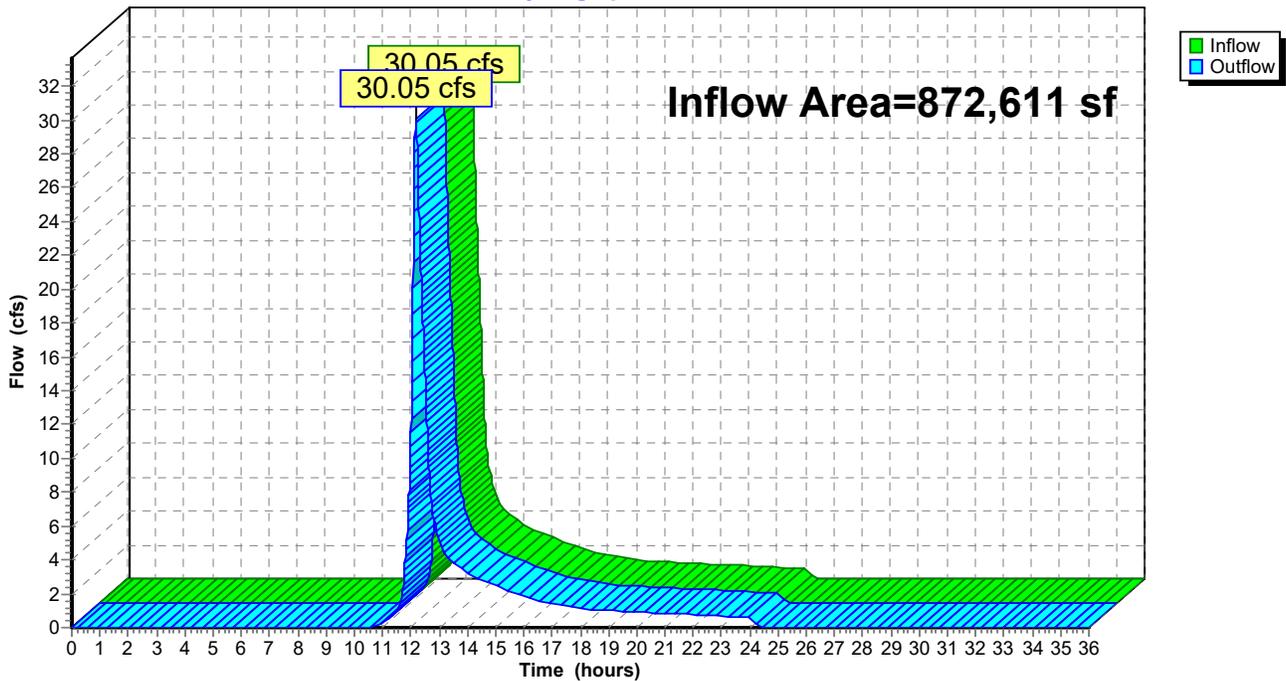
Summary for Reach DP2: DP2

Inflow Area = 872,611 sf, 5.55% Impervious, Inflow Depth = 1.70" for 25-Year event
Inflow = 30.05 cfs @ 12.18 hrs, Volume= 123,834 cf
Outflow = 30.05 cfs @ 12.18 hrs, Volume= 123,834 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach DP2: DP2

Hydrograph



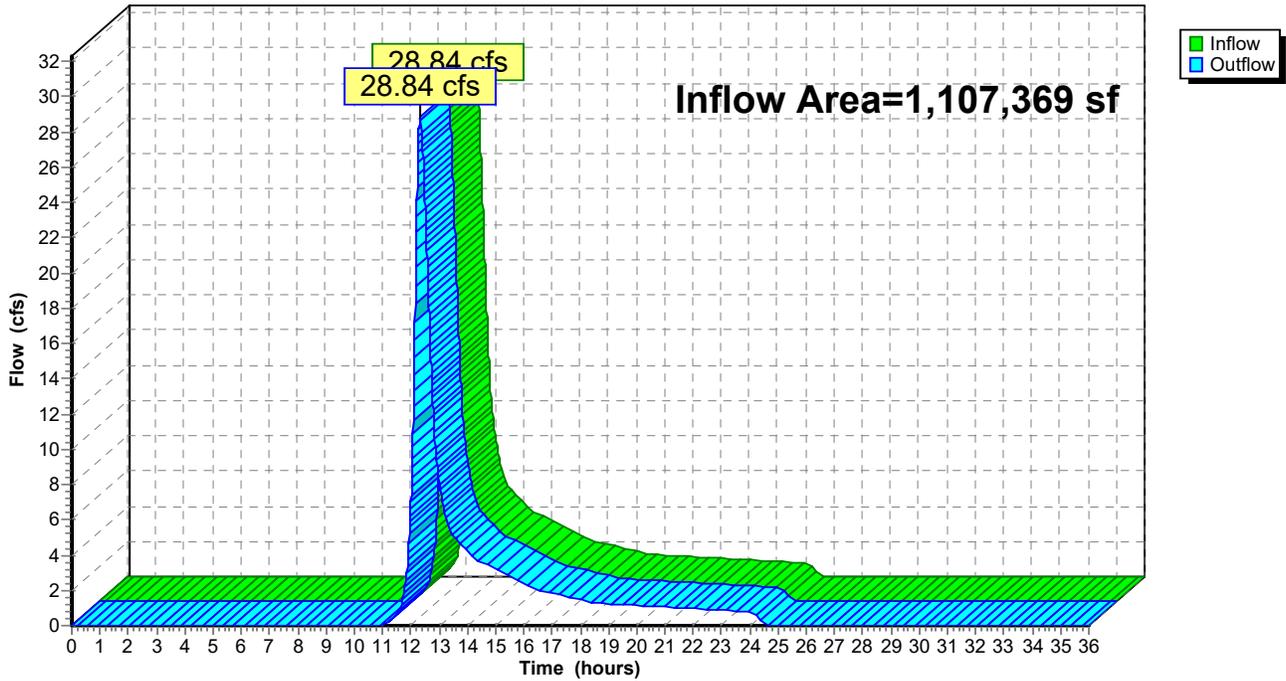
Summary for Reach DP3: DP3

Inflow Area = 1,107,369 sf, 0.05% Impervious, Inflow Depth = 1.61" for 25-Year event
Inflow = 28.84 cfs @ 12.34 hrs, Volume= 148,948 cf
Outflow = 28.84 cfs @ 12.34 hrs, Volume= 148,948 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach DP3: DP3

Hydrograph



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Type III 24-hr 100-Year Rainfall=7.24"

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Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 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 EX-1: TRIB. TO WETLAND Runoff Area=70,159 sf 48.57% Impervious Runoff Depth=3.71"
Flow Length=438' Tc=6.3 min CN=69 Runoff=6.93 cfs 21,701 cf

Subcatchment EX-2: TRIB. TO WETLAND Runoff Area=689,990 sf 7.02% Impervious Runoff Depth=3.19"
Flow Length=2,266' Tc=11.9 min CN=64 Runoff=48.09 cfs 183,141 cf

Subcatchment EX-3: TRIB. TO WETLAND Runoff Area=182,621 sf 0.00% Impervious Runoff Depth=2.77"
Flow Length=1,195' Tc=15.7 min CN=60 Runoff=9.83 cfs 42,228 cf

Subcatchment EX-4: TRIB. TO WETLAND Runoff Area=1,107,369 sf 0.05% Impervious Runoff Depth=2.98"
Flow Length=2,193' Tc=22.2 min CN=62 Runoff=56.14 cfs 274,873 cf

Reach DP1: DP1 Inflow=6.93 cfs 21,701 cf
Outflow=6.93 cfs 21,701 cf

Reach DP2: DP2 Inflow=57.29 cfs 225,370 cf
Outflow=57.29 cfs 225,370 cf

Reach DP3: DP3 Inflow=56.14 cfs 274,873 cf
Outflow=56.14 cfs 274,873 cf

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Type III 24-hr 100-Year Rainfall=7.24"

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Summary for Subcatchment EX-1: TRIB. TO WETLAND SERIES 'A'

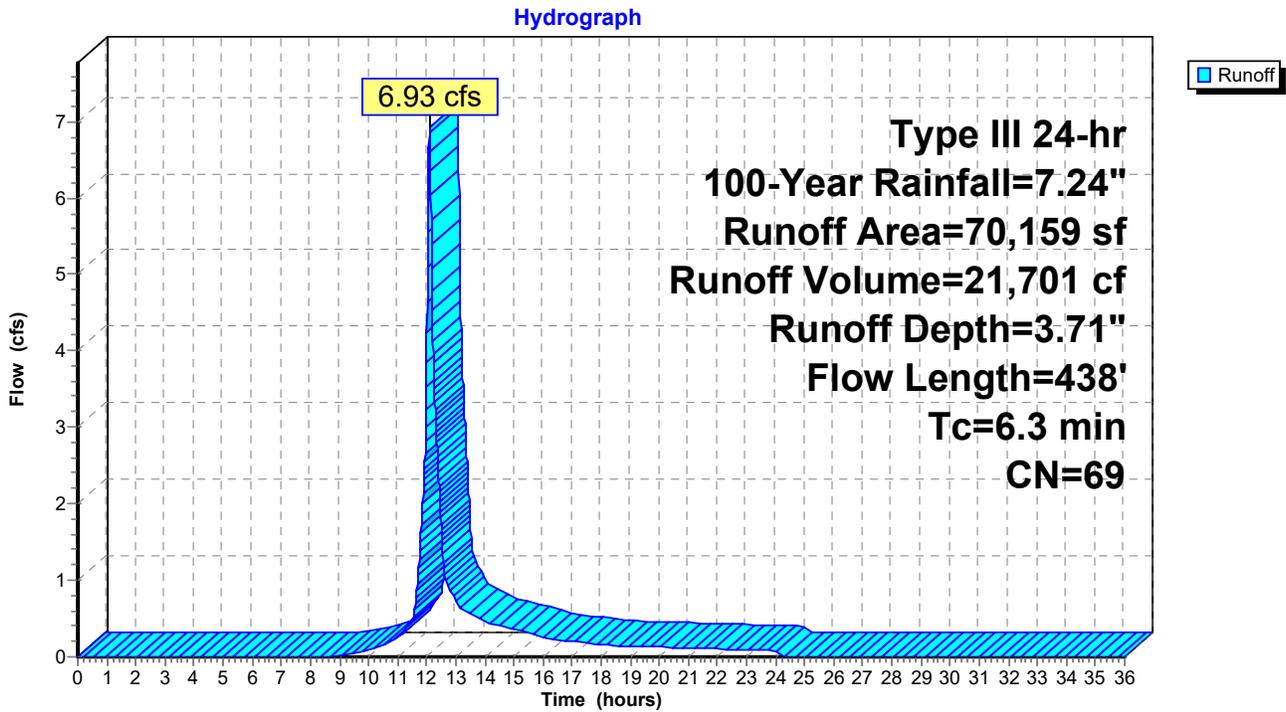
Runoff = 6.93 cfs @ 12.09 hrs, Volume= 21,701 cf, Depth= 3.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.24"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 5,963 | 98 | Roofs, HSG A |
| 24,410 | 98 | Paved parking, HSG A |
| 30,725 | 39 | >75% Grass cover, Good, HSG A |
| 2,745 | 98 | Roofs, HSG B |
| 912 | 98 | Paved parking, HSG B |
| 5,176 | 61 | >75% Grass cover, Good, HSG B |
| 47 | 98 | Paved parking, HSG C |
| 181 | 74 | >75% Grass cover, Good, HSG C |
| 70,159 | 69 | Weighted Average |
| 36,082 | | 51.43% Pervious Area |
| 34,077 | | 48.57% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|--|
| 4.2 | 50 | 0.1170 | 0.20 | | Sheet Flow, Grass: Dense n= 0.240 P2= 2.99" |
| 1.7 | 202 | 0.0820 | 2.00 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.1 | 26 | 0.0088 | 4.26 | 3.34 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 0.2 | 99 | 0.0280 | 7.59 | 5.96 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 0.1 | 61 | 0.0560 | 10.73 | 8.43 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 6.3 | 438 | Total | | | |

Subcatchment EX-1: TRIB. TO WETLAND SERIES 'A'



EBS - Dining Hall - PRE

Type III 24-hr 100-Year Rainfall=7.24"

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Summary for Subcatchment EX-2: TRIB. TO WETLAND SERIES 'C'

Runoff = 48.09 cfs @ 12.17 hrs, Volume= 183,141 cf, Depth= 3.19"

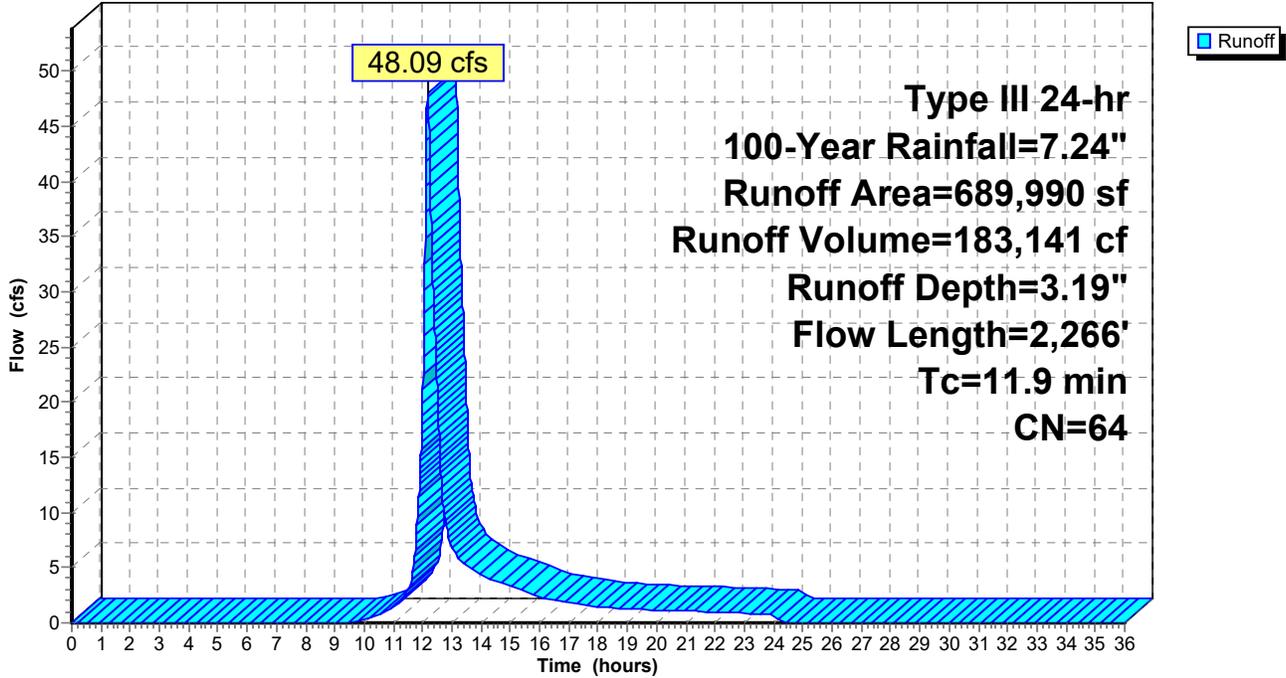
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.24"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 9,940 | 98 | Roofs, HSG A |
| 9,534 | 98 | Paved parking, HSG A |
| 118,153 | 39 | >75% Grass cover, Good, HSG A |
| * 53,904 | 74 | Sports Field, HSG A |
| 32,167 | 30 | Woods, Good, HSG A |
| 8,708 | 98 | Roofs, HSG B |
| 13,340 | 98 | Paved parking, HSG B |
| 116,266 | 61 | >75% Grass cover, Good, HSG B |
| 1,147 | 85 | Gravel roads, HSG B |
| 44,821 | 55 | Woods, Good, HSG B |
| 2,381 | 98 | Roofs, HSG C |
| 4,557 | 98 | Paved parking, HSG C |
| 200,348 | 74 | >75% Grass cover, Good, HSG C |
| 1,768 | 89 | Gravel roads, HSG C |
| 72,956 | 70 | Woods, Good, HSG C |
| 689,990 | 64 | Weighted Average |
| 641,530 | | 92.98% Pervious Area |
| 48,460 | | 7.02% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|--|
| 4.9 | 50 | 0.2180 | 0.17 | | Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.99" |
| 3.7 | 885 | 0.3200 | 3.96 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.4 | 273 | 0.1000 | 10.16 | 80.27 | Channel Flow, Area= 7.9 sf Perim= 12.0' r= 0.66' n= 0.035 Earth, dense weeds |
| 1.5 | 185 | 0.0860 | 2.05 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.7 | 295 | 0.1600 | 6.81 | 10.90 | Channel Flow, Area= 1.6 sf Perim= 6.3' r= 0.25' n= 0.035 Earth, dense weeds |
| 0.1 | 84 | 0.1600 | 18.15 | 14.25 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 |
| 0.4 | 245 | 0.0410 | 9.19 | 7.21 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 |
| 0.2 | 249 | 0.1840 | 17.38 | 215.52 | Channel Flow, Area= 12.4 sf Perim= 13.3' r= 0.93' n= 0.035 Earth, dense weeds |
| 11.9 | 2,266 | Total | | | |

Subcatchment EX-2: TRIB. TO WETLAND SERIES 'C'

Hydrograph



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Type III 24-hr 100-Year Rainfall=7.24"

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Summary for Subcatchment EX-3: TRIB. TO WETLAND SERIES 'D'

Runoff = 9.83 cfs @ 12.23 hrs, Volume= 42,228 cf, Depth= 2.77"

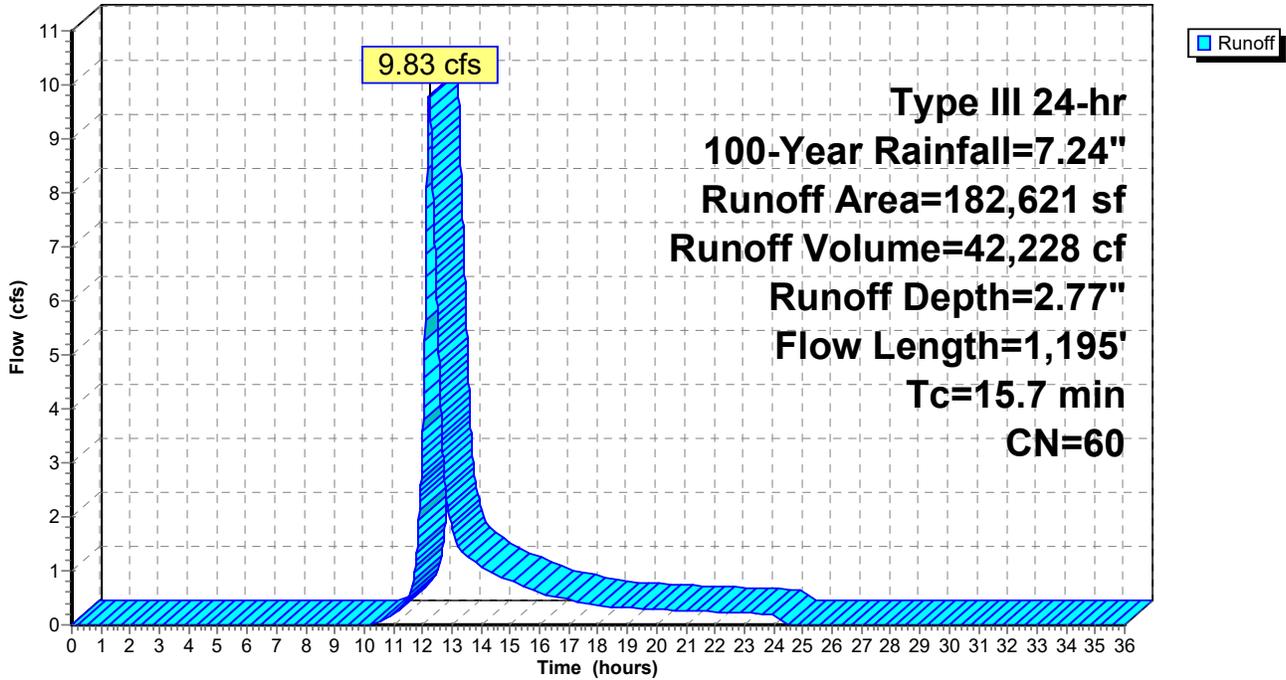
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.24"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 42,530 | 39 | >75% Grass cover, Good, HSG A |
| * 31,835 | 74 | Sports Field, HSG A |
| 18,582 | 30 | Woods, Good, HSG A |
| 1,198 | 61 | >75% Grass cover, Good, HSG B |
| 1,802 | 55 | Woods, Good, HSG B |
| 33,603 | 74 | >75% Grass cover, Good, HSG C |
| 53,071 | 70 | Woods, Good, HSG C |
| 182,621 | 60 | Weighted Average |
| 182,621 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|---|
| 4.6 | 50 | 0.2500 | 0.18 | | Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.99" |
| 5.0 | 725 | 0.2300 | 2.40 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 5.7 | 225 | 0.0089 | 0.66 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.2 | 37 | 0.5000 | 3.54 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 0.2 | 158 | 0.1650 | 12.49 | 96.14 | Channel Flow, Area= 7.7 sf Perim= 12.5' r= 0.62' n= 0.035 Earth, dense weeds |
| 15.7 | 1,195 | Total | | | |

Subcatchment EX-3: TRIB. TO WETLAND SERIES 'D'

Hydrograph



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Type III 24-hr 100-Year Rainfall=7.24"

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Summary for Subcatchment EX-4: TRIB. TO WETLAND SERIES 'E' & 'W1'

Runoff = 56.14 cfs @ 12.31 hrs, Volume= 274,873 cf, Depth= 2.98"

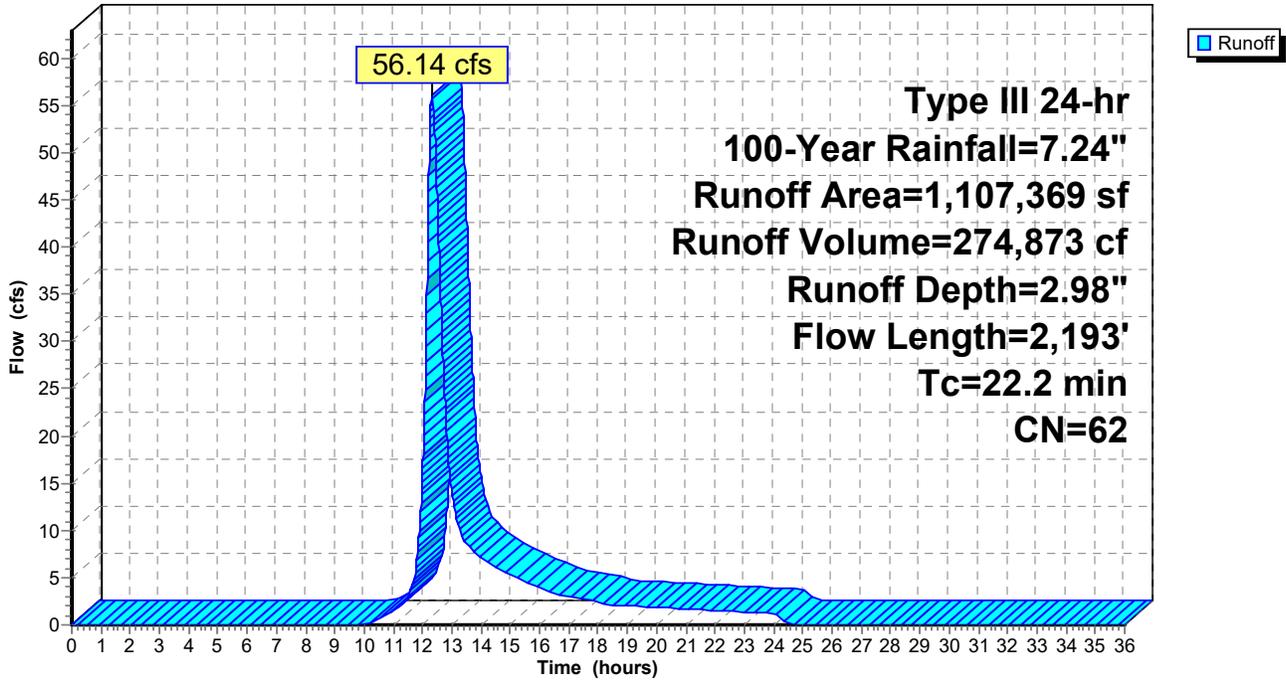
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.24"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 538 | 98 | Roofs, HSG A |
| 81,691 | 39 | >75% Grass cover, Good, HSG A |
| * 15,863 | 74 | Sports Field, HSG A |
| 51,270 | 30 | Woods, Good, HSG A |
| 92,909 | 61 | >75% Grass cover, Good, HSG B |
| 290,810 | 55 | Woods, Good, HSG B |
| 76,916 | 74 | >75% Grass cover, Good, HSG C |
| 497,372 | 70 | Woods, Good, HSG C |
| 1,107,369 | 62 | Weighted Average |
| 1,106,831 | | 99.95% Pervious Area |
| 538 | | 0.05% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|--|
| 7.9 | 50 | 0.0660 | 0.11 | | Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.99" |
| 4.6 | 613 | 0.2000 | 2.24 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 2.1 | 431 | 0.4600 | 3.39 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 4.9 | 729 | 0.2500 | 2.50 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 1.7 | 99 | 0.0200 | 0.99 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.8 | 135 | 0.3000 | 2.74 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 0.2 | 136 | 0.0850 | 11.51 | 180.77 | Channel Flow, Area= 15.7 sf Perim= 17.5' r= 0.90' n= 0.035 Earth, dense weeds |
| 22.2 | 2,193 | Total | | | |

Subcatchment EX-4: TRIB. TO WETLAND SERIES 'E' & 'W1'

Hydrograph



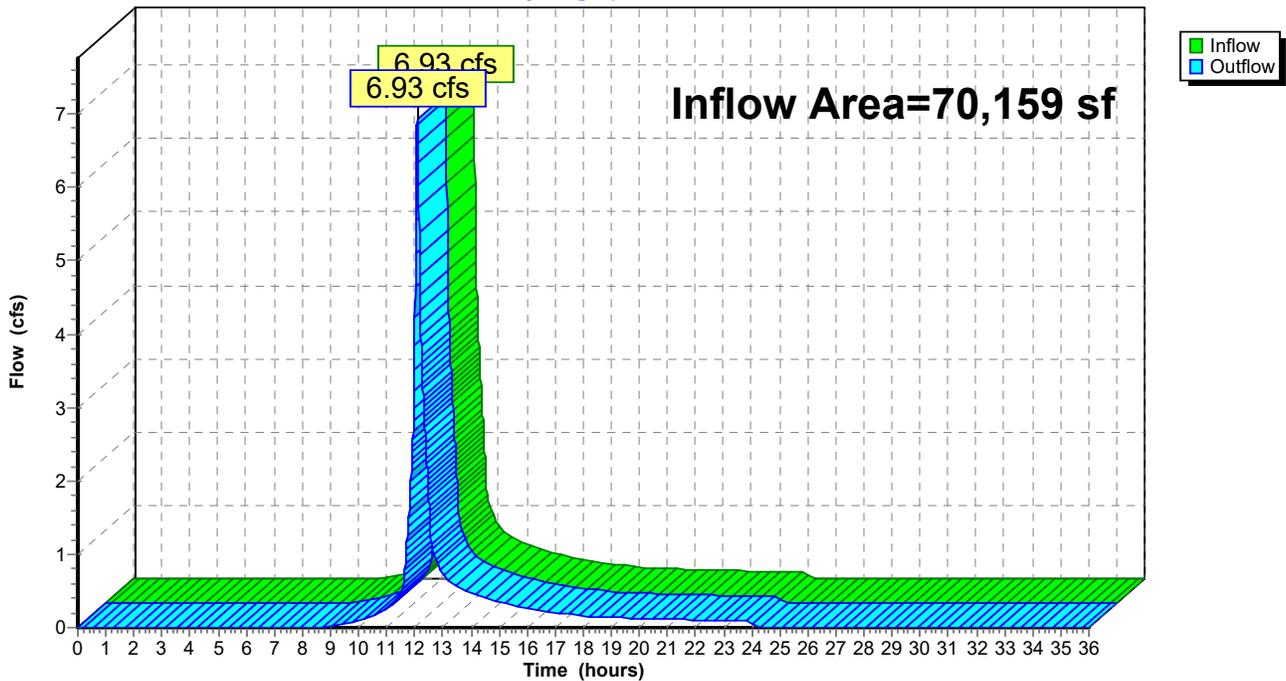
Summary for Reach DP1: DP1

Inflow Area = 70,159 sf, 48.57% Impervious, Inflow Depth = 3.71" for 100-Year event
Inflow = 6.93 cfs @ 12.09 hrs, Volume= 21,701 cf
Outflow = 6.93 cfs @ 12.09 hrs, Volume= 21,701 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach DP1: DP1

Hydrograph



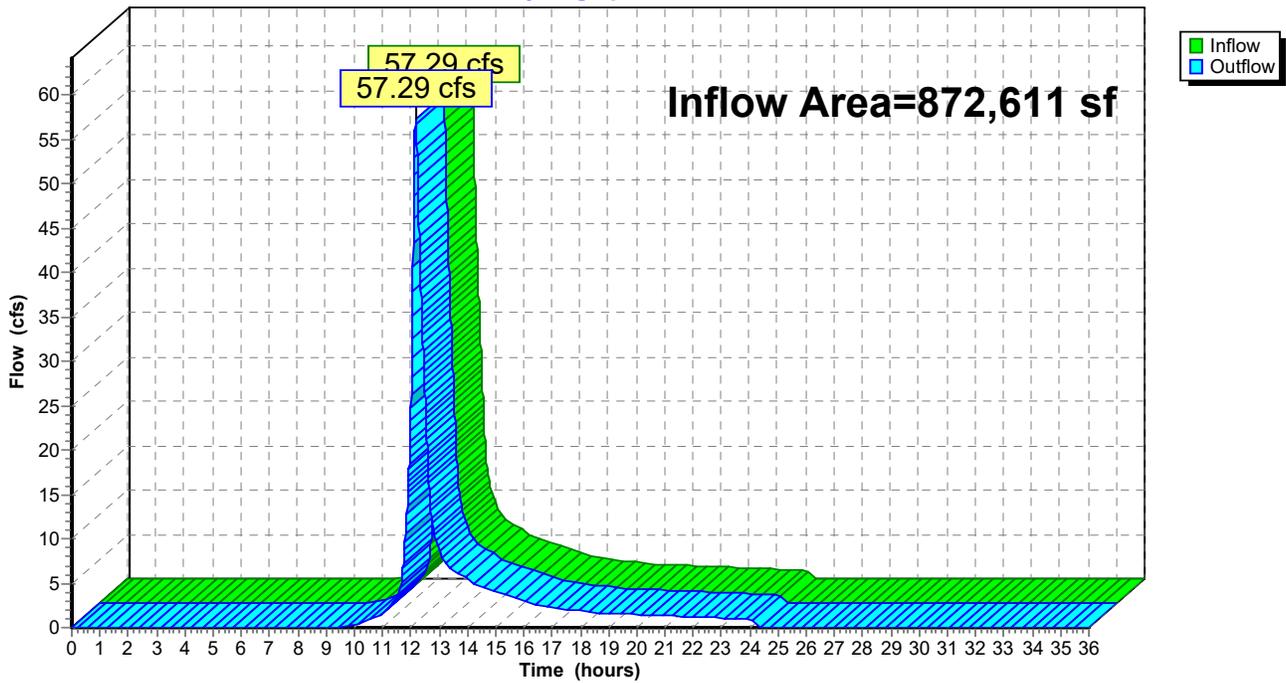
Summary for Reach DP2: DP2

Inflow Area = 872,611 sf, 5.55% Impervious, Inflow Depth = 3.10" for 100-Year event
Inflow = 57.29 cfs @ 12.18 hrs, Volume= 225,370 cf
Outflow = 57.29 cfs @ 12.18 hrs, Volume= 225,370 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach DP2: DP2

Hydrograph



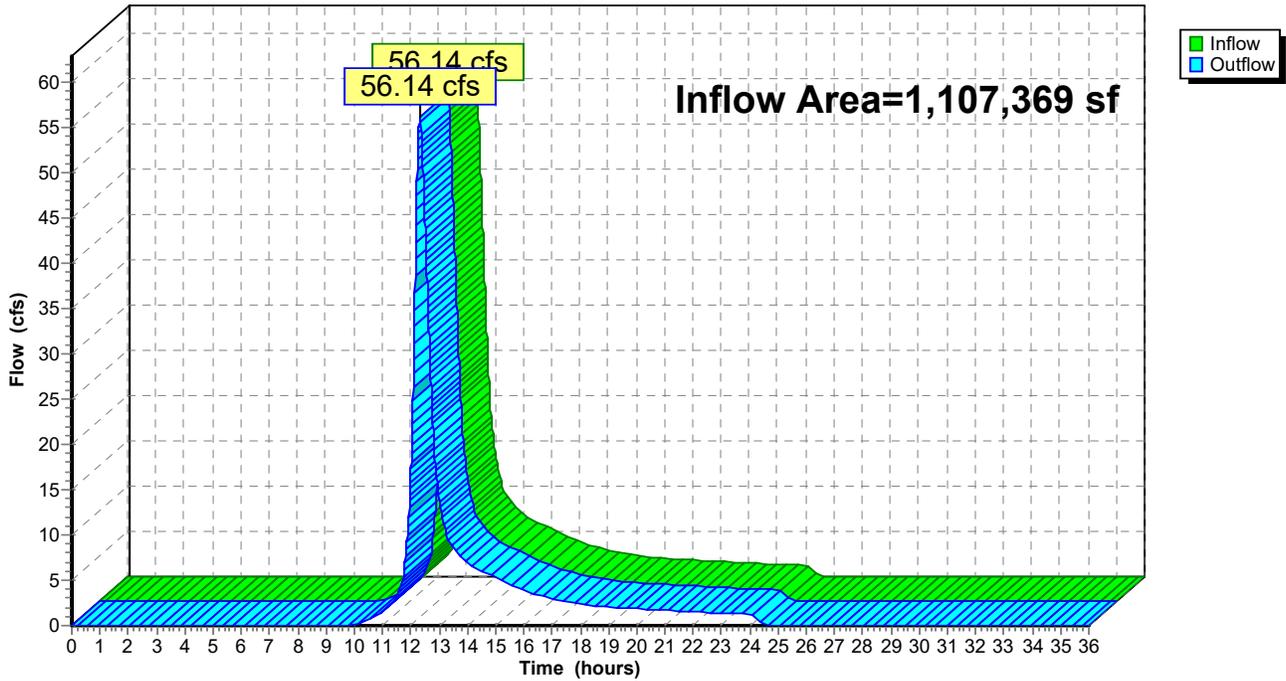
Summary for Reach DP3: DP3

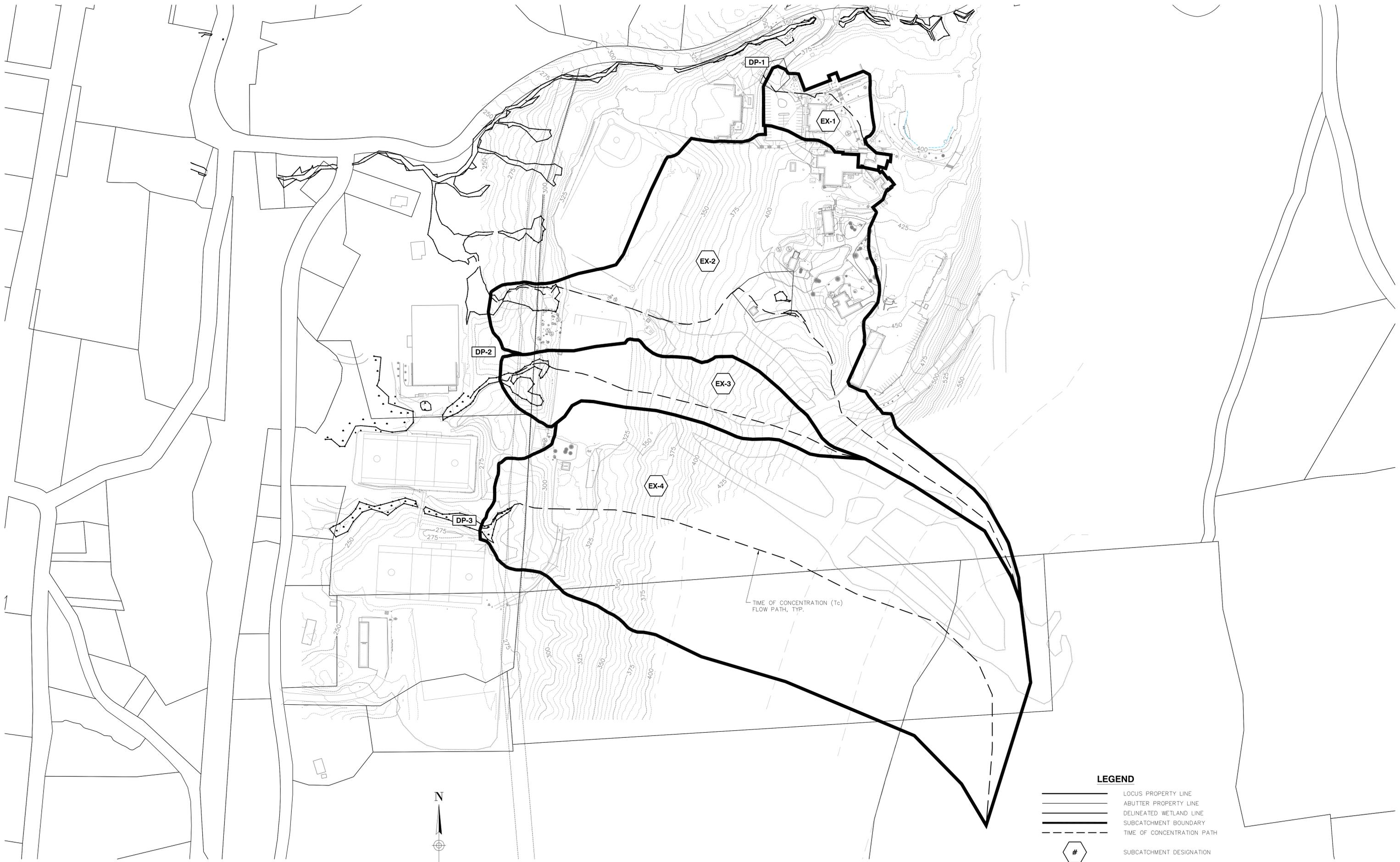
Inflow Area = 1,107,369 sf, 0.05% Impervious, Inflow Depth = 2.98" for 100-Year event
Inflow = 56.14 cfs @ 12.31 hrs, Volume= 274,873 cf
Outflow = 56.14 cfs @ 12.31 hrs, Volume= 274,873 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach DP3: DP3

Hydrograph





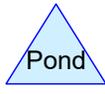
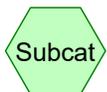
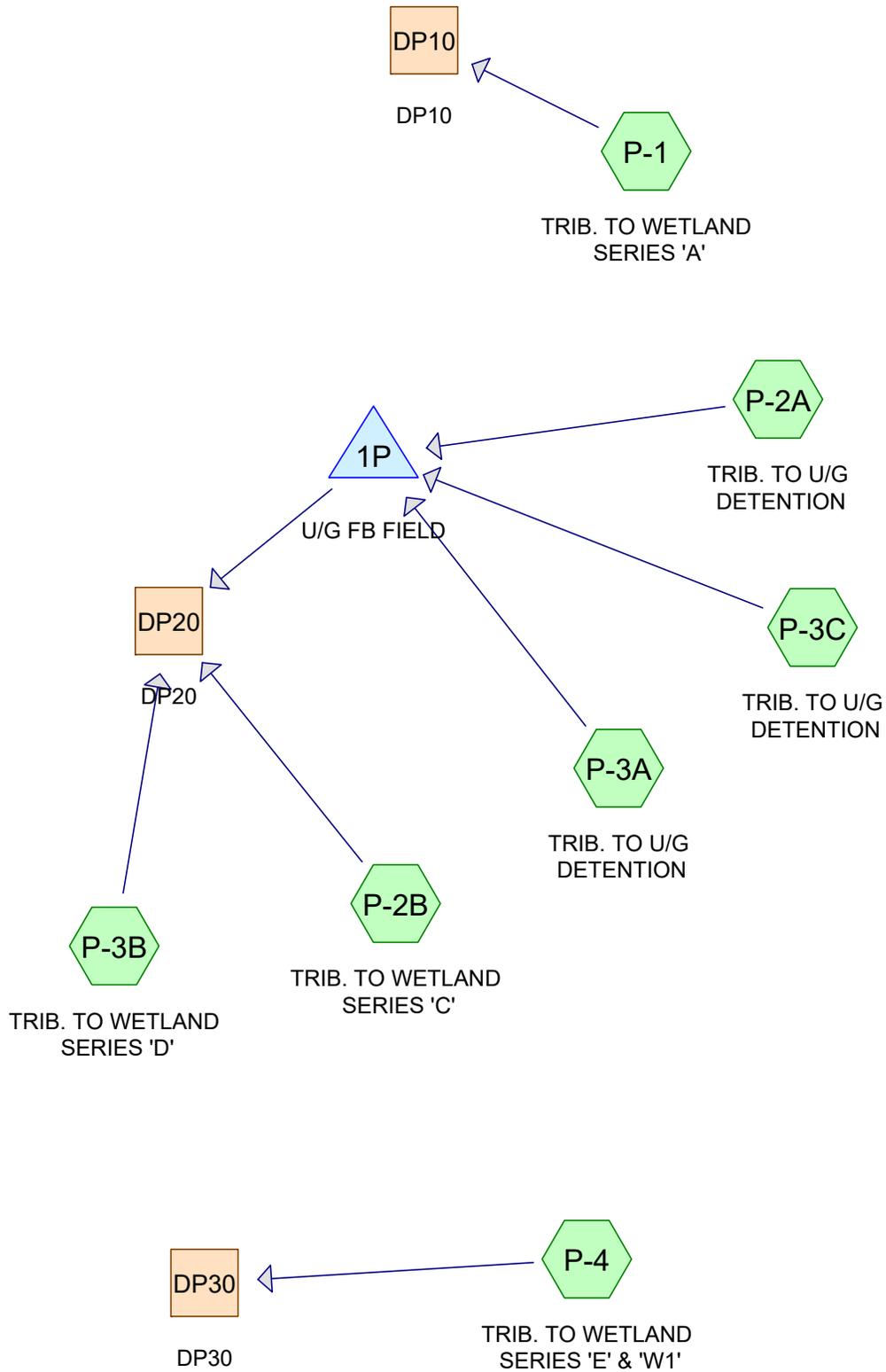
TIME OF CONCENTRATION (T_c)
FLOW PATH, TYP.

LEGEND

-  LOCUS PROPERTY LINE
-  ABUTTER PROPERTY LINE
-  DELINEATED WETLAND LINE
-  SUBCATCHMENT BOUNDARY
-  TIME OF CONCENTRATION PATH
-  SUBCATCHMENT DESIGNATION
-  DESIGN POINT DESIGNATION



PRE-DRAINAGE PLAN



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Area Listing (selected nodes)

| Area (sq-ft) | CN | Description (subcatchment-numbers) |
|-----------------|----|--|
| 270,545 | 39 | >75% Grass cover, Good, HSG A (P-1, P-2A, P-2B, P-3A, P-3B, P-3C, P-4) |
| 211,590 | 61 | >75% Grass cover, Good, HSG B (P-1, P-2A, P-2B, P-3C, P-4) |
| 274,721 | 74 | >75% Grass cover, Good, HSG C (P-1, P-2A, P-2B, P-3C, P-4) |
| 6,194 | 76 | Gravel roads, HSG A (P-4) |
| 789 | 85 | Gravel roads, HSG B (P-2A) |
| 1,676 | 89 | Gravel roads, HSG C (P-2A) |
| 4,417 | 86 | Green Roofs, HSG A (P-2A) |
| 524 | 98 | Green Roofs, HSG B (P-2A) |
| 8,525 | 86 | Green Roofs, HSG C (P-2A) |
| 33,320 | 98 | Paved parking, HSG A (P-1, P-2A, P-2B) |
| 18,454 | 98 | Paved parking, HSG B (P-1, P-2A) |
| 18,532 | 98 | Paved parking, HSG C (P-1, P-2A, P-2B) |
| 11,761 | 98 | Roofs, HSG A (P-1, P-2A, P-2B, P-4) |
| 11,458 | 98 | Roofs, HSG B (P-1, P-2A) |
| 16,440 | 98 | Roofs, HSG C (P-2A) |
| 63,991 | 74 | Sports Field (Runoff), HSG A (P-2B, P-3A, P-3C) |
| 52,191 | 74 | Sports Field (UD), HSG A (P-3A, P-3C) |
| 98,357 | 30 | Woods, Good, HSG A (P-2B, P-3B, P-4) |
| 337,019 | 55 | Woods, Good, HSG B (P-2A, P-2B, P-3C, P-4) |
| 623,306 | 70 | Woods, Good, HSG C (P-2A, P-2B, P-3C, P-4) |

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Soil Listing (selected nodes)

| Area (sq-ft) | Soil Group | Subcatchment Numbers |
|-----------------|---------------|--|
| 540,776 | HSG A | P-1, P-2A, P-2B, P-3A, P-3B, P-3C, P-4 |
| 579,834 | HSG B | P-1, P-2A, P-2B, P-3C, P-4 |
| 943,200 | HSG C | P-1, P-2A, P-2B, P-3C, P-4 |
| 0 | HSG D | |
| 0 | Other | |

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Ground Covers (selected nodes)

| HSG-A (sq-ft) | HSG-B (sq-ft) | HSG-C (sq-ft) | HSG-D (sq-ft) | Other (sq-ft) | Total (sq-ft) | Ground Cover | Sub Num |
|------------------|------------------|------------------|------------------|------------------|------------------|---------------------------|------------|
| 270,545 | 211,590 | 274,721 | 0 | 0 | 756,856 | >75% Grass cover, Good | |
| 6,194 | 789 | 1,676 | 0 | 0 | 8,659 | Gravel roads | |
| 4,417 | 524 | 8,525 | 0 | 0 | 13,466 | Green Roofs | |
| 33,320 | 18,454 | 18,532 | 0 | 0 | 70,306 | Paved parking | |
| 11,761 | 11,458 | 16,440 | 0 | 0 | 39,659 | Roofs | |
| 63,991 | 0 | 0 | 0 | 0 | 63,991 | Sports Field (Runoff) | |
| 52,191 | 0 | 0 | 0 | 0 | 52,191 | Sports Field (UD) | |
| 98,357 | 337,019 | 623,306 | 0 | 0 | 1,058,682 | Woods, Good | |

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Type III 24-hr 2-Year Rainfall=2.99"

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Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 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 P-1: TRIB. TO WETLAND Runoff Area=62,580 sf 45.24% Impervious Runoff Depth=0.58"
 Flow Length=459' Tc=6.3 min CN=67 Runoff=0.77 cfs 3,025 cf

Subcatchment P-2A: TRIB. TO U/G Runoff Area=387,859 sf 20.66% Impervious Runoff Depth=0.80"
 Flow Length=1,945' Tc=11.4 min CN=72 Runoff=6.28 cfs 25,926 cf

Subcatchment P-2B: TRIB. TO WETLAND Runoff Area=296,000 sf 0.51% Impervious Runoff Depth=0.27"
 Flow Length=1,376' Tc=11.2 min CN=58 Runoff=0.80 cfs 6,675 cf

Subcatchment P-3A: TRIB. TO U/G Runoff Area=73,805 sf 0.00% Impervious Runoff Depth=0.43"
 Flow Length=219' Tc=13.3 min CN=63 Runoff=0.43 cfs 2,636 cf

Subcatchment P-3B: TRIB. TO WETLAND Runoff Area=31,938 sf 0.00% Impervious Runoff Depth=0.00"
 Flow Length=207' Tc=6.0 min CN=34 Runoff=0.00 cfs 0 cf

Subcatchment P-3C: TRIB. TO U/G Runoff Area=109,470 sf 0.00% Impervious Runoff Depth=0.43"
 Flow Length=890' Tc=9.4 min CN=63 Runoff=0.71 cfs 3,910 cf

Subcatchment P-4: TRIB. TO WETLAND Runoff Area=1,102,158 sf 0.05% Impervious Runoff Depth=0.39"
 Flow Length=2,193' Tc=22.2 min CN=62 Runoff=4.86 cfs 36,216 cf

Reach DP10: DP10 Inflow=0.77 cfs 3,025 cf
 Outflow=0.77 cfs 3,025 cf

Reach DP20: DP20 Inflow=0.88 cfs 7,232 cf
 Outflow=0.88 cfs 7,232 cf

Reach DP30: DP30 Inflow=4.86 cfs 36,216 cf
 Outflow=4.86 cfs 36,216 cf

Pond 1P: U/G FB FIELD Peak Elev=323.81' Storage=7,623 cf Inflow=7.37 cfs 33,769 cf
 Discarded=1.90 cfs 33,205 cf Primary=0.15 cfs 557 cf Outflow=2.05 cfs 33,762 cf

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Type III 24-hr 2-Year Rainfall=2.99"

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Summary for Subcatchment P-1: TRIB. TO WETLAND SERIES 'A'

Runoff = 0.77 cfs @ 12.11 hrs, Volume= 3,025 cf, Depth= 0.58"

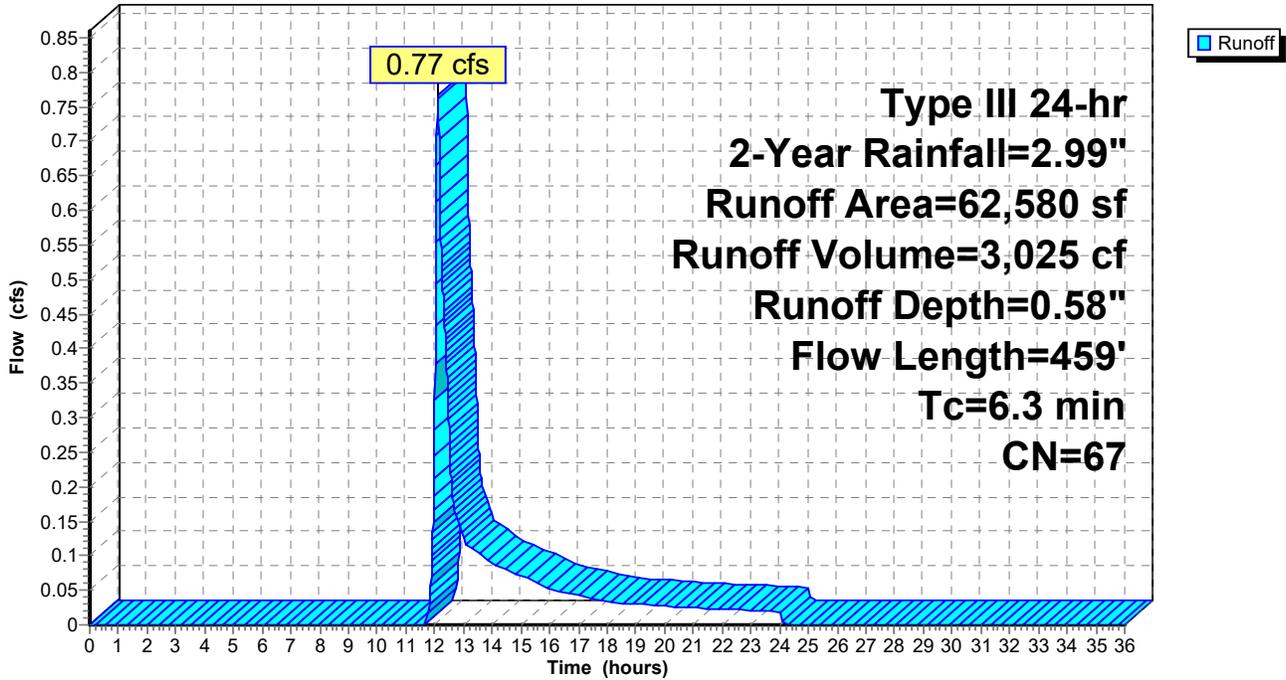
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=2.99"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 1,283 | 98 | Roofs, HSG A |
| 22,964 | 98 | Paved parking, HSG A |
| 29,273 | 39 | >75% Grass cover, Good, HSG A |
| 2,745 | 98 | Roofs, HSG B |
| 1,256 | 98 | Paved parking, HSG B |
| 4,831 | 61 | >75% Grass cover, Good, HSG B |
| 63 | 98 | Paved parking, HSG C |
| 165 | 74 | >75% Grass cover, Good, HSG C |
| 62,580 | 67 | Weighted Average |
| 34,269 | | 54.76% Pervious Area |
| 28,311 | | 45.24% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|--|
| 4.2 | 50 | 0.1170 | 0.20 | | Sheet Flow, Grass: Dense n= 0.240 P2= 2.99" |
| 1.7 | 202 | 0.0820 | 2.00 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.1 | 26 | 0.0088 | 4.26 | 3.34 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 0.2 | 99 | 0.0280 | 7.59 | 5.96 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 0.1 | 61 | 0.0560 | 10.73 | 8.43 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 0.0 | 21 | 0.0600 | 11.11 | 8.73 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 6.3 | 459 | Total | | | |

Subcatchment P-1: TRIB. TO WETLAND SERIES 'A'

Hydrograph



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Type III 24-hr 2-Year Rainfall=2.99"

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Summary for Subcatchment P-2A: TRIB. TO U/G DETENTION

Runoff = 6.28 cfs @ 12.17 hrs, Volume= 25,926 cf, Depth= 0.80"

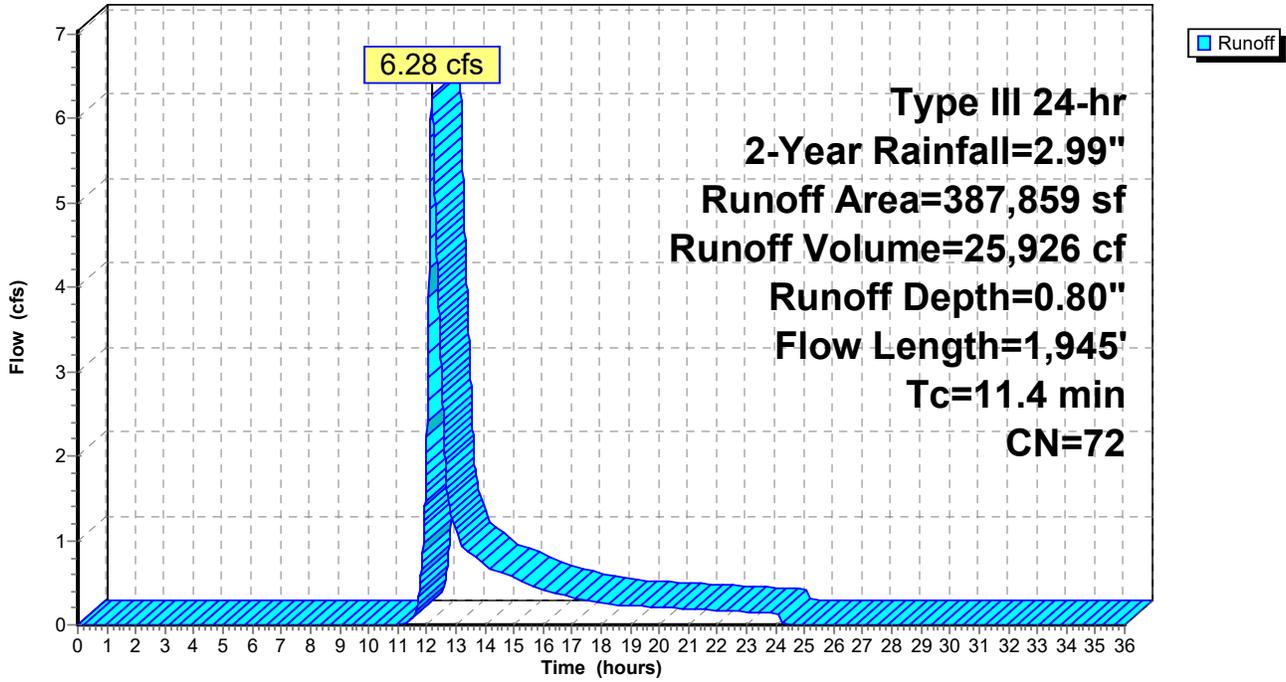
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=2.99"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 9,845 | 98 | Roofs, HSG A |
| 9,244 | 98 | Paved parking, HSG A |
| 13,046 | 39 | >75% Grass cover, Good, HSG A |
| * 4,417 | 86 | Green Roofs, HSG A |
| 8,713 | 98 | Roofs, HSG B |
| 17,198 | 98 | Paved parking, HSG B |
| 106,168 | 61 | >75% Grass cover, Good, HSG B |
| 789 | 85 | Gravel roads, HSG B |
| 42,693 | 55 | Woods, Good, HSG B |
| * 524 | 98 | Green Roofs, HSG B |
| 16,440 | 98 | Roofs, HSG C |
| 18,177 | 98 | Paved parking, HSG C |
| 89,512 | 74 | >75% Grass cover, Good, HSG C |
| 1,676 | 89 | Gravel roads, HSG C |
| 40,892 | 70 | Woods, Good, HSG C |
| * 8,525 | 86 | Green Roofs, HSG C |
| 387,859 | 72 | Weighted Average |
| 307,718 | | 79.34% Pervious Area |
| 80,141 | | 20.66% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|--|
| 4.9 | 50 | 0.2180 | 0.17 | | Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.99" |
| 3.7 | 885 | 0.3200 | 3.96 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.4 | 273 | 0.1000 | 10.16 | 80.27 | Channel Flow, Area= 7.9 sf Perim= 12.0' r= 0.66' n= 0.035 Earth, dense weeds |
| 1.5 | 189 | 0.0860 | 2.05 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.3 | 53 | 0.0470 | 3.46 | 8.31 | Channel Flow, Area= 2.4 sf Perim= 10.4' r= 0.23' n= 0.035 Earth, dense weeds |
| 0.2 | 309 | 0.1500 | 23.02 | 40.68 | Pipe Channel, 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior |
| 0.4 | 186 | 0.0100 | 7.20 | 22.62 | Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior |
| 11.4 | 1,945 | Total | | | |

Subcatchment P-2A: TRIB. TO U/G DETENTION

Hydrograph



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Type III 24-hr 2-Year Rainfall=2.99"

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Summary for Subcatchment P-2B: TRIB. TO WETLAND SERIES 'C'

Runoff = 0.80 cfs @ 12.38 hrs, Volume= 6,675 cf, Depth= 0.27"

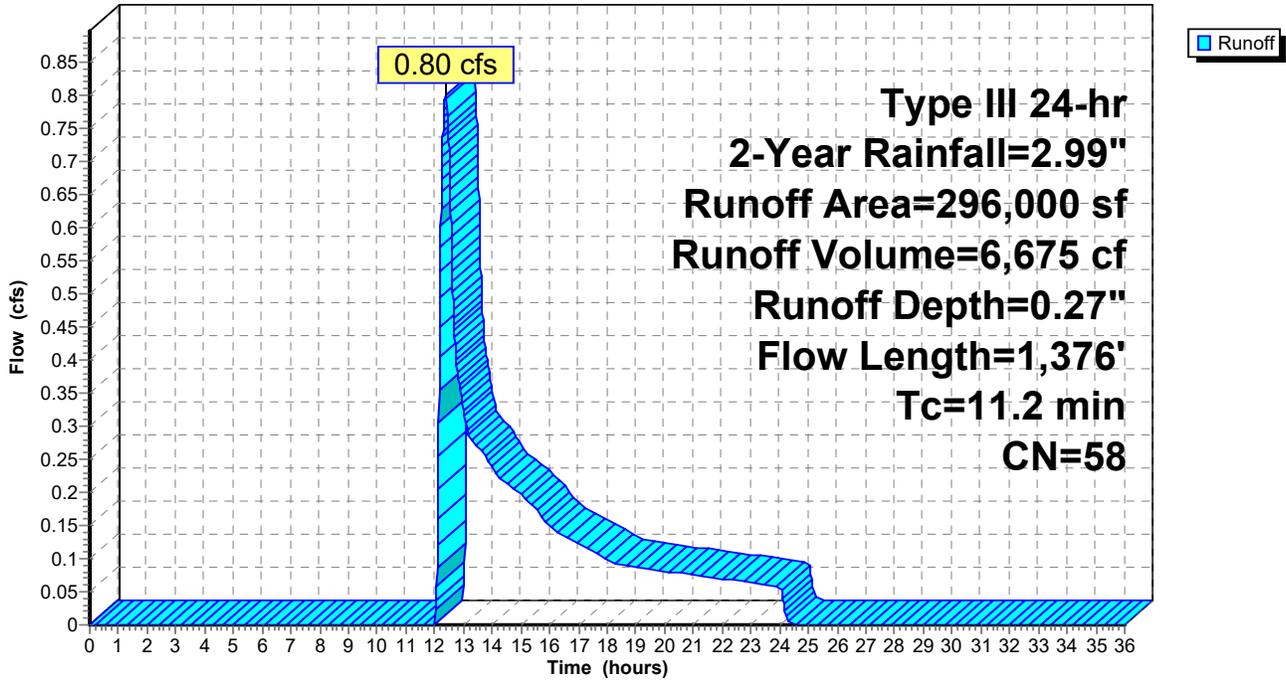
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=2.99"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 95 | 98 | Roofs, HSG A |
| 1,112 | 98 | Paved parking, HSG A |
| 91,315 | 39 | >75% Grass cover, Good, HSG A |
| * 42,036 | 74 | Sports Field (Runoff), HSG A |
| 32,167 | 30 | Woods, Good, HSG A |
| 6,484 | 61 | >75% Grass cover, Good, HSG B |
| 1,713 | 55 | Woods, Good, HSG B |
| 292 | 98 | Paved parking, HSG C |
| 74,669 | 74 | >75% Grass cover, Good, HSG C |
| 46,117 | 70 | Woods, Good, HSG C |
| 296,000 | 58 | Weighted Average |
| 294,501 | | 99.49% Pervious Area |
| 1,499 | | 0.51% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|--|
| 4.6 | 50 | 0.2500 | 0.18 | | Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.99" |
| 5.1 | 667 | 0.1900 | 2.18 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 0.9 | 165 | 0.1800 | 2.97 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.4 | 245 | 0.0410 | 9.19 | 7.21 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 0.2 | 249 | 0.1840 | 17.38 | 215.52 | Channel Flow, Area= 12.4 sf Perim= 13.3' r= 0.93' n= 0.035 Earth, dense weeds |
| 11.2 | 1,376 | Total | | | |

Subcatchment P-2B: TRIB. TO WETLAND SERIES 'C'

Hydrograph



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Type III 24-hr 2-Year Rainfall=2.99"

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Summary for Subcatchment P-3A: TRIB. TO U/G DETENTION

Runoff = 0.43 cfs @ 12.25 hrs, Volume= 2,636 cf, Depth= 0.43"

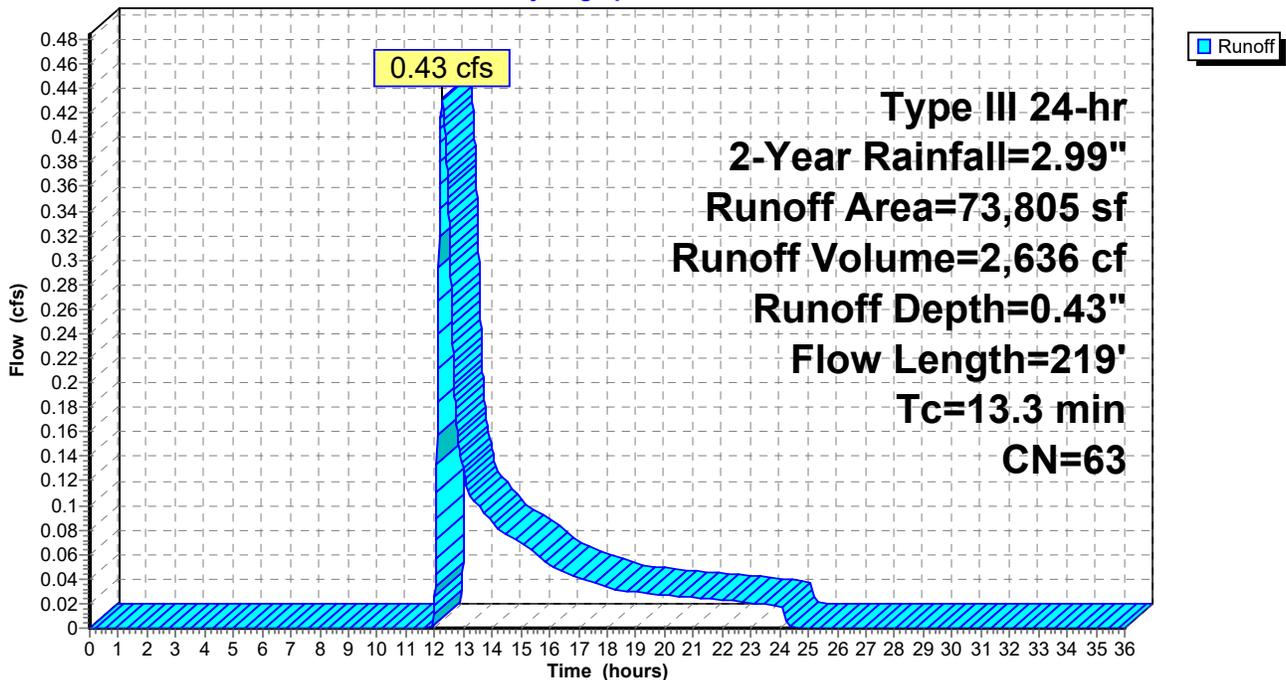
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=2.99"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 22,446 | 39 | >75% Grass cover, Good, HSG A |
| * 12,840 | 74 | Sports Field (Runoff), HSG A |
| * 38,519 | 74 | Sports Field (UD), HSG A |
| 73,805 | 63 | Weighted Average |
| 73,805 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|--|
| 11.2 | 50 | 0.0100 | 0.07 | | Sheet Flow, Grass: Dense n= 0.240 P2= 2.99" |
| 1.9 | 103 | 0.0165 | 0.90 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.2 | 66 | 0.0200 | 6.42 | 5.04 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 13.3 | 219 | Total | | | |

Subcatchment P-3A: TRIB. TO U/G DETENTION

Hydrograph



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Summary for Subcatchment P-3B: TRIB. TO WETLAND SERIES 'D'

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

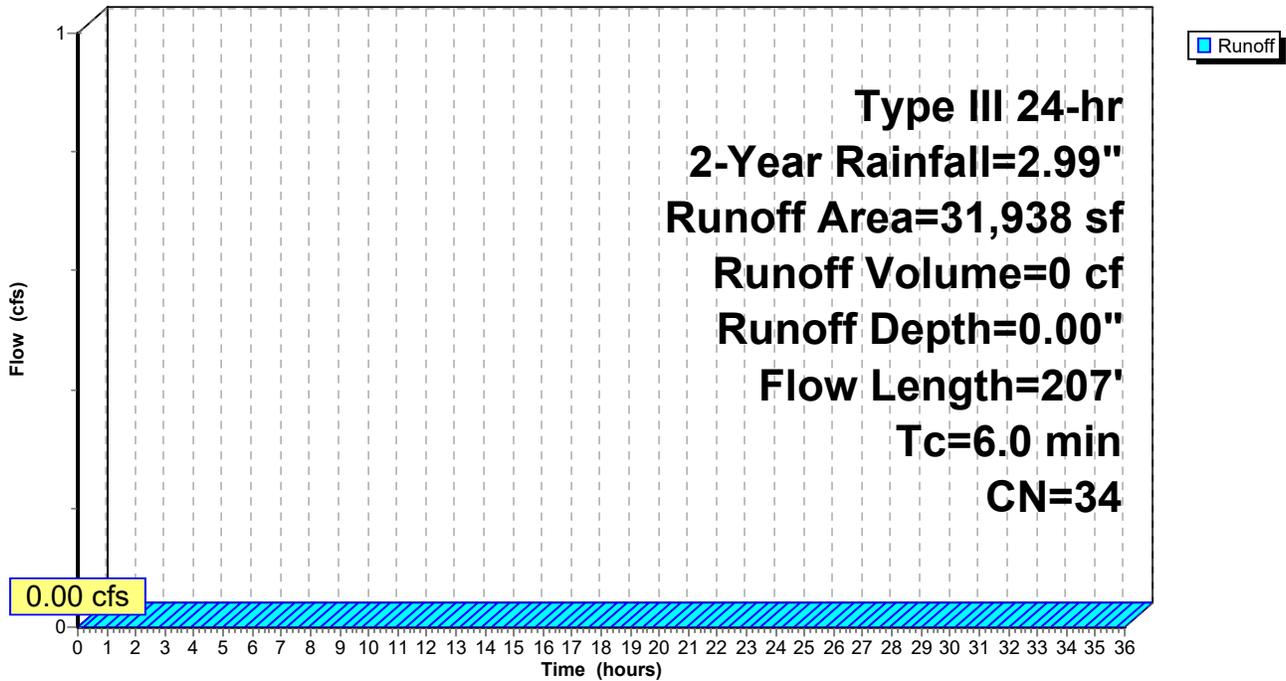
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=2.99"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 13,356 | 39 | >75% Grass cover, Good, HSG A |
| 18,582 | 30 | Woods, Good, HSG A |
| 31,938 | 34 | Weighted Average |
| 31,938 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|--|-------------------|----------------|---|
| 3.7 | 50 | 0.4500 | 0.23 | | Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.99" |
| 0.2 | 157 | 0.1650 | 12.49 | 96.14 | Channel Flow, Area= 7.7 sf Perim= 12.5' r= 0.62' n= 0.035 Earth, dense weeds |
| 3.9 | 207 | Total, Increased to minimum Tc = 6.0 min | | | |

Subcatchment P-3B: TRIB. TO WETLAND SERIES 'D'

Hydrograph



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Type III 24-hr 2-Year Rainfall=2.99"

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Summary for Subcatchment P-3C: TRIB. TO U/G DETENTION

Runoff = 0.71 cfs @ 12.17 hrs, Volume= 3,910 cf, Depth= 0.43"

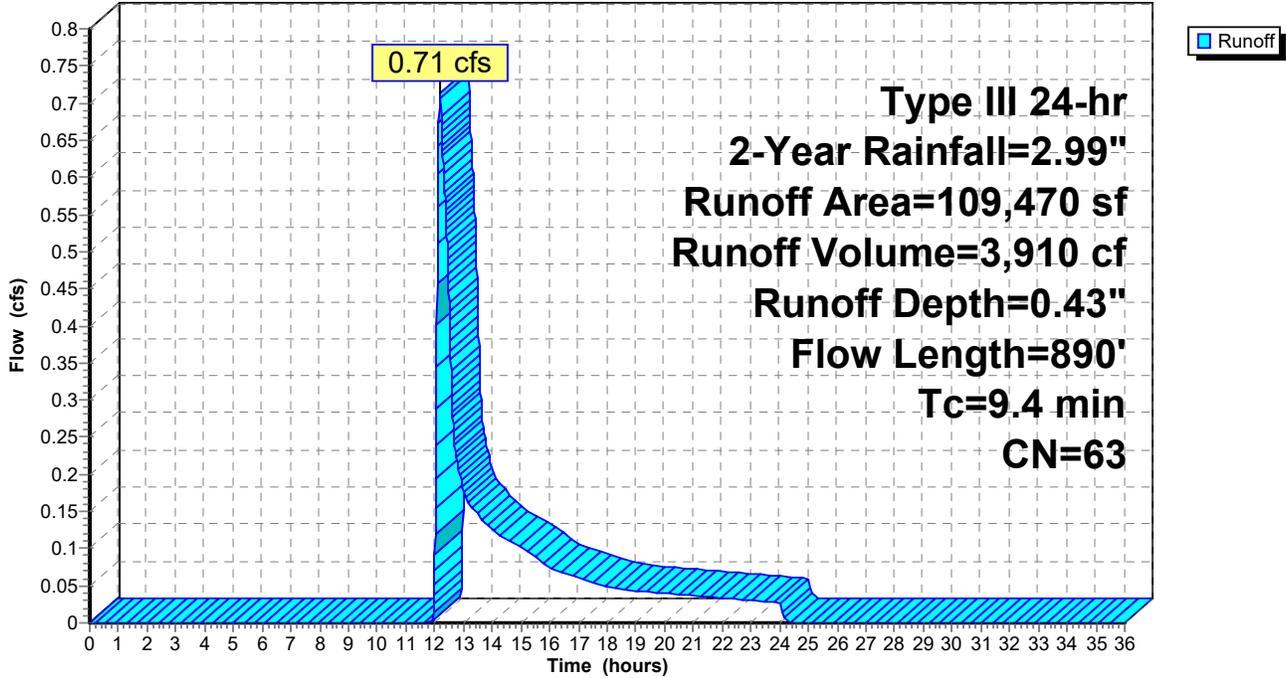
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=2.99"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 30,634 | 39 | >75% Grass cover, Good, HSG A |
| * 9,115 | 74 | Sports Field (Runoff), HSG A |
| * 13,672 | 74 | Sports Field (UD), HSG A |
| 729 | 61 | >75% Grass cover, Good, HSG B |
| 838 | 55 | Woods, Good, HSG B |
| 17,287 | 74 | >75% Grass cover, Good, HSG C |
| 37,195 | 70 | Woods, Good, HSG C |
| 109,470 | 63 | Weighted Average |
| 109,470 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|--|
| 4.9 | 50 | 0.2180 | 0.17 | | Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.99" |
| 1.1 | 223 | 0.2300 | 3.36 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 2.4 | 348 | 0.2400 | 2.45 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 0.7 | 148 | 0.2400 | 3.43 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.3 | 121 | 0.0200 | 6.42 | 5.04 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 9.4 | 890 | Total | | | |

Subcatchment P-3C: TRIB. TO U/G DETENTION

Hydrograph



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Summary for Subcatchment P-4: TRIB. TO WETLAND SERIES 'E' & 'W1'

Runoff = 4.86 cfs @ 12.45 hrs, Volume= 36,216 cf, Depth= 0.39"

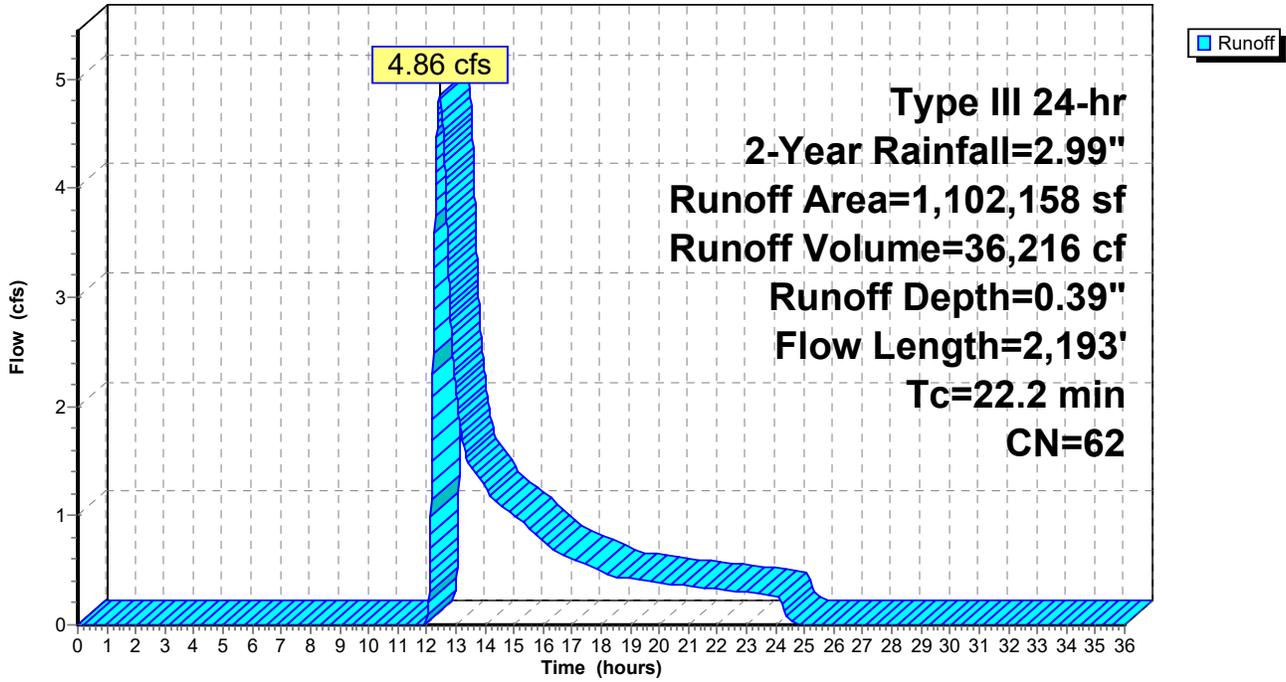
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=2.99"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 538 | 98 | Roofs, HSG A |
| 70,475 | 39 | >75% Grass cover, Good, HSG A |
| 6,194 | 76 | Gravel roads, HSG A |
| 47,608 | 30 | Woods, Good, HSG A |
| 93,378 | 61 | >75% Grass cover, Good, HSG B |
| 291,775 | 55 | Woods, Good, HSG B |
| 93,088 | 74 | >75% Grass cover, Good, HSG C |
| 499,102 | 70 | Woods, Good, HSG C |
| 1,102,158 | 62 | Weighted Average |
| 1,101,620 | | 99.95% Pervious Area |
| 538 | | 0.05% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|--|
| 7.9 | 50 | 0.0660 | 0.11 | | Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.99" |
| 4.6 | 613 | 0.2000 | 2.24 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 2.1 | 431 | 0.4600 | 3.39 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 4.9 | 729 | 0.2500 | 2.50 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 1.7 | 99 | 0.0200 | 0.99 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.8 | 135 | 0.3000 | 2.74 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 0.2 | 136 | 0.0850 | 11.51 | 180.77 | Channel Flow, Area= 15.7 sf Perim= 17.5' r= 0.90' n= 0.035 Earth, dense weeds |
| 22.2 | 2,193 | Total | | | |

Subcatchment P-4: TRIB. TO WETLAND SERIES 'E' & 'W1'

Hydrograph



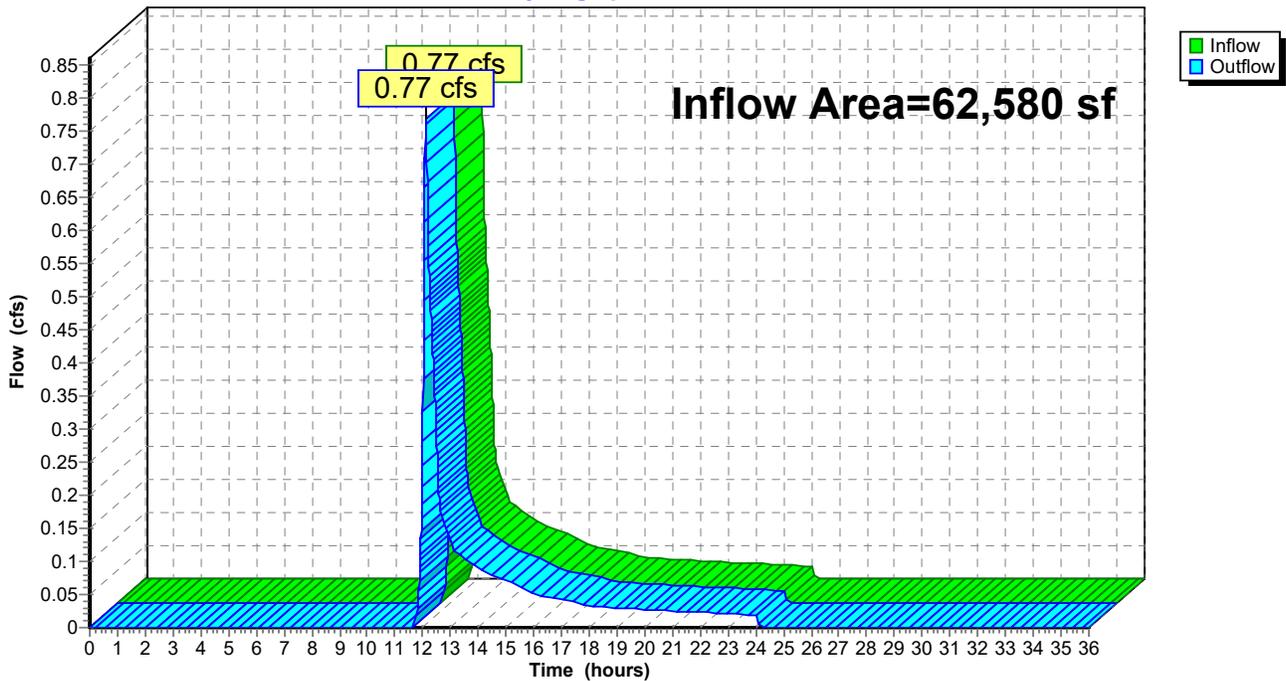
Summary for Reach DP10: DP10

Inflow Area = 62,580 sf, 45.24% Impervious, Inflow Depth = 0.58" for 2-Year event
Inflow = 0.77 cfs @ 12.11 hrs, Volume= 3,025 cf
Outflow = 0.77 cfs @ 12.11 hrs, Volume= 3,025 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach DP10: DP10

Hydrograph



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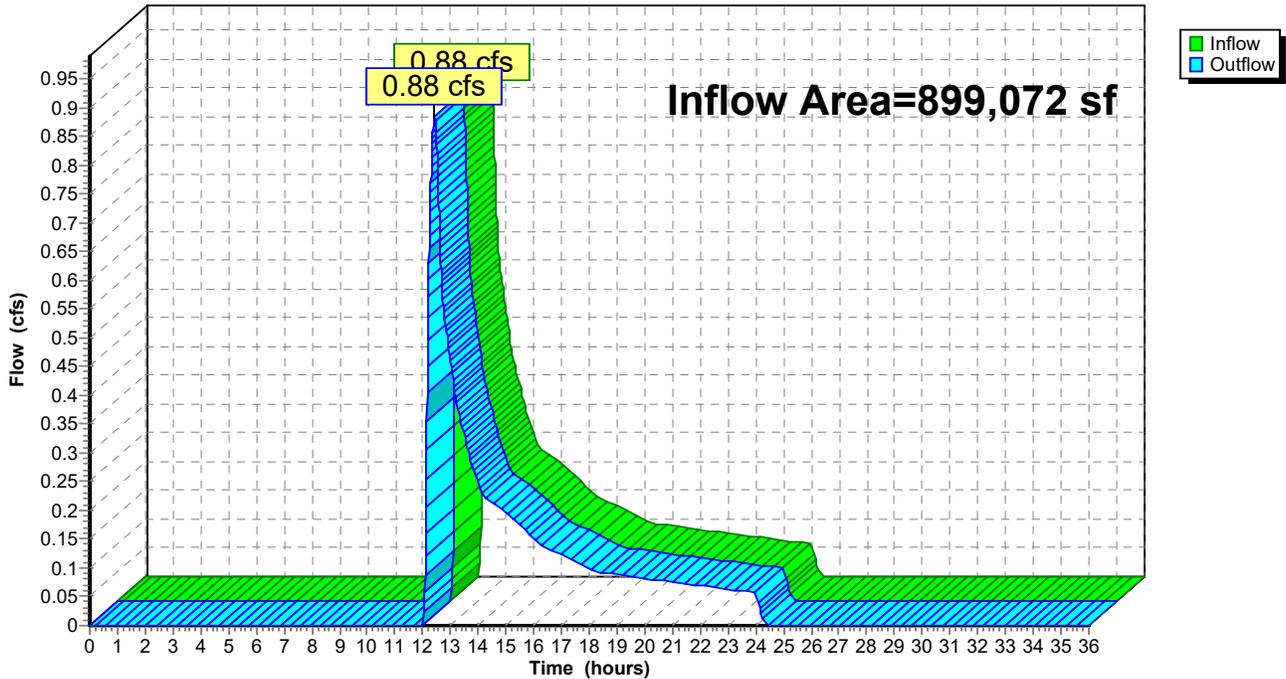
Summary for Reach DP20: DP20

Inflow Area = 899,072 sf, 9.08% Impervious, Inflow Depth = 0.10" for 2-Year event
Inflow = 0.88 cfs @ 12.43 hrs, Volume= 7,232 cf
Outflow = 0.88 cfs @ 12.43 hrs, Volume= 7,232 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach DP20: DP20

Hydrograph



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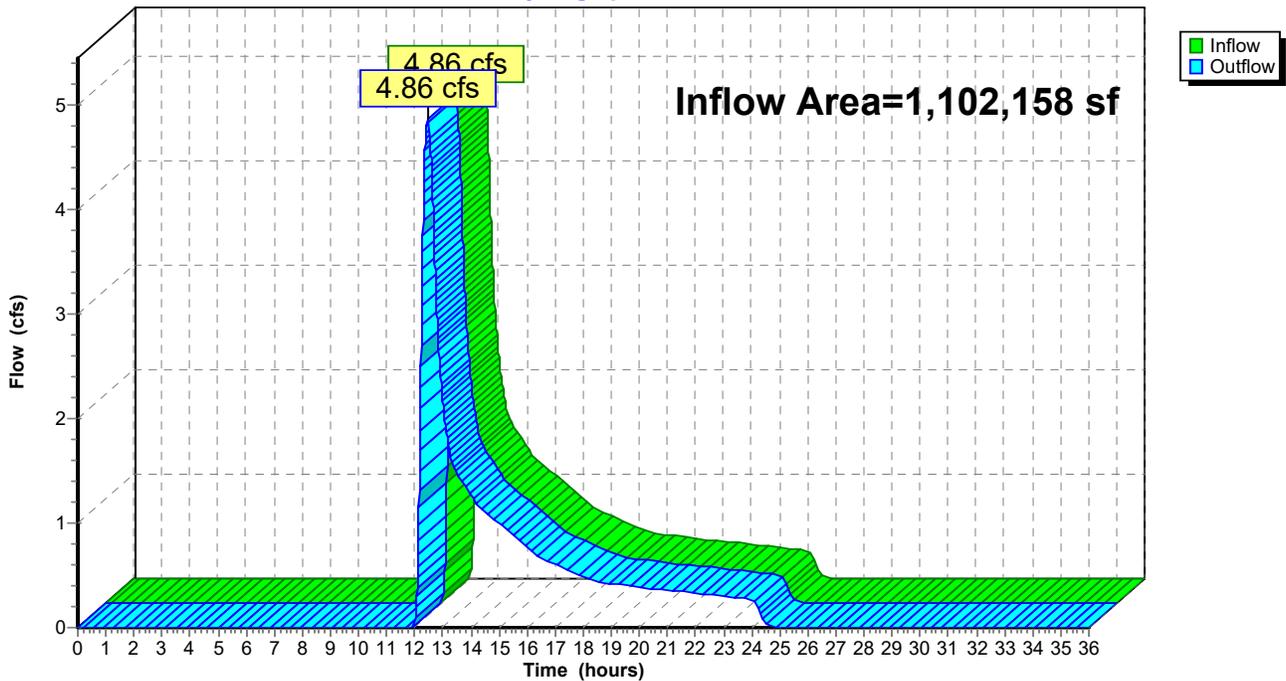
Summary for Reach DP30: DP30

Inflow Area = 1,102,158 sf, 0.05% Impervious, Inflow Depth = 0.39" for 2-Year event
Inflow = 4.86 cfs @ 12.45 hrs, Volume= 36,216 cf
Outflow = 4.86 cfs @ 12.45 hrs, Volume= 36,216 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach DP30: DP30

Hydrograph



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Type III 24-hr 2-Year Rainfall=2.99"

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Summary for Pond 1P: U/G FB FIELD

Inflow Area = 571,134 sf, 14.03% Impervious, Inflow Depth > 0.71" for 2-Year event
 Inflow = 7.37 cfs @ 12.18 hrs, Volume= 33,769 cf, Incl. 0.01 cfs Base Flow
 Outflow = 2.05 cfs @ 12.70 hrs, Volume= 33,762 cf, Atten= 72%, Lag= 31.1 min
 Discarded = 1.90 cfs @ 12.12 hrs, Volume= 33,205 cf
 Primary = 0.15 cfs @ 12.70 hrs, Volume= 557 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 323.81' @ 12.70 hrs Surf.Area= 34,043 sf Storage= 7,623 cf

Plug-Flow detention time= 29.4 min calculated for 33,762 cf (100% of inflow)
 Center-of-Mass det. time= 29.1 min (922.9 - 893.8)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|---------|---------------|---|
| #1A | 323.25' | 15,421 cf | 321.21'W x 103.44'L x 4.17'H Field A 138,437 cf Overall - 99,884 cf Embedded = 38,553 cf x 40.0% Voids |
| #2A | 324.25' | 67,137 cf | StormTrap ST1 SingleTrap 2-6 x 322 Inside #1 Inside= 82.7"W x 30.0"H => 14.83 sf x 14.06'L = 208.5 cf Outside= 82.7"W x 38.0"H => 21.84 sf x 14.06'L = 307.1 cf 322 Chambers in 46 Rows 317.21' x 98.44' Core + 0.00' x 0.50' Border = 317.21' x 99.44' System |
| #3B | 323.25' | 600 cf | 24.69'W x 33.13'L x 4.17'H Field B 3,407 cf Overall - 1,908 cf Embedded = 1,499 cf x 40.0% Voids |
| #4B | 324.25' | 1,251 cf | StormTrap ST1 SingleTrap 2-6 x 6 Inside #3 Inside= 82.7"W x 30.0"H => 14.83 sf x 14.06'L = 208.5 cf Outside= 82.7"W x 38.0"H => 21.84 sf x 14.06'L = 307.1 cf 6 Chambers in 3 Rows 20.69' x 28.13' Core + 0.00' x 0.50' Border = 20.69' x 29.13' System |
| #5 | 324.25' | 93 cf | 18.0" Round Pipe Storage L= 52.6' S= 0.0200 '/ |
| | | 84,502 cf | Total Available Storage |

Storage Group A created with Chamber Wizard
 Storage Group B created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|---------|---|
| #1 | Discarded | 323.25' | 2.410 in/hr Exfiltration over Surface area Phase-In= 0.10' |
| #2 | Primary | 315.36' | 18.0" Round Culvert L= 43.6' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 315.36' / 311.00' S= 0.1000 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf |
| #3 | Device 2 | 323.51' | 4.0" Vert. WQV-RECHARGE Orifice C= 0.600 |
| #4 | Device 2 | 323.81' | 15.0" W x 4.0" H Vert. 2-YR Orifice C= 0.600 |
| #5 | Device 2 | 324.86' | 15.0" W x 4.0" H Vert. 10-YR Orifice C= 0.600 |
| #6 | Device 2 | 325.41' | 15.0" W x 4.0" H Vert. 25-YR Orifice C= 0.600 |
| #7 | Device 2 | 326.57' | 4.0' long x 0.18' rise 100-YR Sharp-Crested Rectangular Weir 2 End Contraction(s) |

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Discarded OutFlow Max=1.90 cfs @ 12.12 hrs HW=323.38' (Free Discharge)

↑1=Exfiltration (Exfiltration Controls 1.90 cfs)

Primary OutFlow Max=0.15 cfs @ 12.70 hrs HW=323.81' (Free Discharge)

↑2=Culvert (Passes 0.15 cfs of 23.61 cfs potential flow)

↑3=WQV-RECHARGE Orifice (Orifice Controls 0.15 cfs @ 1.86 fps)

↑4=2-YR Orifice (Controls 0.00 cfs)

↑5=10-YR Orifice (Controls 0.00 cfs)

↑6=25-YR Orifice (Controls 0.00 cfs)

↑7=100-YR Sharp-Crested Rectangular Weir(Controls 0.00 cfs)

Pond 1P: U/G FB FIELD - Chamber Wizard Field A

Chamber Model = StormTrap ST1 SingleTrap 2-6 (StormTrap ST1 SingleTrap® Type VI)

Inside= 82.7"W x 30.0"H => 14.83 sf x 14.06'L = 208.5 cf

Outside= 82.7"W x 38.0"H => 21.84 sf x 14.06'L = 307.1 cf

7 Chambers/Row x 14.06' Long = 98.44' Row Length +6.0" Border x 2 +24.0" End Stone x 2 = 103.44' Base Length

46 Rows x 82.7" Wide + 24.0" Side Stone x 2 = 321.21' Base Width

12.0" Base + 38.0" Chamber Height = 4.17' Field Height

322 Chambers x 208.5 cf = 67,137.3 cf Chamber Storage

322 Chambers x 307.1 cf + 1,004.5 cf Border = 99,884.3 cf Displacement

138,437.4 cf Field - 99,884.3 cf Chambers = 38,553.2 cf Stone x 40.0% Voids = 15,421.3 cf Stone Storage

Chamber Storage + Stone Storage = 82,558.6 cf = 1.895 af

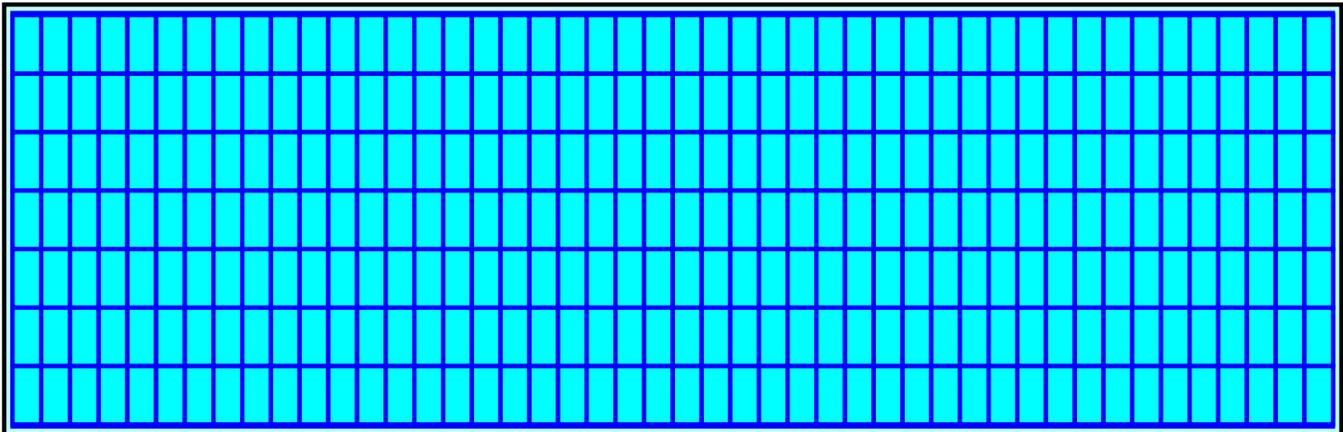
Overall Storage Efficiency = 59.6%

Overall System Size = 103.44' x 321.21' x 4.17'

322 Chambers (plus border)

5,127.3 cy Field

1,427.9 cy Stone



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Type III 24-hr 2-Year Rainfall=2.99"

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Pond 1P: U/G FB FIELD - Chamber Wizard Field B

Chamber Model = StormTrap ST1 SingleTrap 2-6 (StormTrap ST1 SingleTrap® Type VI)

Inside= 82.7"W x 30.0"H => 14.83 sf x 14.06'L = 208.5 cf

Outside= 82.7"W x 38.0"H => 21.84 sf x 14.06'L = 307.1 cf

2 Chambers/Row x 14.06' Long = 28.13' Row Length +6.0" Border x 2 +24.0" End Stone x 2 = 33.13' Base Length

3 Rows x 82.7" Wide + 24.0" Side Stone x 2 = 24.69' Base Width

12.0" Base + 38.0" Chamber Height = 4.17' Field Height

6 Chambers x 208.5 cf = 1,251.0 cf Chamber Storage

6 Chambers x 307.1 cf + 65.5 cf Border = 1,908.0 cf Displacement

3,407.4 cf Field - 1,908.0 cf Chambers = 1,499.4 cf Stone x 40.0% Voids = 599.8 cf Stone Storage

Chamber Storage + Stone Storage = 1,850.8 cf = 0.042 af

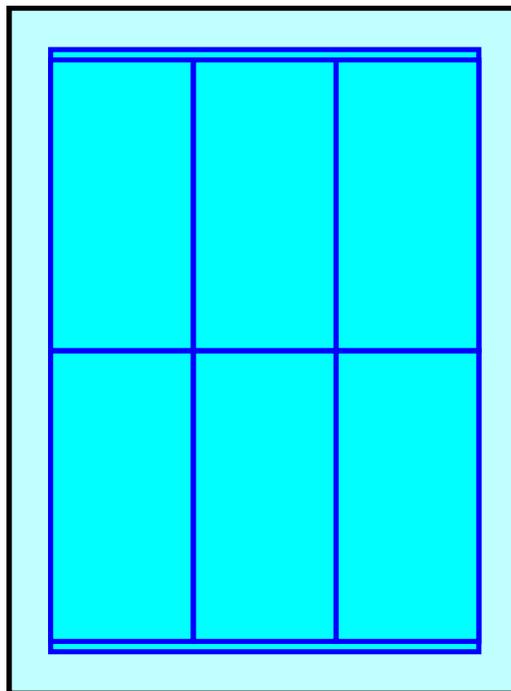
Overall Storage Efficiency = 54.3%

Overall System Size = 33.13' x 24.69' x 4.17'

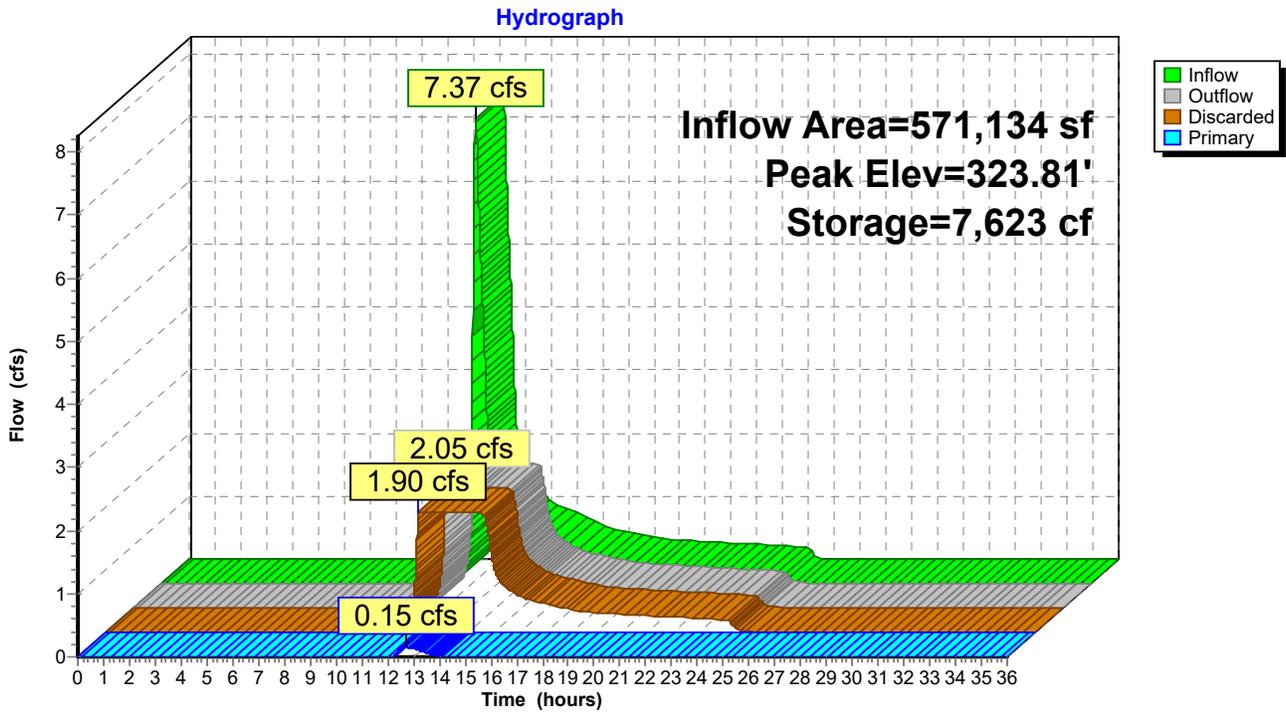
6 Chambers (plus border)

126.2 cy Field

55.5 cy Stone



Pond 1P: U/G FB FIELD



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Type III 24-hr 10-Year Rainfall=4.29"

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Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 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 P-1: TRIB. TO WETLAND Runoff Area=62,580 sf 45.24% Impervious Runoff Depth=1.33"
Flow Length=459' Tc=6.3 min CN=67 Runoff=2.07 cfs 6,921 cf

Subcatchment P-2A: TRIB. TO U/G Runoff Area=387,859 sf 20.66% Impervious Runoff Depth=1.67"
Flow Length=1,945' Tc=11.4 min CN=72 Runoff=14.15 cfs 53,872 cf

Subcatchment P-2B: TRIB. TO WETLAND Runoff Area=296,000 sf 0.51% Impervious Runoff Depth=0.80"
Flow Length=1,376' Tc=11.2 min CN=58 Runoff=4.12 cfs 19,755 cf

Subcatchment P-3A: TRIB. TO U/G Runoff Area=73,805 sf 0.00% Impervious Runoff Depth=1.08"
Flow Length=219' Tc=13.3 min CN=63 Runoff=1.49 cfs 6,641 cf

Subcatchment P-3B: TRIB. TO WETLAND Runoff Area=31,938 sf 0.00% Impervious Runoff Depth=0.01"
Flow Length=207' Tc=6.0 min CN=34 Runoff=0.00 cfs 22 cf

Subcatchment P-3C: TRIB. TO U/G Runoff Area=109,470 sf 0.00% Impervious Runoff Depth=1.08"
Flow Length=890' Tc=9.4 min CN=63 Runoff=2.50 cfs 9,850 cf

Subcatchment P-4: TRIB. TO WETLAND Runoff Area=1,102,158 sf 0.05% Impervious Runoff Depth=1.02"
Flow Length=2,193' Tc=22.2 min CN=62 Runoff=16.94 cfs 93,805 cf

Reach DP10: DP10 Inflow=2.07 cfs 6,921 cf
Outflow=2.07 cfs 6,921 cf

Reach DP20: DP20 Inflow=5.62 cfs 86,176 cf
Outflow=5.62 cfs 86,176 cf

Reach DP30: DP30 Inflow=16.94 cfs 93,805 cf
Outflow=16.94 cfs 93,805 cf

Pond 1P: U/G FB FIELD Peak Elev=324.86' Storage=30,768 cf Inflow=18.04 cfs 71,660 cf
Discarded=0.00 cfs 0 cf Primary=2.34 cfs 66,398 cf Outflow=2.34 cfs 66,398 cf

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Type III 24-hr 10-Year Rainfall=4.29"

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Summary for Subcatchment P-1: TRIB. TO WETLAND SERIES 'A'

Runoff = 2.07 cfs @ 12.10 hrs, Volume= 6,921 cf, Depth= 1.33"

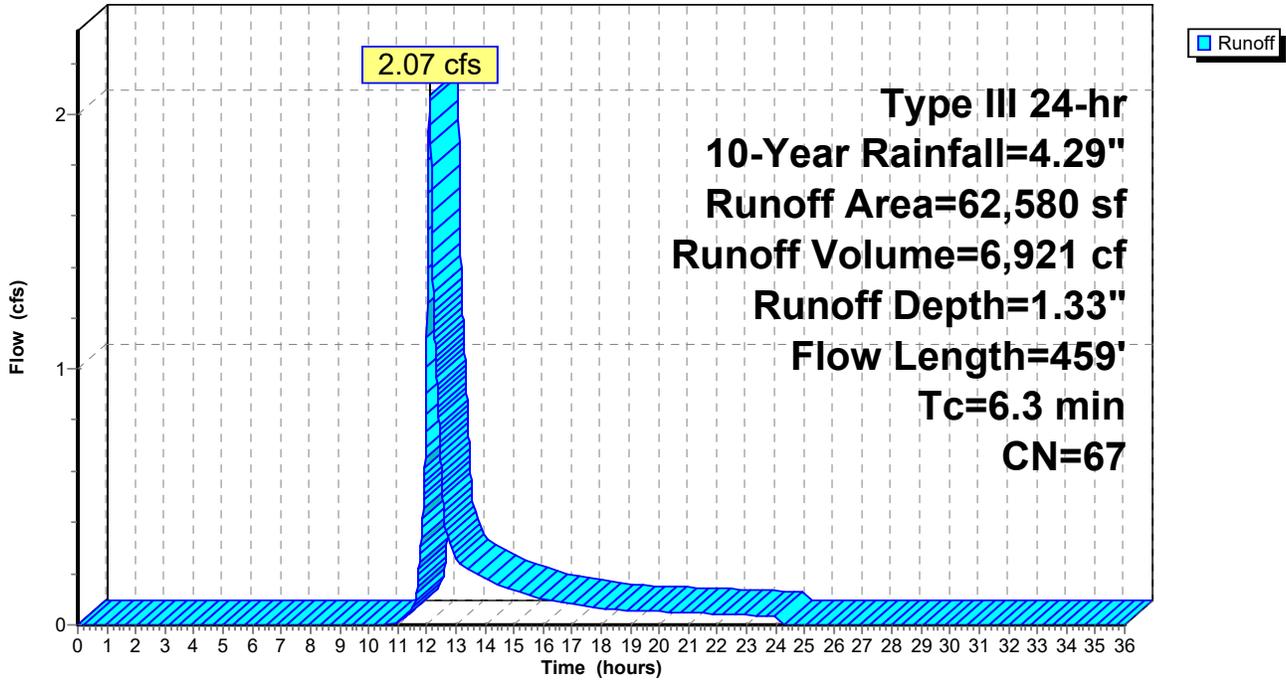
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.29"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 1,283 | 98 | Roofs, HSG A |
| 22,964 | 98 | Paved parking, HSG A |
| 29,273 | 39 | >75% Grass cover, Good, HSG A |
| 2,745 | 98 | Roofs, HSG B |
| 1,256 | 98 | Paved parking, HSG B |
| 4,831 | 61 | >75% Grass cover, Good, HSG B |
| 63 | 98 | Paved parking, HSG C |
| 165 | 74 | >75% Grass cover, Good, HSG C |
| 62,580 | 67 | Weighted Average |
| 34,269 | | 54.76% Pervious Area |
| 28,311 | | 45.24% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|--|
| 4.2 | 50 | 0.1170 | 0.20 | | Sheet Flow, Grass: Dense n= 0.240 P2= 2.99" |
| 1.7 | 202 | 0.0820 | 2.00 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.1 | 26 | 0.0088 | 4.26 | 3.34 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 0.2 | 99 | 0.0280 | 7.59 | 5.96 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 0.1 | 61 | 0.0560 | 10.73 | 8.43 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 0.0 | 21 | 0.0600 | 11.11 | 8.73 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 6.3 | 459 | Total | | | |

Subcatchment P-1: TRIB. TO WETLAND SERIES 'A'

Hydrograph



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Type III 24-hr 10-Year Rainfall=4.29"

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Summary for Subcatchment P-2A: TRIB. TO U/G DETENTION

Runoff = 14.15 cfs @ 12.17 hrs, Volume= 53,872 cf, Depth= 1.67"

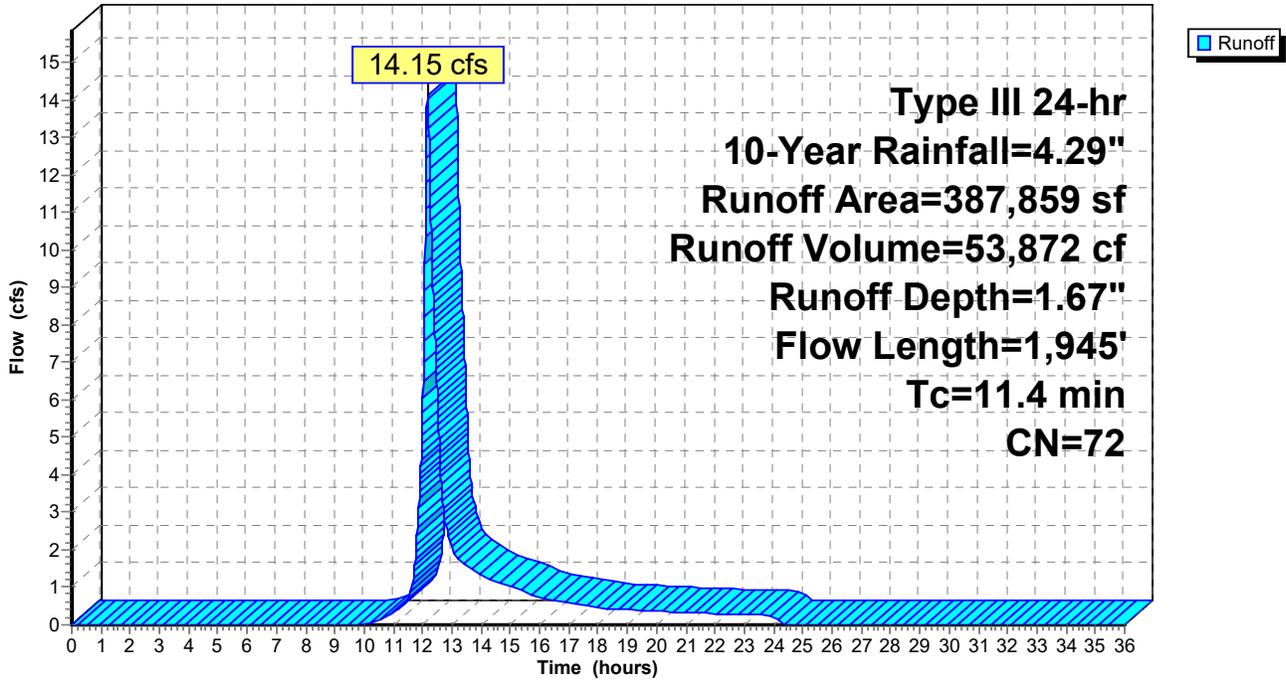
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.29"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 9,845 | 98 | Roofs, HSG A |
| 9,244 | 98 | Paved parking, HSG A |
| 13,046 | 39 | >75% Grass cover, Good, HSG A |
| * 4,417 | 86 | Green Roofs, HSG A |
| 8,713 | 98 | Roofs, HSG B |
| 17,198 | 98 | Paved parking, HSG B |
| 106,168 | 61 | >75% Grass cover, Good, HSG B |
| 789 | 85 | Gravel roads, HSG B |
| 42,693 | 55 | Woods, Good, HSG B |
| * 524 | 98 | Green Roofs, HSG B |
| 16,440 | 98 | Roofs, HSG C |
| 18,177 | 98 | Paved parking, HSG C |
| 89,512 | 74 | >75% Grass cover, Good, HSG C |
| 1,676 | 89 | Gravel roads, HSG C |
| 40,892 | 70 | Woods, Good, HSG C |
| * 8,525 | 86 | Green Roofs, HSG C |
| 387,859 | 72 | Weighted Average |
| 307,718 | | 79.34% Pervious Area |
| 80,141 | | 20.66% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|--|
| 4.9 | 50 | 0.2180 | 0.17 | | Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.99" |
| 3.7 | 885 | 0.3200 | 3.96 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.4 | 273 | 0.1000 | 10.16 | 80.27 | Channel Flow, Area= 7.9 sf Perim= 12.0' r= 0.66' n= 0.035 Earth, dense weeds |
| 1.5 | 189 | 0.0860 | 2.05 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.3 | 53 | 0.0470 | 3.46 | 8.31 | Channel Flow, Area= 2.4 sf Perim= 10.4' r= 0.23' n= 0.035 Earth, dense weeds |
| 0.2 | 309 | 0.1500 | 23.02 | 40.68 | Pipe Channel, 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior |
| 0.4 | 186 | 0.0100 | 7.20 | 22.62 | Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior |
| 11.4 | 1,945 | Total | | | |

Subcatchment P-2A: TRIB. TO U/G DETENTION

Hydrograph



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Type III 24-hr 10-Year Rainfall=4.29"

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Summary for Subcatchment P-2B: TRIB. TO WETLAND SERIES 'C'

Runoff = 4.12 cfs @ 12.19 hrs, Volume= 19,755 cf, Depth= 0.80"

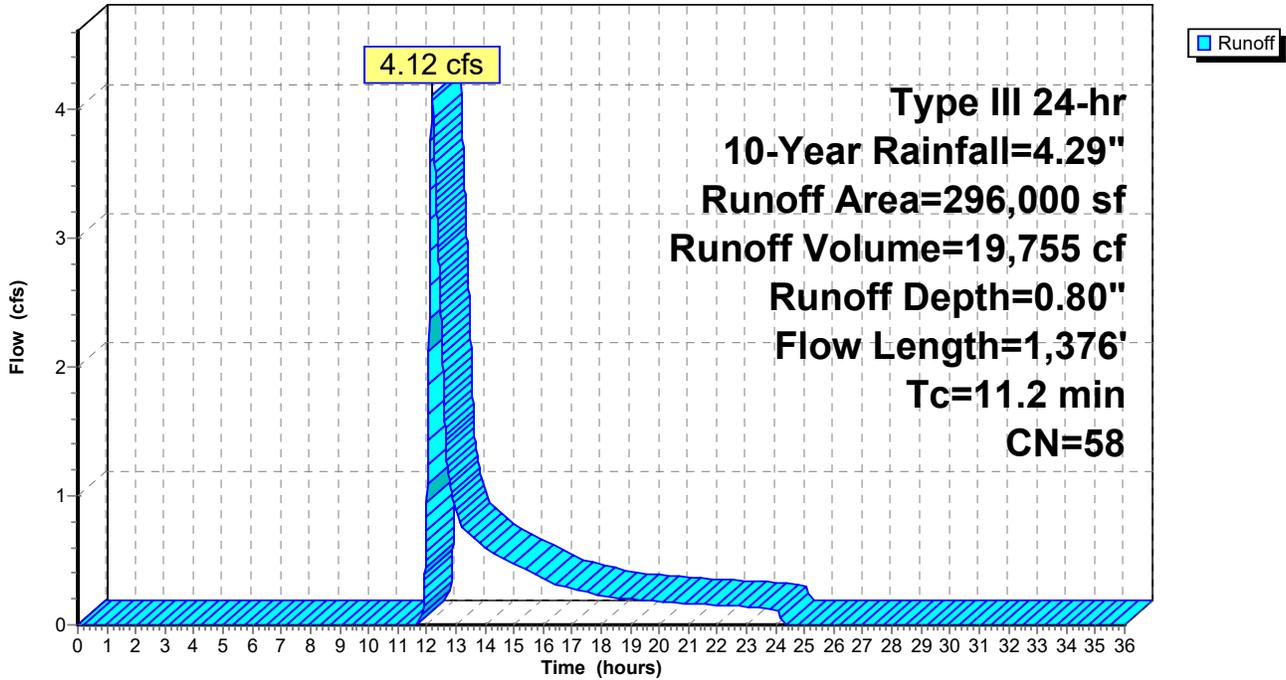
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.29"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 95 | 98 | Roofs, HSG A |
| 1,112 | 98 | Paved parking, HSG A |
| 91,315 | 39 | >75% Grass cover, Good, HSG A |
| * 42,036 | 74 | Sports Field (Runoff), HSG A |
| 32,167 | 30 | Woods, Good, HSG A |
| 6,484 | 61 | >75% Grass cover, Good, HSG B |
| 1,713 | 55 | Woods, Good, HSG B |
| 292 | 98 | Paved parking, HSG C |
| 74,669 | 74 | >75% Grass cover, Good, HSG C |
| 46,117 | 70 | Woods, Good, HSG C |
| 296,000 | 58 | Weighted Average |
| 294,501 | | 99.49% Pervious Area |
| 1,499 | | 0.51% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|--|
| 4.6 | 50 | 0.2500 | 0.18 | | Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.99" |
| 5.1 | 667 | 0.1900 | 2.18 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 0.9 | 165 | 0.1800 | 2.97 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.4 | 245 | 0.0410 | 9.19 | 7.21 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 0.2 | 249 | 0.1840 | 17.38 | 215.52 | Channel Flow, Area= 12.4 sf Perim= 13.3' r= 0.93' n= 0.035 Earth, dense weeds |
| 11.2 | 1,376 | Total | | | |

Subcatchment P-2B: TRIB. TO WETLAND SERIES 'C'

Hydrograph



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Type III 24-hr 10-Year Rainfall=4.29"

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Summary for Subcatchment P-3A: TRIB. TO U/G DETENTION

Runoff = 1.49 cfs @ 12.20 hrs, Volume= 6,641 cf, Depth= 1.08"

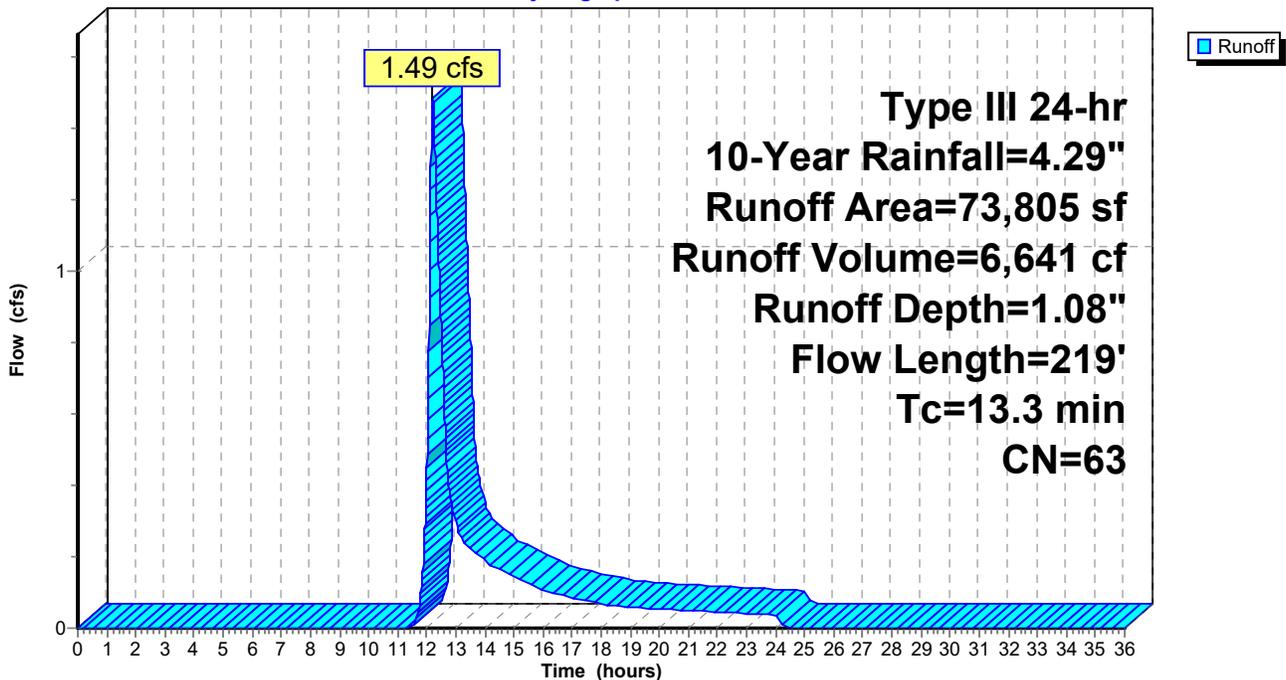
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.29"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 22,446 | 39 | >75% Grass cover, Good, HSG A |
| * 12,840 | 74 | Sports Field (Runoff), HSG A |
| * 38,519 | 74 | Sports Field (UD), HSG A |
| 73,805 | 63 | Weighted Average |
| 73,805 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|--|
| 11.2 | 50 | 0.0100 | 0.07 | | Sheet Flow, Grass: Dense n= 0.240 P2= 2.99" |
| 1.9 | 103 | 0.0165 | 0.90 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.2 | 66 | 0.0200 | 6.42 | 5.04 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 13.3 | 219 | Total | | | |

Subcatchment P-3A: TRIB. TO U/G DETENTION

Hydrograph



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Type III 24-hr 10-Year Rainfall=4.29"

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Summary for Subcatchment P-3C: TRIB. TO U/G DETENTION

Runoff = 2.50 cfs @ 12.15 hrs, Volume= 9,850 cf, Depth= 1.08"

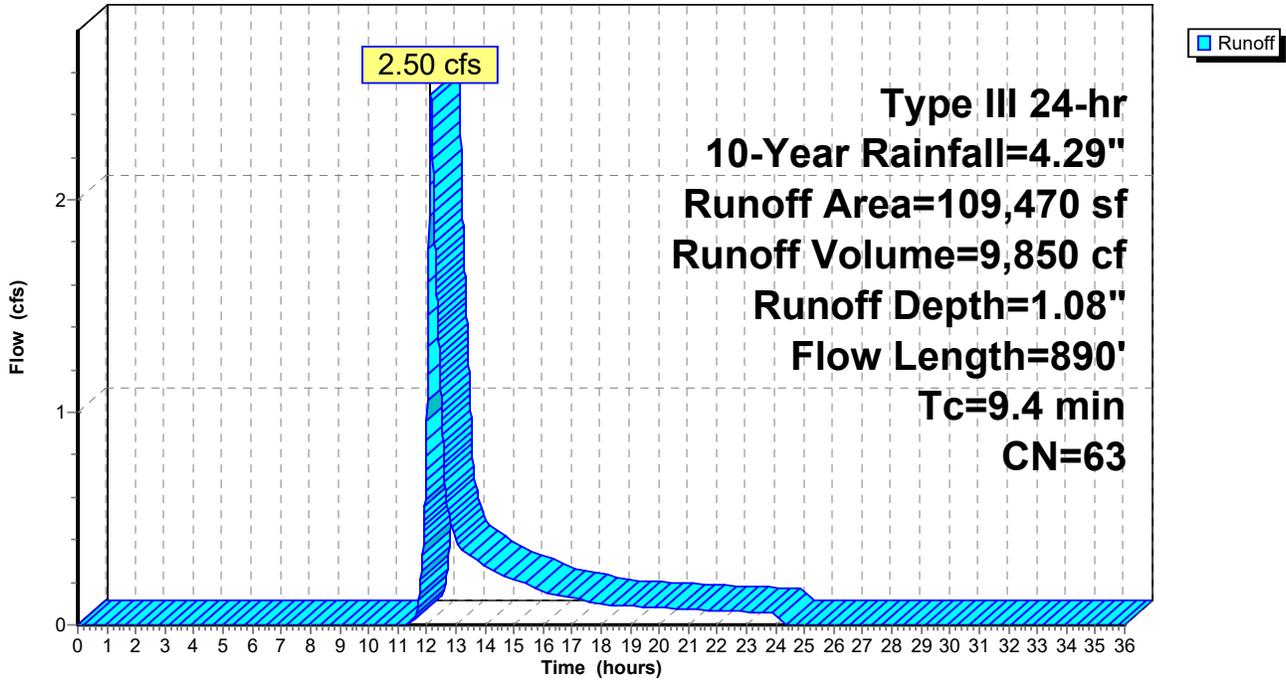
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.29"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 30,634 | 39 | >75% Grass cover, Good, HSG A |
| * 9,115 | 74 | Sports Field (Runoff), HSG A |
| * 13,672 | 74 | Sports Field (UD), HSG A |
| 729 | 61 | >75% Grass cover, Good, HSG B |
| 838 | 55 | Woods, Good, HSG B |
| 17,287 | 74 | >75% Grass cover, Good, HSG C |
| 37,195 | 70 | Woods, Good, HSG C |
| 109,470 | 63 | Weighted Average |
| 109,470 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|--|
| 4.9 | 50 | 0.2180 | 0.17 | | Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.99" |
| 1.1 | 223 | 0.2300 | 3.36 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 2.4 | 348 | 0.2400 | 2.45 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 0.7 | 148 | 0.2400 | 3.43 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.3 | 121 | 0.0200 | 6.42 | 5.04 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 9.4 | 890 | Total | | | |

Subcatchment P-3C: TRIB. TO U/G DETENTION

Hydrograph



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Type III 24-hr 10-Year Rainfall=4.29"

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Summary for Subcatchment P-4: TRIB. TO WETLAND SERIES 'E' & 'W1'

Runoff = 16.94 cfs @ 12.36 hrs, Volume= 93,805 cf, Depth= 1.02"

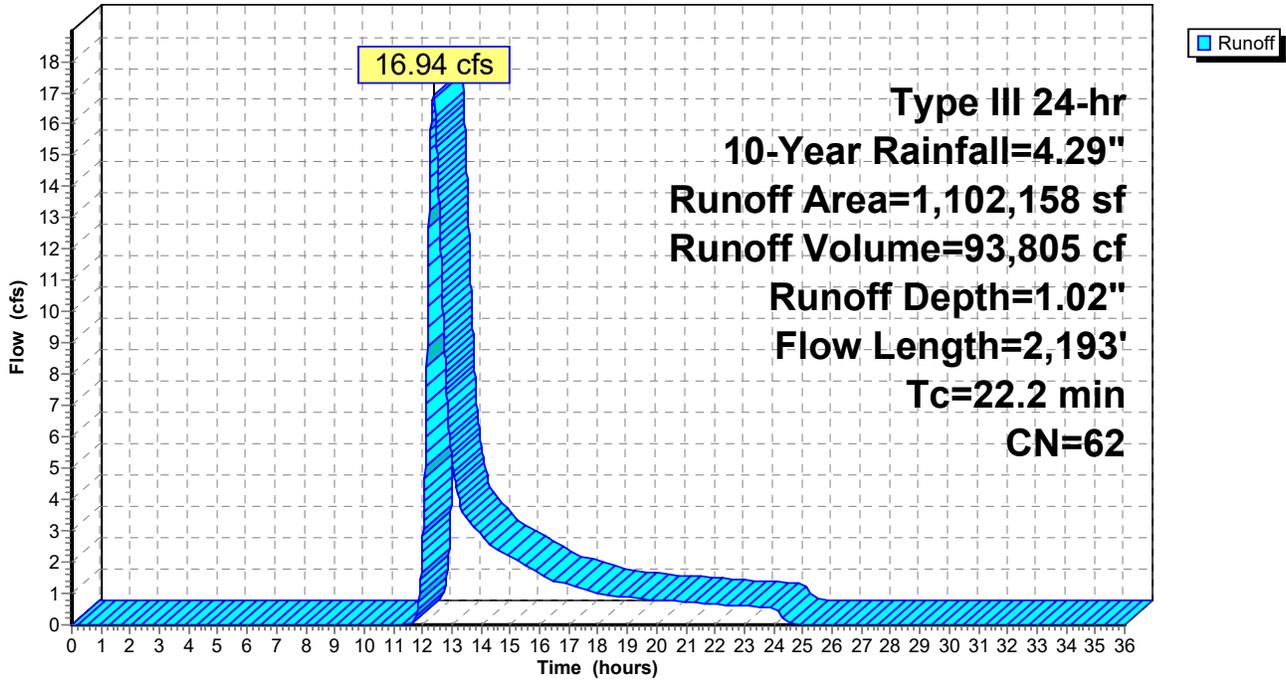
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.29"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 538 | 98 | Roofs, HSG A |
| 70,475 | 39 | >75% Grass cover, Good, HSG A |
| 6,194 | 76 | Gravel roads, HSG A |
| 47,608 | 30 | Woods, Good, HSG A |
| 93,378 | 61 | >75% Grass cover, Good, HSG B |
| 291,775 | 55 | Woods, Good, HSG B |
| 93,088 | 74 | >75% Grass cover, Good, HSG C |
| 499,102 | 70 | Woods, Good, HSG C |
| 1,102,158 | 62 | Weighted Average |
| 1,101,620 | | 99.95% Pervious Area |
| 538 | | 0.05% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|--|
| 7.9 | 50 | 0.0660 | 0.11 | | Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.99" |
| 4.6 | 613 | 0.2000 | 2.24 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 2.1 | 431 | 0.4600 | 3.39 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 4.9 | 729 | 0.2500 | 2.50 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 1.7 | 99 | 0.0200 | 0.99 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.8 | 135 | 0.3000 | 2.74 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 0.2 | 136 | 0.0850 | 11.51 | 180.77 | Channel Flow, Area= 15.7 sf Perim= 17.5' r= 0.90' n= 0.035 Earth, dense weeds |
| 22.2 | 2,193 | Total | | | |

Subcatchment P-4: TRIB. TO WETLAND SERIES 'E' & 'W1'

Hydrograph



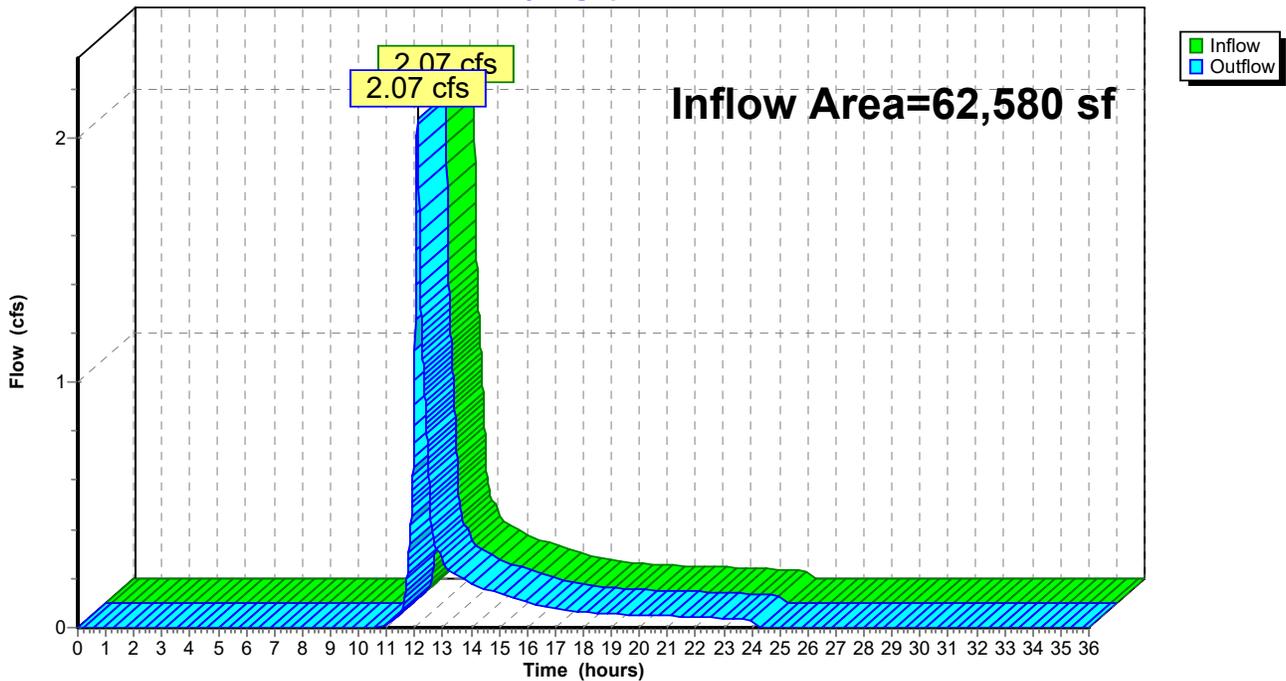
Summary for Reach DP10: DP10

Inflow Area = 62,580 sf, 45.24% Impervious, Inflow Depth = 1.33" for 10-Year event
Inflow = 2.07 cfs @ 12.10 hrs, Volume= 6,921 cf
Outflow = 2.07 cfs @ 12.10 hrs, Volume= 6,921 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach DP10: DP10

Hydrograph



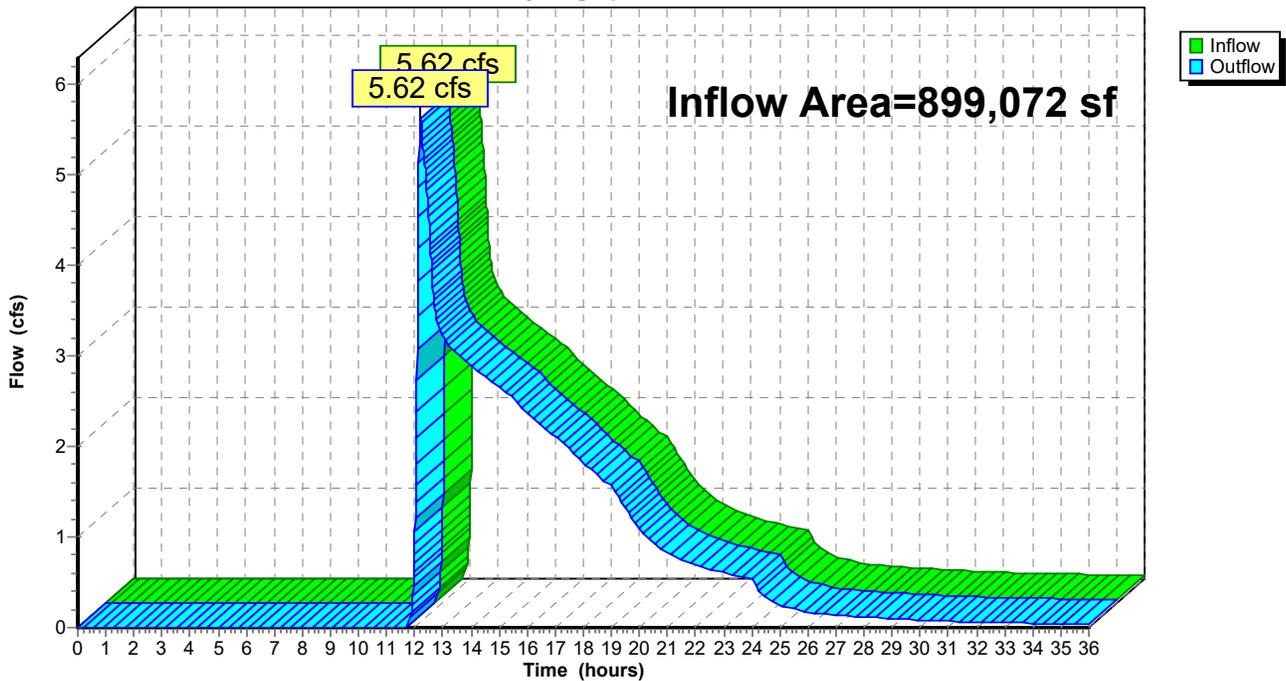
Summary for Reach DP20: DP20

Inflow Area = 899,072 sf, 9.08% Impervious, Inflow Depth > 1.15" for 10-Year event
Inflow = 5.62 cfs @ 12.21 hrs, Volume= 86,176 cf
Outflow = 5.62 cfs @ 12.21 hrs, Volume= 86,176 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach DP20: DP20

Hydrograph



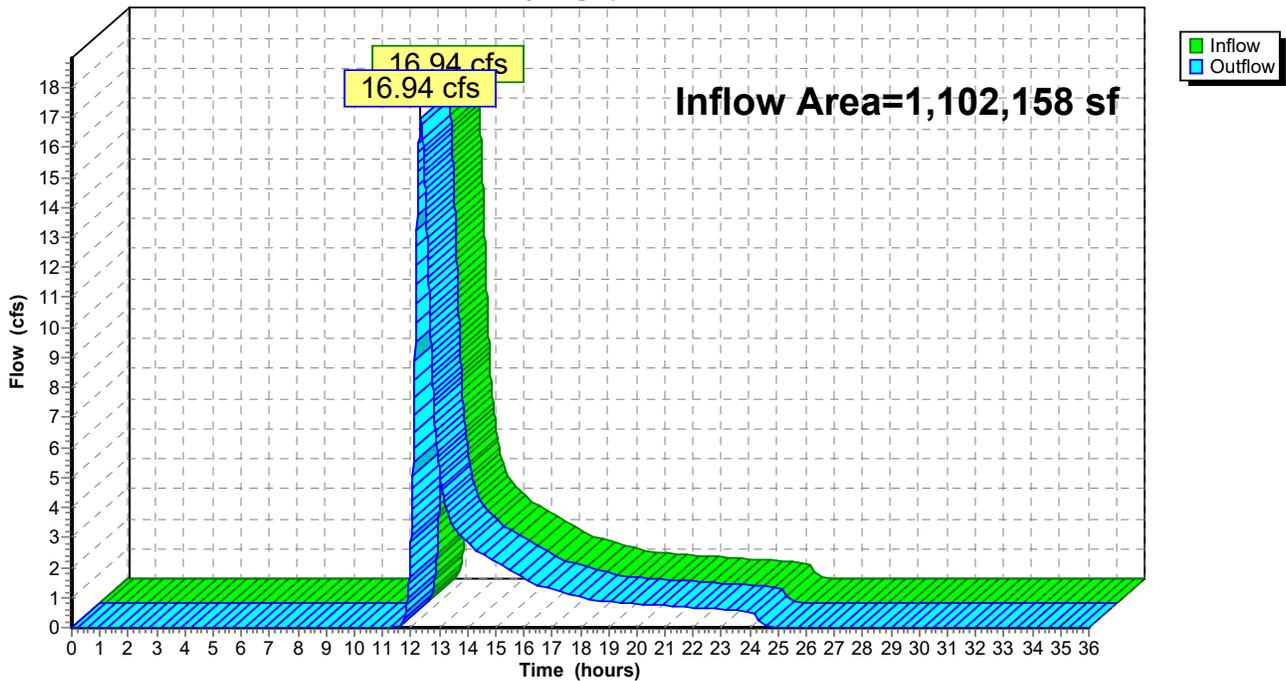
Summary for Reach DP30: DP30

Inflow Area = 1,102,158 sf, 0.05% Impervious, Inflow Depth = 1.02" for 10-Year event
Inflow = 16.94 cfs @ 12.36 hrs, Volume= 93,805 cf
Outflow = 16.94 cfs @ 12.36 hrs, Volume= 93,805 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach DP30: DP30

Hydrograph



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Summary for Pond 1P: U/G FB FIELD

Inflow Area = 571,134 sf, 14.03% Impervious, Inflow Depth > 1.51" for 10-Year event
 Inflow = 18.04 cfs @ 12.17 hrs, Volume= 71,660 cf, Incl. 0.01 cfs Base Flow
 Outflow = 2.34 cfs @ 13.25 hrs, Volume= 66,398 cf, Atten= 87%, Lag= 64.8 min
 Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Primary = 2.34 cfs @ 13.25 hrs, Volume= 66,398 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 324.86' @ 13.25 hrs Surf.Area= 34,076 sf Storage= 30,768 cf

Plug-Flow detention time= 211.5 min calculated for 66,398 cf (93% of inflow)
 Center-of-Mass det. time= 170.6 min (1,036.4 - 865.8)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|---------|---------------|---|
| #1A | 323.25' | 15,421 cf | 321.21'W x 103.44'L x 4.17'H Field A 138,437 cf Overall - 99,884 cf Embedded = 38,553 cf x 40.0% Voids |
| #2A | 324.25' | 67,137 cf | StormTrap ST1 SingleTrap 2-6 x 322 Inside #1 Inside= 82.7"W x 30.0"H => 14.83 sf x 14.06'L = 208.5 cf Outside= 82.7"W x 38.0"H => 21.84 sf x 14.06'L = 307.1 cf 322 Chambers in 46 Rows 317.21' x 98.44' Core + 0.00' x 0.50' Border = 317.21' x 99.44' System |
| #3B | 323.25' | 600 cf | 24.69'W x 33.13'L x 4.17'H Field B 3,407 cf Overall - 1,908 cf Embedded = 1,499 cf x 40.0% Voids |
| #4B | 324.25' | 1,251 cf | StormTrap ST1 SingleTrap 2-6 x 6 Inside #3 Inside= 82.7"W x 30.0"H => 14.83 sf x 14.06'L = 208.5 cf Outside= 82.7"W x 38.0"H => 21.84 sf x 14.06'L = 307.1 cf 6 Chambers in 3 Rows 20.69' x 28.13' Core + 0.00' x 0.50' Border = 20.69' x 29.13' System |
| #5 | 324.25' | 93 cf | 18.0" Round Pipe Storage L= 52.6' S= 0.0200 '/' |
| | | 84,502 cf | Total Available Storage |

Storage Group A created with Chamber Wizard
 Storage Group B created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|---------|--|
| #1 | Discarded | 323.25' | 2.410 in/hr Exfiltration X 0.00 over Surface area Phase-In= 0.10' |
| #2 | Primary | 315.36' | 18.0" Round Culvert L= 43.6' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 315.36' / 311.00' S= 0.1000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf |
| #3 | Device 2 | 323.51' | 4.0" Vert. WQV-RECHARGE Orifice C= 0.600 |
| #4 | Device 2 | 323.81' | 15.0" W x 4.0" H Vert. 2-YR Orifice C= 0.600 |
| #5 | Device 2 | 324.86' | 15.0" W x 4.0" H Vert. 10-YR Orifice C= 0.600 |
| #6 | Device 2 | 325.41' | 15.0" W x 4.0" H Vert. 25-YR Orifice C= 0.600 |
| #7 | Device 2 | 326.57' | 4.0' long x 0.18' rise 100-YR Sharp-Crested Rectangular Weir 2 End Contraction(s) |

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Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=323.25' (Free Discharge)

↑1=Exfiltration (Controls 0.00 cfs)

Primary OutFlow Max=2.34 cfs @ 13.25 hrs HW=324.86' (Free Discharge)

↑2=Culvert (Passes 2.34 cfs of 25.17 cfs potential flow)

↑3=WQV-RECHARGE Orifice (Orifice Controls 0.46 cfs @ 5.24 fps)

↑4=2-YR Orifice (Orifice Controls 1.88 cfs @ 4.52 fps)

↑5=10-YR Orifice (Controls 0.00 cfs)

↑6=25-YR Orifice (Controls 0.00 cfs)

↑7=100-YR Sharp-Crested Rectangular Weir(Controls 0.00 cfs)

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Type III 24-hr 10-Year Rainfall=4.29"

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Pond 1P: U/G FB FIELD - Chamber Wizard Field A

Chamber Model = StormTrap ST1 SingleTrap 2-6 (StormTrap ST1 SingleTrap® Type VI)

Inside= 82.7"W x 30.0"H => 14.83 sf x 14.06'L = 208.5 cf

Outside= 82.7"W x 38.0"H => 21.84 sf x 14.06'L = 307.1 cf

7 Chambers/Row x 14.06' Long = 98.44' Row Length +6.0" Border x 2 +24.0" End Stone x 2 = 103.44' Base Length

46 Rows x 82.7" Wide + 24.0" Side Stone x 2 = 321.21' Base Width

12.0" Base + 38.0" Chamber Height = 4.17' Field Height

322 Chambers x 208.5 cf = 67,137.3 cf Chamber Storage

322 Chambers x 307.1 cf + 1,004.5 cf Border = 99,884.3 cf Displacement

138,437.4 cf Field - 99,884.3 cf Chambers = 38,553.2 cf Stone x 40.0% Voids = 15,421.3 cf Stone Storage

Chamber Storage + Stone Storage = 82,558.6 cf = 1.895 af

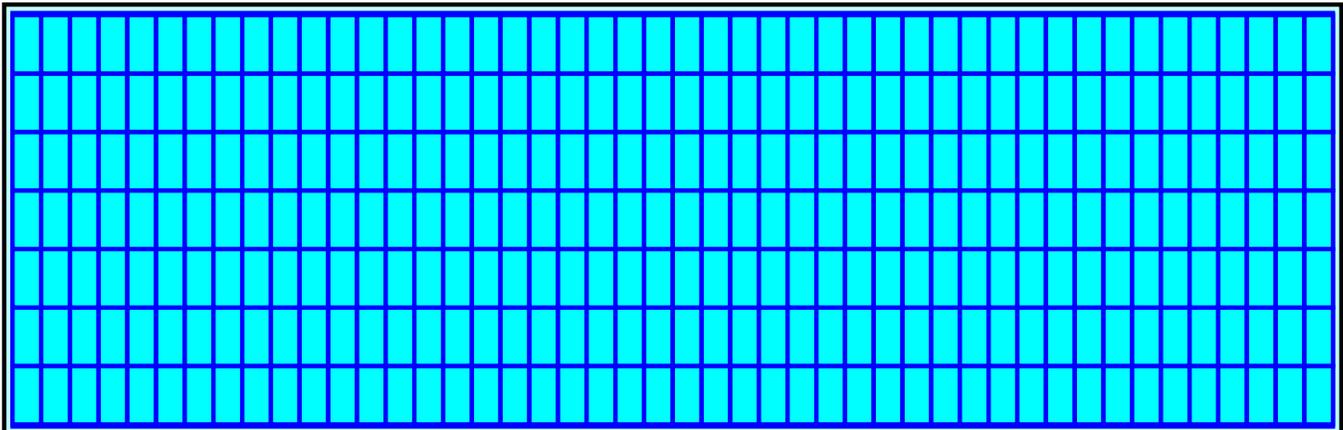
Overall Storage Efficiency = 59.6%

Overall System Size = 103.44' x 321.21' x 4.17'

322 Chambers (plus border)

5,127.3 cy Field

1,427.9 cy Stone



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Type III 24-hr 10-Year Rainfall=4.29"

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Pond 1P: U/G FB FIELD - Chamber Wizard Field B

Chamber Model = StormTrap ST1 SingleTrap 2-6 (StormTrap ST1 SingleTrap® Type VI)

Inside= 82.7"W x 30.0"H => 14.83 sf x 14.06'L = 208.5 cf

Outside= 82.7"W x 38.0"H => 21.84 sf x 14.06'L = 307.1 cf

2 Chambers/Row x 14.06' Long = 28.13' Row Length +6.0" Border x 2 +24.0" End Stone x 2 = 33.13' Base Length

3 Rows x 82.7" Wide + 24.0" Side Stone x 2 = 24.69' Base Width

12.0" Base + 38.0" Chamber Height = 4.17' Field Height

6 Chambers x 208.5 cf = 1,251.0 cf Chamber Storage

6 Chambers x 307.1 cf + 65.5 cf Border = 1,908.0 cf Displacement

3,407.4 cf Field - 1,908.0 cf Chambers = 1,499.4 cf Stone x 40.0% Voids = 599.8 cf Stone Storage

Chamber Storage + Stone Storage = 1,850.8 cf = 0.042 af

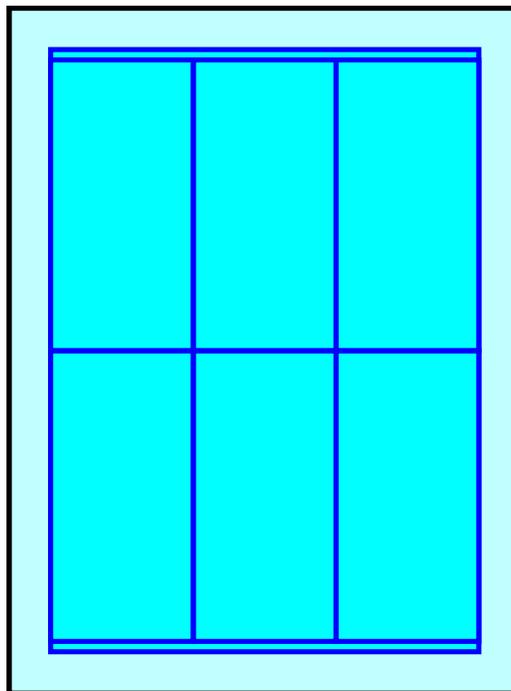
Overall Storage Efficiency = 54.3%

Overall System Size = 33.13' x 24.69' x 4.17'

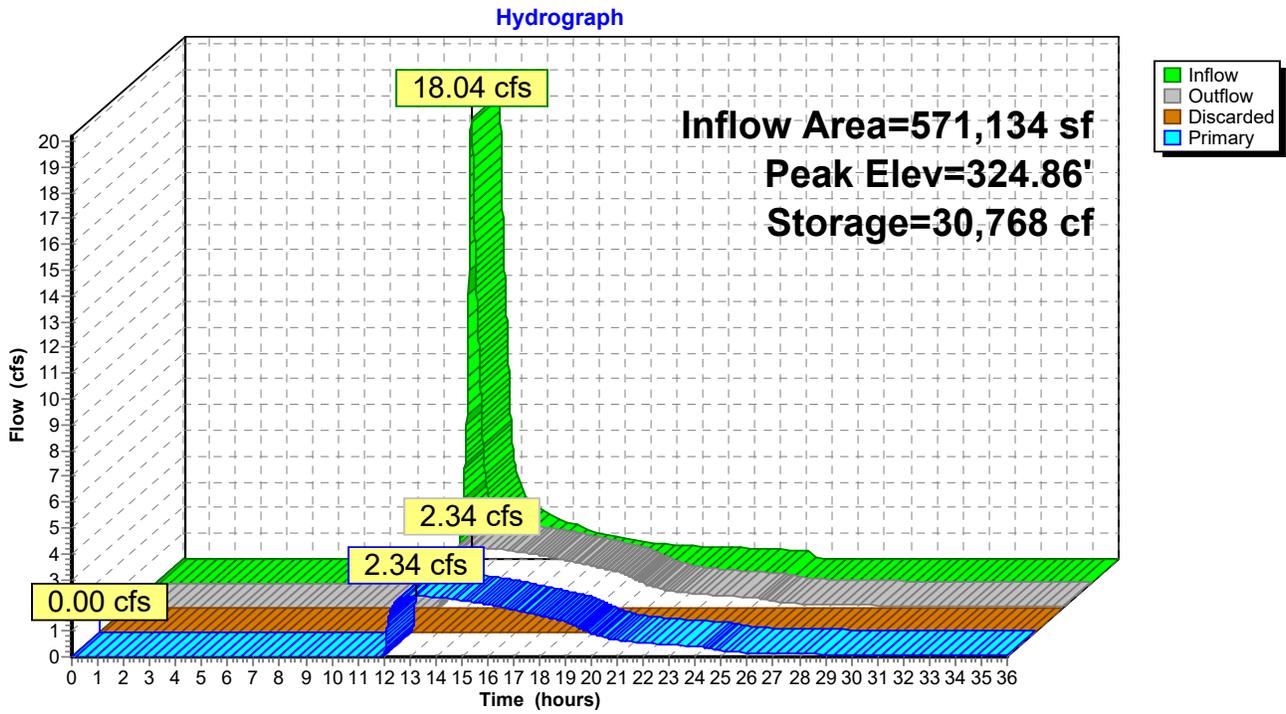
6 Chambers (plus border)

126.2 cy Field

55.5 cy Stone



Pond 1P: U/G FB FIELD



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Type III 24-hr 25-Year Rainfall=5.28"

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Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 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 P-1: TRIB. TO WETLAND Runoff Area=62,580 sf 45.24% Impervious Runoff Depth=2.00"
Flow Length=459' Tc=6.3 min CN=67 Runoff=3.25 cfs 10,433 cf

Subcatchment P-2A: TRIB. TO U/G Runoff Area=387,859 sf 20.66% Impervious Runoff Depth=2.42"
Flow Length=1,945' Tc=11.4 min CN=72 Runoff=20.89 cfs 78,078 cf

Subcatchment P-2B: TRIB. TO WETLAND Runoff Area=296,000 sf 0.51% Impervious Runoff Depth=1.33"
Flow Length=1,376' Tc=11.2 min CN=58 Runoff=7.79 cfs 32,706 cf

Subcatchment P-3A: TRIB. TO U/G Runoff Area=73,805 sf 0.00% Impervious Runoff Depth=1.69"
Flow Length=219' Tc=13.3 min CN=63 Runoff=2.49 cfs 10,389 cf

Subcatchment P-3B: TRIB. TO WETLAND Runoff Area=31,938 sf 0.00% Impervious Runoff Depth=0.09"
Flow Length=207' Tc=6.0 min CN=34 Runoff=0.01 cfs 250 cf

Subcatchment P-3C: TRIB. TO U/G Runoff Area=109,470 sf 0.00% Impervious Runoff Depth=1.69"
Flow Length=890' Tc=9.4 min CN=63 Runoff=4.17 cfs 15,409 cf

Subcatchment P-4: TRIB. TO WETLAND Runoff Area=1,102,158 sf 0.05% Impervious Runoff Depth=1.61"
Flow Length=2,193' Tc=22.2 min CN=62 Runoff=28.70 cfs 148,247 cf

Reach DP10: DP10 Inflow=3.25 cfs 10,433 cf
Outflow=3.25 cfs 10,433 cf

Reach DP20: DP20 Inflow=9.83 cfs 132,817 cf
Outflow=9.83 cfs 132,817 cf

Reach DP30: DP30 Inflow=28.70 cfs 148,247 cf
Outflow=28.70 cfs 148,247 cf

Pond 1P: U/G FB FIELD Peak Elev=325.40' Storage=46,069 cf Inflow=27.39 cfs 105,171 cf
Discarded=0.00 cfs 0 cf Primary=4.17 cfs 99,861 cf Outflow=4.17 cfs 99,861 cf

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Type III 24-hr 25-Year Rainfall=5.28"

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Summary for Subcatchment P-1: TRIB. TO WETLAND SERIES 'A'

Runoff = 3.25 cfs @ 12.10 hrs, Volume= 10,433 cf, Depth= 2.00"

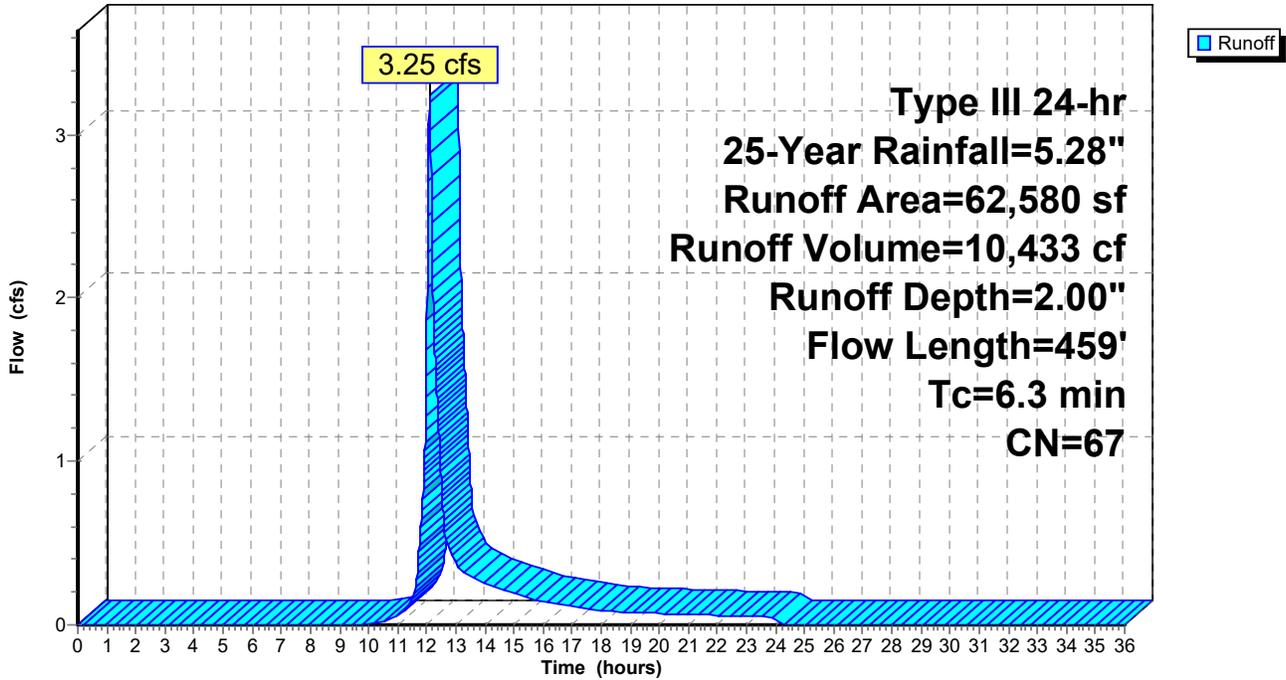
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.28"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 1,283 | 98 | Roofs, HSG A |
| 22,964 | 98 | Paved parking, HSG A |
| 29,273 | 39 | >75% Grass cover, Good, HSG A |
| 2,745 | 98 | Roofs, HSG B |
| 1,256 | 98 | Paved parking, HSG B |
| 4,831 | 61 | >75% Grass cover, Good, HSG B |
| 63 | 98 | Paved parking, HSG C |
| 165 | 74 | >75% Grass cover, Good, HSG C |
| 62,580 | 67 | Weighted Average |
| 34,269 | | 54.76% Pervious Area |
| 28,311 | | 45.24% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|--|
| 4.2 | 50 | 0.1170 | 0.20 | | Sheet Flow, Grass: Dense n= 0.240 P2= 2.99" |
| 1.7 | 202 | 0.0820 | 2.00 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.1 | 26 | 0.0088 | 4.26 | 3.34 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 0.2 | 99 | 0.0280 | 7.59 | 5.96 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 0.1 | 61 | 0.0560 | 10.73 | 8.43 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 0.0 | 21 | 0.0600 | 11.11 | 8.73 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 6.3 | 459 | Total | | | |

Subcatchment P-1: TRIB. TO WETLAND SERIES 'A'

Hydrograph



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Type III 24-hr 25-Year Rainfall=5.28"

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Summary for Subcatchment P-2A: TRIB. TO U/G DETENTION

Runoff = 20.89 cfs @ 12.16 hrs, Volume= 78,078 cf, Depth= 2.42"

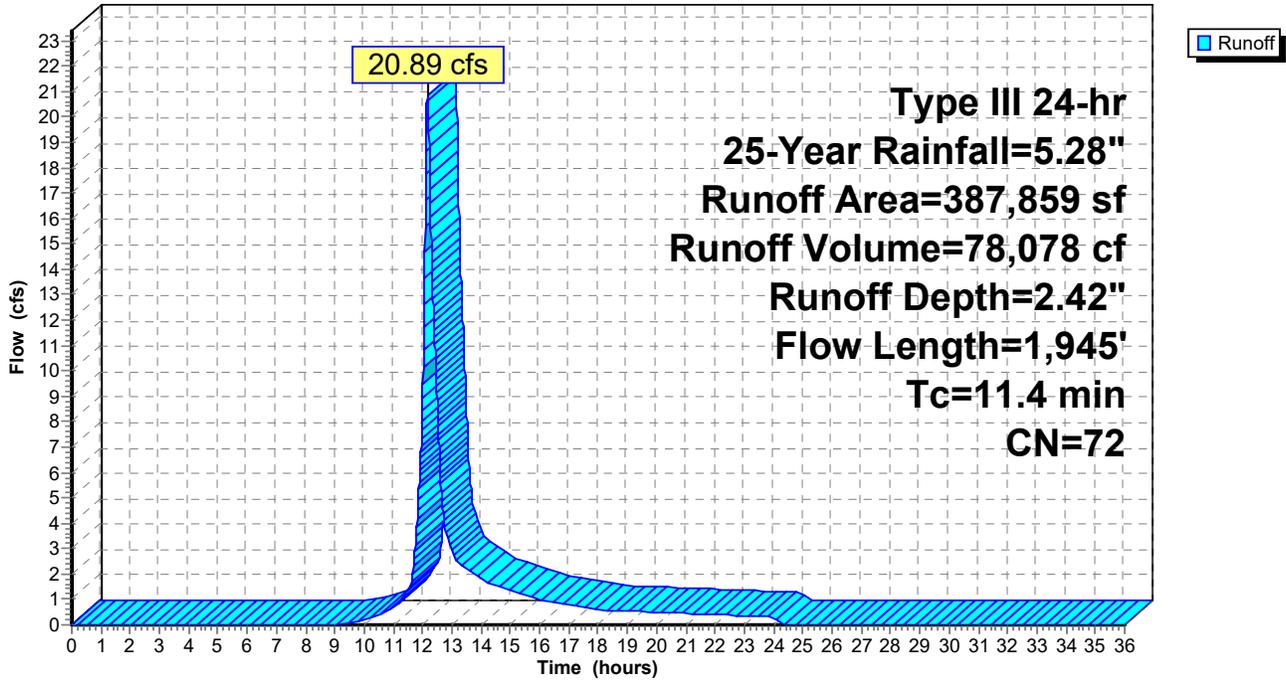
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.28"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 9,845 | 98 | Roofs, HSG A |
| 9,244 | 98 | Paved parking, HSG A |
| 13,046 | 39 | >75% Grass cover, Good, HSG A |
| * 4,417 | 86 | Green Roofs, HSG A |
| 8,713 | 98 | Roofs, HSG B |
| 17,198 | 98 | Paved parking, HSG B |
| 106,168 | 61 | >75% Grass cover, Good, HSG B |
| 789 | 85 | Gravel roads, HSG B |
| 42,693 | 55 | Woods, Good, HSG B |
| * 524 | 98 | Green Roofs, HSG B |
| 16,440 | 98 | Roofs, HSG C |
| 18,177 | 98 | Paved parking, HSG C |
| 89,512 | 74 | >75% Grass cover, Good, HSG C |
| 1,676 | 89 | Gravel roads, HSG C |
| 40,892 | 70 | Woods, Good, HSG C |
| * 8,525 | 86 | Green Roofs, HSG C |
| 387,859 | 72 | Weighted Average |
| 307,718 | | 79.34% Pervious Area |
| 80,141 | | 20.66% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|--|
| 4.9 | 50 | 0.2180 | 0.17 | | Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.99" |
| 3.7 | 885 | 0.3200 | 3.96 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.4 | 273 | 0.1000 | 10.16 | 80.27 | Channel Flow, Area= 7.9 sf Perim= 12.0' r= 0.66' n= 0.035 Earth, dense weeds |
| 1.5 | 189 | 0.0860 | 2.05 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.3 | 53 | 0.0470 | 3.46 | 8.31 | Channel Flow, Area= 2.4 sf Perim= 10.4' r= 0.23' n= 0.035 Earth, dense weeds |
| 0.2 | 309 | 0.1500 | 23.02 | 40.68 | Pipe Channel, 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior |
| 0.4 | 186 | 0.0100 | 7.20 | 22.62 | Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior |
| 11.4 | 1,945 | Total | | | |

Subcatchment P-2A: TRIB. TO U/G DETENTION

Hydrograph



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Type III 24-hr 25-Year Rainfall=5.28"

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Summary for Subcatchment P-2B: TRIB. TO WETLAND SERIES 'C'

Runoff = 7.79 cfs @ 12.17 hrs, Volume= 32,706 cf, Depth= 1.33"

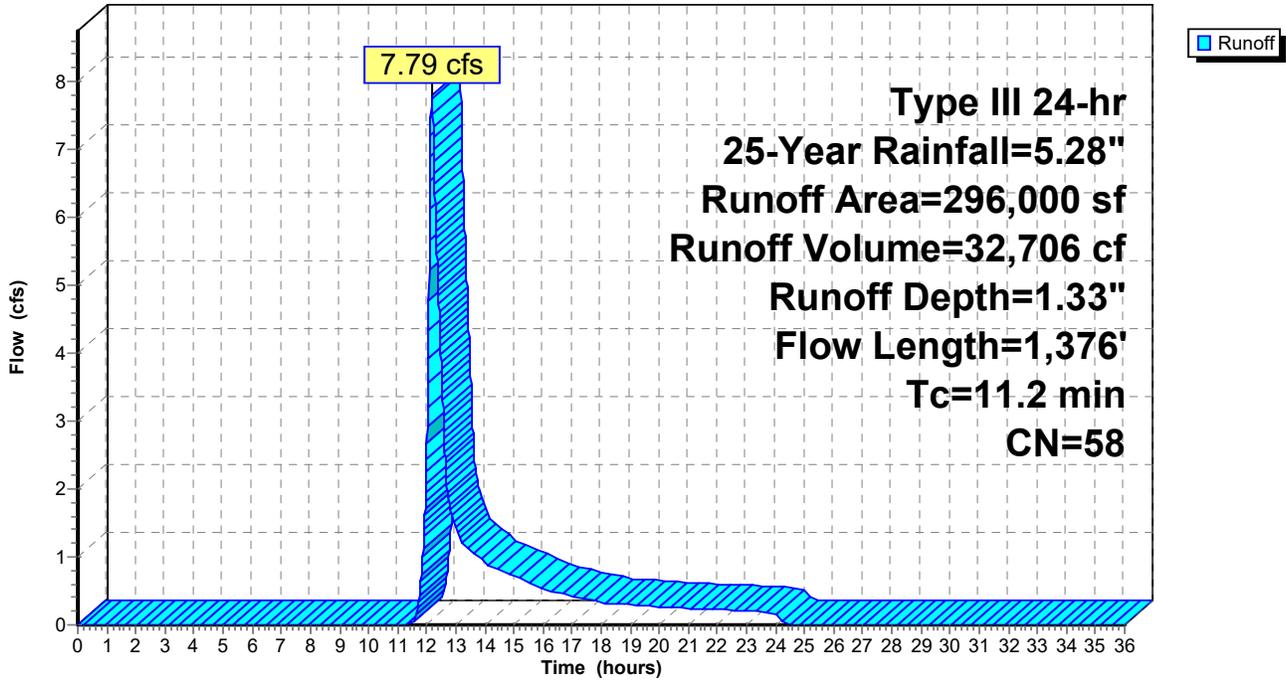
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.28"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 95 | 98 | Roofs, HSG A |
| 1,112 | 98 | Paved parking, HSG A |
| 91,315 | 39 | >75% Grass cover, Good, HSG A |
| * 42,036 | 74 | Sports Field (Runoff), HSG A |
| 32,167 | 30 | Woods, Good, HSG A |
| 6,484 | 61 | >75% Grass cover, Good, HSG B |
| 1,713 | 55 | Woods, Good, HSG B |
| 292 | 98 | Paved parking, HSG C |
| 74,669 | 74 | >75% Grass cover, Good, HSG C |
| 46,117 | 70 | Woods, Good, HSG C |
| 296,000 | 58 | Weighted Average |
| 294,501 | | 99.49% Pervious Area |
| 1,499 | | 0.51% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|--|
| 4.6 | 50 | 0.2500 | 0.18 | | Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.99" |
| 5.1 | 667 | 0.1900 | 2.18 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 0.9 | 165 | 0.1800 | 2.97 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.4 | 245 | 0.0410 | 9.19 | 7.21 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 0.2 | 249 | 0.1840 | 17.38 | 215.52 | Channel Flow, Area= 12.4 sf Perim= 13.3' r= 0.93' n= 0.035 Earth, dense weeds |
| 11.2 | 1,376 | Total | | | |

Subcatchment P-2B: TRIB. TO WETLAND SERIES 'C'

Hydrograph



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Type III 24-hr 25-Year Rainfall=5.28"

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Summary for Subcatchment P-3A: TRIB. TO U/G DETENTION

Runoff = 2.49 cfs @ 12.19 hrs, Volume= 10,389 cf, Depth= 1.69"

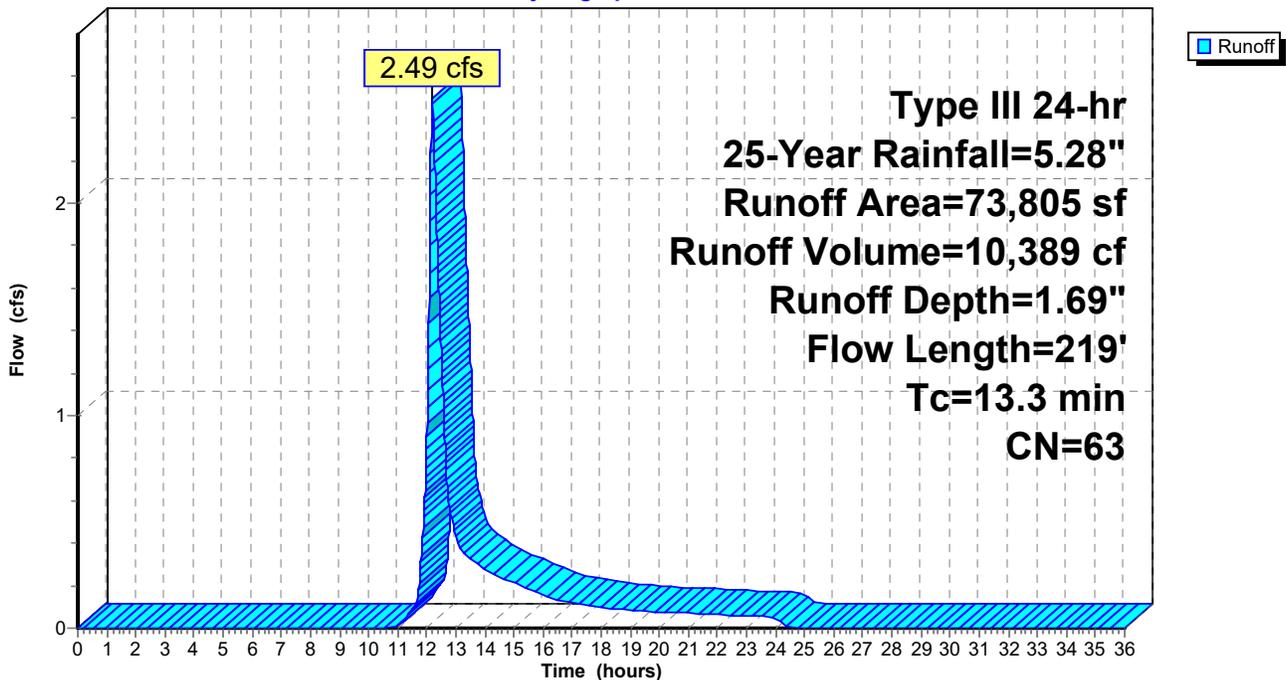
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.28"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 22,446 | 39 | >75% Grass cover, Good, HSG A |
| * 12,840 | 74 | Sports Field (Runoff), HSG A |
| * 38,519 | 74 | Sports Field (UD), HSG A |
| 73,805 | 63 | Weighted Average |
| 73,805 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|--|
| 11.2 | 50 | 0.0100 | 0.07 | | Sheet Flow, Grass: Dense n= 0.240 P2= 2.99" |
| 1.9 | 103 | 0.0165 | 0.90 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.2 | 66 | 0.0200 | 6.42 | 5.04 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 13.3 | 219 | Total | | | |

Subcatchment P-3A: TRIB. TO U/G DETENTION

Hydrograph



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Type III 24-hr 25-Year Rainfall=5.28"

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Summary for Subcatchment P-3B: TRIB. TO WETLAND SERIES 'D'

Runoff = 0.01 cfs @ 15.06 hrs, Volume= 250 cf, Depth= 0.09"

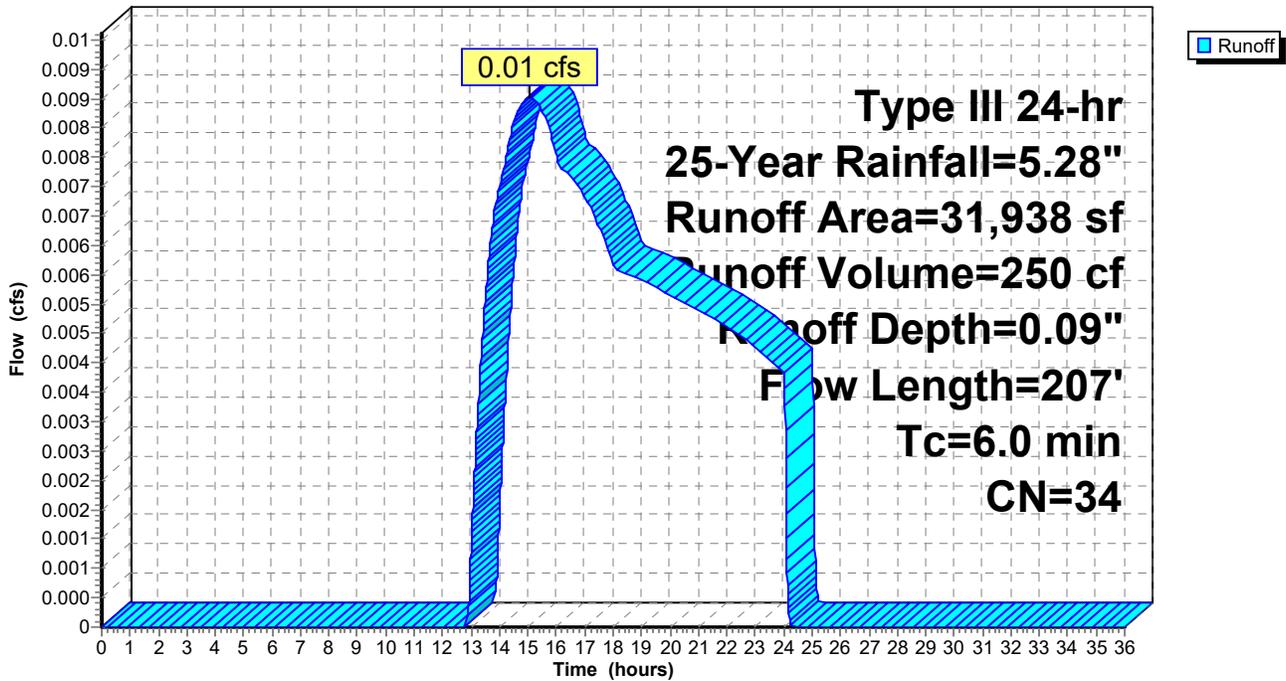
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.28"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 13,356 | 39 | >75% Grass cover, Good, HSG A |
| 18,582 | 30 | Woods, Good, HSG A |
| 31,938 | 34 | Weighted Average |
| 31,938 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|--|-------------------|----------------|---|
| 3.7 | 50 | 0.4500 | 0.23 | | Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.99" |
| 0.2 | 157 | 0.1650 | 12.49 | 96.14 | Channel Flow, Area= 7.7 sf Perim= 12.5' r= 0.62' n= 0.035 Earth, dense weeds |
| 3.9 | 207 | Total, Increased to minimum Tc = 6.0 min | | | |

Subcatchment P-3B: TRIB. TO WETLAND SERIES 'D'

Hydrograph



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Type III 24-hr 25-Year Rainfall=5.28"

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Summary for Subcatchment P-3C: TRIB. TO U/G DETENTION

Runoff = 4.17 cfs @ 12.14 hrs, Volume= 15,409 cf, Depth= 1.69"

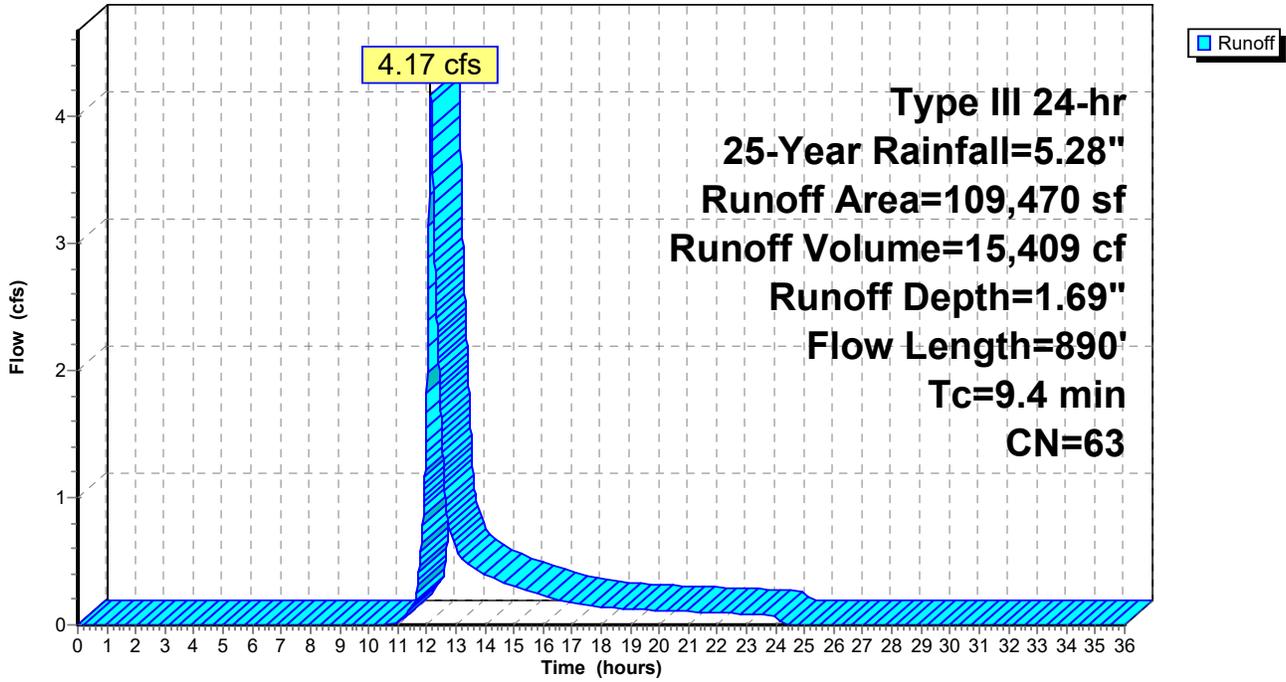
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.28"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 30,634 | 39 | >75% Grass cover, Good, HSG A |
| * 9,115 | 74 | Sports Field (Runoff), HSG A |
| * 13,672 | 74 | Sports Field (UD), HSG A |
| 729 | 61 | >75% Grass cover, Good, HSG B |
| 838 | 55 | Woods, Good, HSG B |
| 17,287 | 74 | >75% Grass cover, Good, HSG C |
| 37,195 | 70 | Woods, Good, HSG C |
| 109,470 | 63 | Weighted Average |
| 109,470 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|--|
| 4.9 | 50 | 0.2180 | 0.17 | | Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.99" |
| 1.1 | 223 | 0.2300 | 3.36 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 2.4 | 348 | 0.2400 | 2.45 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 0.7 | 148 | 0.2400 | 3.43 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.3 | 121 | 0.0200 | 6.42 | 5.04 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 9.4 | 890 | Total | | | |

Subcatchment P-3C: TRIB. TO U/G DETENTION

Hydrograph



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Type III 24-hr 25-Year Rainfall=5.28"

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Summary for Subcatchment P-4: TRIB. TO WETLAND SERIES 'E' & 'W1'

Runoff = 28.70 cfs @ 12.34 hrs, Volume= 148,247 cf, Depth= 1.61"

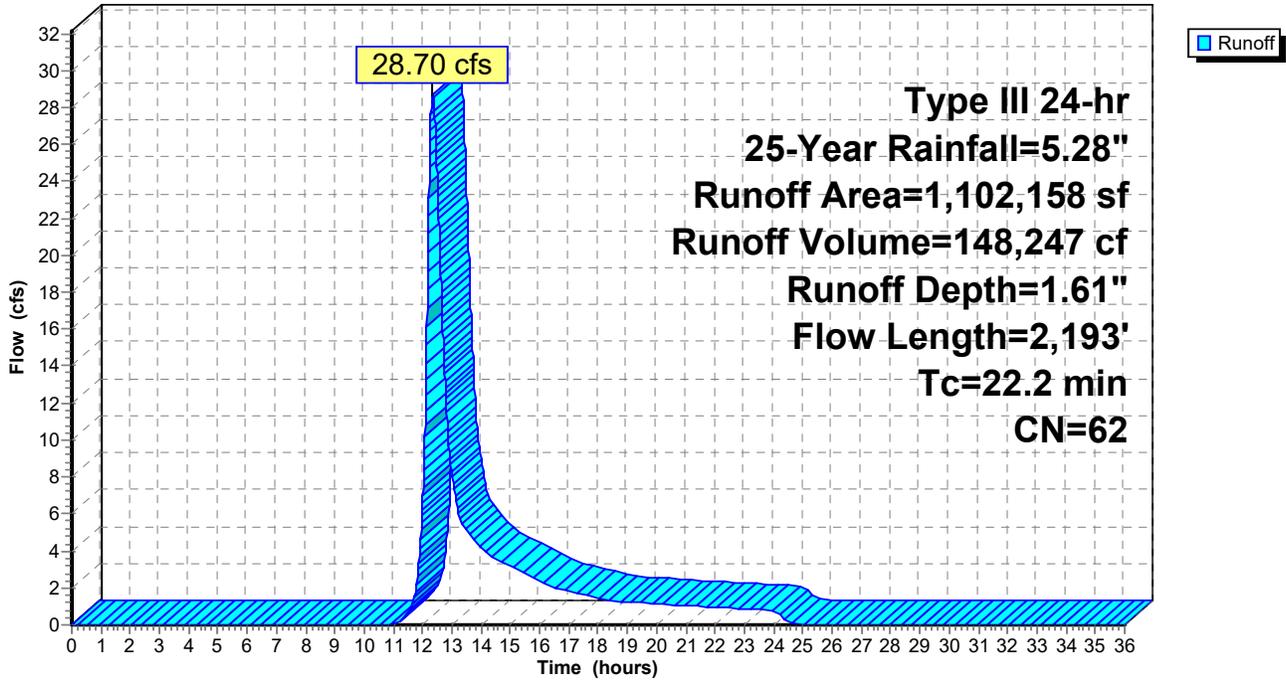
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.28"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 538 | 98 | Roofs, HSG A |
| 70,475 | 39 | >75% Grass cover, Good, HSG A |
| 6,194 | 76 | Gravel roads, HSG A |
| 47,608 | 30 | Woods, Good, HSG A |
| 93,378 | 61 | >75% Grass cover, Good, HSG B |
| 291,775 | 55 | Woods, Good, HSG B |
| 93,088 | 74 | >75% Grass cover, Good, HSG C |
| 499,102 | 70 | Woods, Good, HSG C |
| 1,102,158 | 62 | Weighted Average |
| 1,101,620 | | 99.95% Pervious Area |
| 538 | | 0.05% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|--|
| 7.9 | 50 | 0.0660 | 0.11 | | Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.99" |
| 4.6 | 613 | 0.2000 | 2.24 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 2.1 | 431 | 0.4600 | 3.39 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 4.9 | 729 | 0.2500 | 2.50 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 1.7 | 99 | 0.0200 | 0.99 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.8 | 135 | 0.3000 | 2.74 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 0.2 | 136 | 0.0850 | 11.51 | 180.77 | Channel Flow, Area= 15.7 sf Perim= 17.5' r= 0.90' n= 0.035 Earth, dense weeds |
| 22.2 | 2,193 | Total | | | |

Subcatchment P-4: TRIB. TO WETLAND SERIES 'E' & 'W1'

Hydrograph



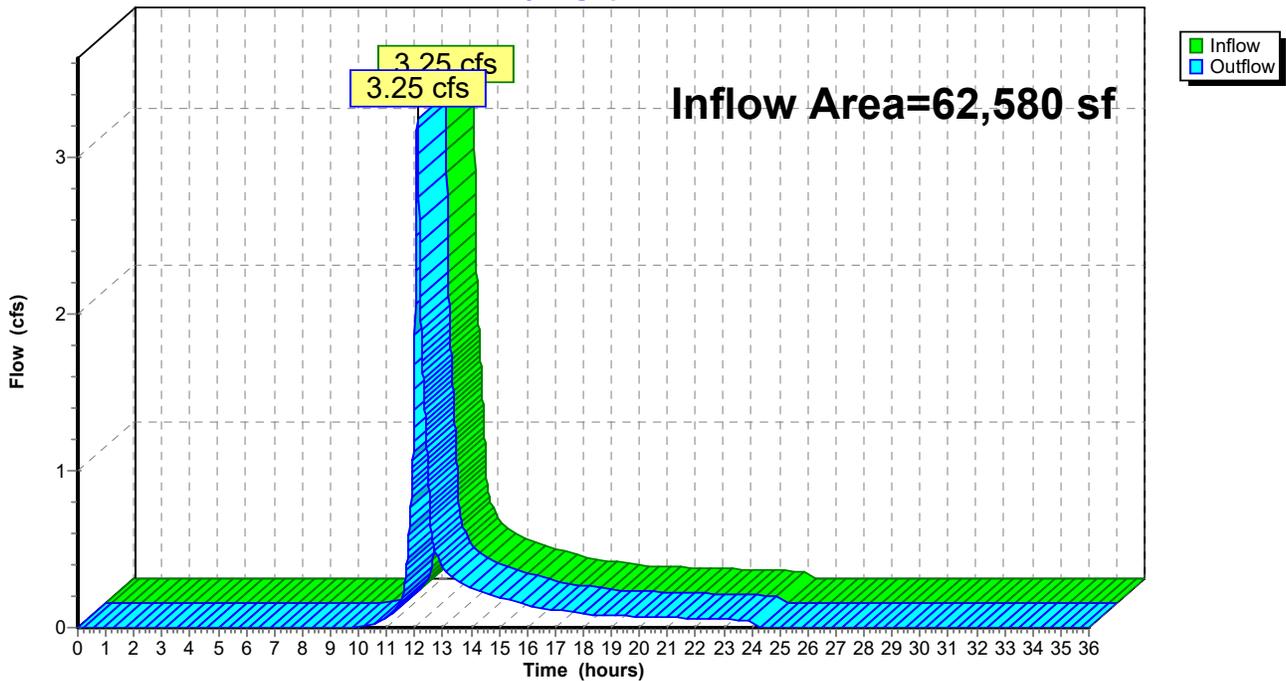
Summary for Reach DP10: DP10

Inflow Area = 62,580 sf, 45.24% Impervious, Inflow Depth = 2.00" for 25-Year event
Inflow = 3.25 cfs @ 12.10 hrs, Volume= 10,433 cf
Outflow = 3.25 cfs @ 12.10 hrs, Volume= 10,433 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach DP10: DP10

Hydrograph



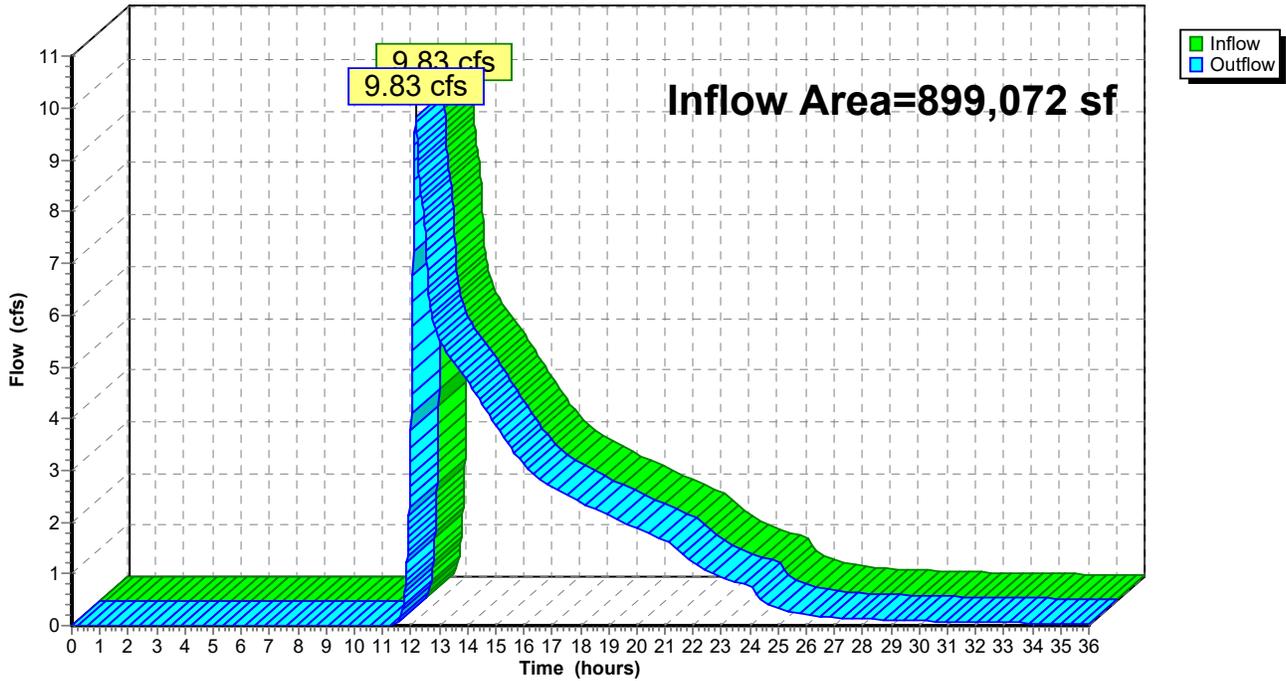
Summary for Reach DP20: DP20

Inflow Area = 899,072 sf, 9.08% Impervious, Inflow Depth > 1.77" for 25-Year event
Inflow = 9.83 cfs @ 12.18 hrs, Volume= 132,817 cf
Outflow = 9.83 cfs @ 12.18 hrs, Volume= 132,817 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach DP20: DP20

Hydrograph



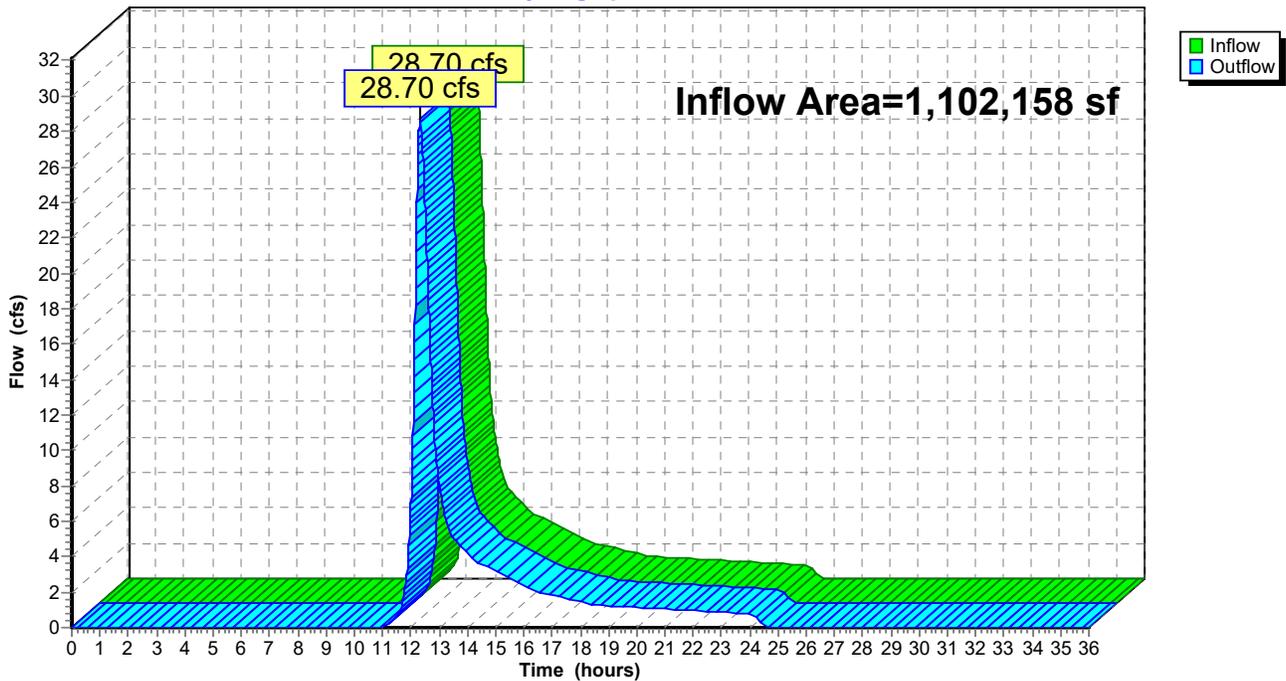
Summary for Reach DP30: DP30

Inflow Area = 1,102,158 sf, 0.05% Impervious, Inflow Depth = 1.61" for 25-Year event
Inflow = 28.70 cfs @ 12.34 hrs, Volume= 148,247 cf
Outflow = 28.70 cfs @ 12.34 hrs, Volume= 148,247 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach DP30: DP30

Hydrograph



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Type III 24-hr 25-Year Rainfall=5.28"

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Summary for Pond 1P: U/G FB FIELD

Inflow Area = 571,134 sf, 14.03% Impervious, Inflow Depth > 2.21" for 25-Year event
 Inflow = 27.39 cfs @ 12.16 hrs, Volume= 105,171 cf, Incl. 0.01 cfs Base Flow
 Outflow = 4.17 cfs @ 12.96 hrs, Volume= 99,861 cf, Atten= 85%, Lag= 47.8 min
 Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Primary = 4.17 cfs @ 12.96 hrs, Volume= 99,861 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 325.40' @ 12.96 hrs Surf.Area= 34,113 sf Storage= 46,069 cf

Plug-Flow detention time= 198.5 min calculated for 99,861 cf (95% of inflow)
 Center-of-Mass det. time= 169.2 min (1,022.5 - 853.3)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|---------|---------------|---|
| #1A | 323.25' | 15,421 cf | 321.21'W x 103.44'L x 4.17'H Field A 138,437 cf Overall - 99,884 cf Embedded = 38,553 cf x 40.0% Voids |
| #2A | 324.25' | 67,137 cf | StormTrap ST1 SingleTrap 2-6 x 322 Inside #1 Inside= 82.7"W x 30.0"H => 14.83 sf x 14.06'L = 208.5 cf Outside= 82.7"W x 38.0"H => 21.84 sf x 14.06'L = 307.1 cf 322 Chambers in 46 Rows 317.21' x 98.44' Core + 0.00' x 0.50' Border = 317.21' x 99.44' System |
| #3B | 323.25' | 600 cf | 24.69'W x 33.13'L x 4.17'H Field B 3,407 cf Overall - 1,908 cf Embedded = 1,499 cf x 40.0% Voids |
| #4B | 324.25' | 1,251 cf | StormTrap ST1 SingleTrap 2-6 x 6 Inside #3 Inside= 82.7"W x 30.0"H => 14.83 sf x 14.06'L = 208.5 cf Outside= 82.7"W x 38.0"H => 21.84 sf x 14.06'L = 307.1 cf 6 Chambers in 3 Rows 20.69' x 28.13' Core + 0.00' x 0.50' Border = 20.69' x 29.13' System |
| #5 | 324.25' | 93 cf | 18.0" Round Pipe Storage L= 52.6' S= 0.0200 '/' |
| | | 84,502 cf | Total Available Storage |

Storage Group A created with Chamber Wizard

Storage Group B created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|---------|--|
| #1 | Discarded | 323.25' | 2.410 in/hr Exfiltration X 0.00 over Surface area Phase-In= 0.10' |
| #2 | Primary | 315.36' | 18.0" Round Culvert L= 43.6' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 315.36' / 311.00' S= 0.1000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf |
| #3 | Device 2 | 323.51' | 4.0" Vert. WQV-RECHARGE Orifice C= 0.600 |
| #4 | Device 2 | 323.81' | 15.0" W x 4.0" H Vert. 2-YR Orifice C= 0.600 |
| #5 | Device 2 | 324.86' | 15.0" W x 4.0" H Vert. 10-YR Orifice C= 0.600 |
| #6 | Device 2 | 325.41' | 15.0" W x 4.0" H Vert. 25-YR Orifice C= 0.600 |
| #7 | Device 2 | 326.57' | 4.0' long x 0.18' rise 100-YR Sharp-Crested Rectangular Weir 2 End Contraction(s) |

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Type III 24-hr 25-Year Rainfall=5.28"

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Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=323.25' (Free Discharge)

↑1=Exfiltration (Controls 0.00 cfs)

Primary OutFlow Max=4.17 cfs @ 12.96 hrs HW=325.40' (Free Discharge)

↑2=Culvert (Passes 4.17 cfs of 25.94 cfs potential flow)

↑3=WQV-RECHARGE Orifice (Orifice Controls 0.55 cfs @ 6.33 fps)

↑4=2-YR Orifice (Orifice Controls 2.39 cfs @ 5.75 fps)

↑5=10-YR Orifice (Orifice Controls 1.22 cfs @ 2.93 fps)

↑6=25-YR Orifice (Controls 0.00 cfs)

↑7=100-YR Sharp-Crested Rectangular Weir(Controls 0.00 cfs)

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Type III 24-hr 25-Year Rainfall=5.28"

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Pond 1P: U/G FB FIELD - Chamber Wizard Field A

Chamber Model = StormTrap ST1 SingleTrap 2-6 (StormTrap ST1 SingleTrap® Type VI)

Inside= 82.7"W x 30.0"H => 14.83 sf x 14.06'L = 208.5 cf

Outside= 82.7"W x 38.0"H => 21.84 sf x 14.06'L = 307.1 cf

7 Chambers/Row x 14.06' Long = 98.44' Row Length +6.0" Border x 2 +24.0" End Stone x 2 = 103.44' Base Length

46 Rows x 82.7" Wide + 24.0" Side Stone x 2 = 321.21' Base Width

12.0" Base + 38.0" Chamber Height = 4.17' Field Height

322 Chambers x 208.5 cf = 67,137.3 cf Chamber Storage

322 Chambers x 307.1 cf + 1,004.5 cf Border = 99,884.3 cf Displacement

138,437.4 cf Field - 99,884.3 cf Chambers = 38,553.2 cf Stone x 40.0% Voids = 15,421.3 cf Stone Storage

Chamber Storage + Stone Storage = 82,558.6 cf = 1.895 af

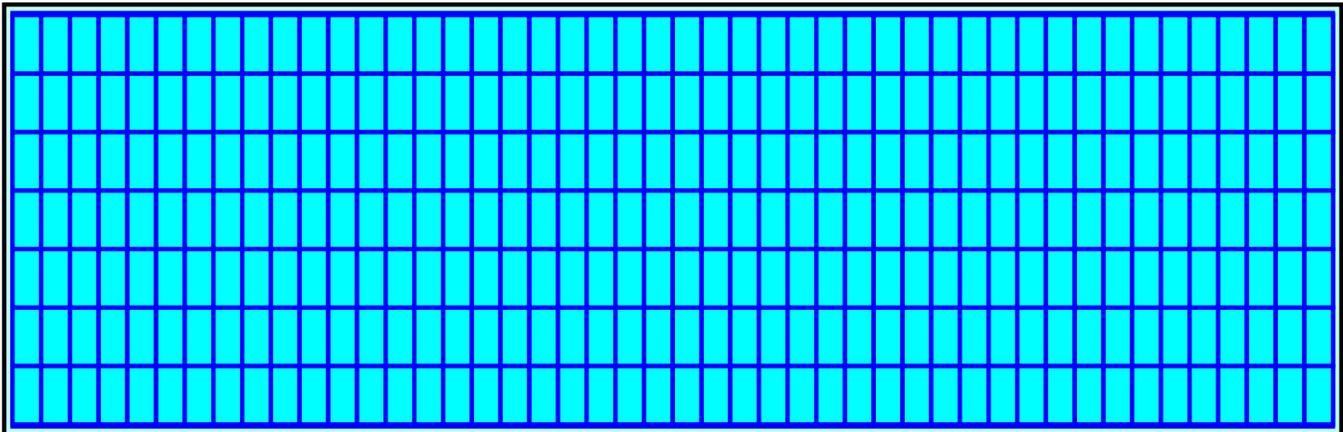
Overall Storage Efficiency = 59.6%

Overall System Size = 103.44' x 321.21' x 4.17'

322 Chambers (plus border)

5,127.3 cy Field

1,427.9 cy Stone



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Type III 24-hr 25-Year Rainfall=5.28"

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Pond 1P: U/G FB FIELD - Chamber Wizard Field B

Chamber Model = StormTrap ST1 SingleTrap 2-6 (StormTrap ST1 SingleTrap® Type VI)

Inside= 82.7"W x 30.0"H => 14.83 sf x 14.06'L = 208.5 cf

Outside= 82.7"W x 38.0"H => 21.84 sf x 14.06'L = 307.1 cf

2 Chambers/Row x 14.06' Long = 28.13' Row Length +6.0" Border x 2 +24.0" End Stone x 2 = 33.13' Base Length

3 Rows x 82.7" Wide + 24.0" Side Stone x 2 = 24.69' Base Width

12.0" Base + 38.0" Chamber Height = 4.17' Field Height

6 Chambers x 208.5 cf = 1,251.0 cf Chamber Storage

6 Chambers x 307.1 cf + 65.5 cf Border = 1,908.0 cf Displacement

3,407.4 cf Field - 1,908.0 cf Chambers = 1,499.4 cf Stone x 40.0% Voids = 599.8 cf Stone Storage

Chamber Storage + Stone Storage = 1,850.8 cf = 0.042 af

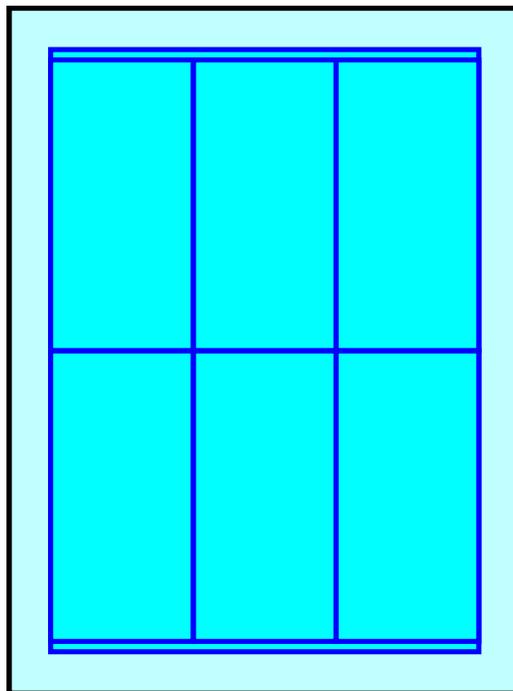
Overall Storage Efficiency = 54.3%

Overall System Size = 33.13' x 24.69' x 4.17'

6 Chambers (plus border)

126.2 cy Field

55.5 cy Stone



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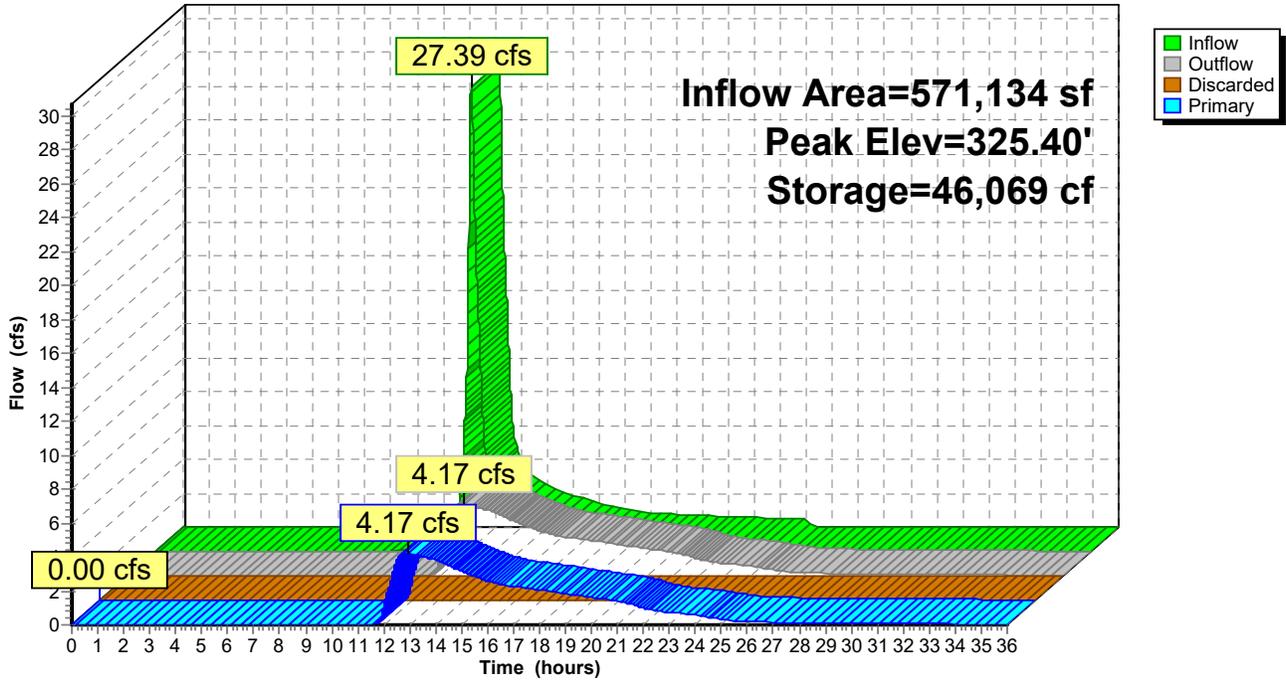
Type III 24-hr 25-Year Rainfall=5.28"

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Pond 1P: U/G FB FIELD

Hydrograph



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Type III 24-hr 100-Year Rainfall=7.24"

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Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 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 P-1: TRIB. TO WETLAND Runoff Area=62,580 sf 45.24% Impervious Runoff Depth=3.50"
Flow Length=459' Tc=6.3 min CN=67 Runoff=5.82 cfs 18,249 cf

Subcatchment P-2A: TRIB. TO U/G Runoff Area=387,859 sf 20.66% Impervious Runoff Depth=4.03"
Flow Length=1,945' Tc=11.4 min CN=72 Runoff=35.22 cfs 130,398 cf

Subcatchment P-2B: TRIB. TO WETLAND Runoff Area=296,000 sf 0.51% Impervious Runoff Depth=2.57"
Flow Length=1,376' Tc=11.2 min CN=58 Runoff=16.55 cfs 63,486 cf

Subcatchment P-3A: TRIB. TO U/G Runoff Area=73,805 sf 0.00% Impervious Runoff Depth=3.08"
Flow Length=219' Tc=13.3 min CN=63 Runoff=4.77 cfs 18,953 cf

Subcatchment P-3B: TRIB. TO WETLAND Runoff Area=31,938 sf 0.00% Impervious Runoff Depth=0.50"
Flow Length=207' Tc=6.0 min CN=34 Runoff=0.14 cfs 1,318 cf

Subcatchment P-3C: TRIB. TO U/G Runoff Area=109,470 sf 0.00% Impervious Runoff Depth=3.08"
Flow Length=890' Tc=9.4 min CN=63 Runoff=7.96 cfs 28,112 cf

Subcatchment P-4: TRIB. TO WETLAND Runoff Area=1,102,158 sf 0.05% Impervious Runoff Depth=2.98"
Flow Length=2,193' Tc=22.2 min CN=62 Runoff=55.87 cfs 273,579 cf

Reach DP10: DP10 Inflow=5.82 cfs 18,249 cf
Outflow=5.82 cfs 18,249 cf

Reach DP20: DP20 Inflow=20.83 cfs 238,144 cf
Outflow=20.83 cfs 238,144 cf

Reach DP30: DP30 Inflow=55.87 cfs 273,579 cf
Outflow=55.87 cfs 273,579 cf

Pond 1P: U/G FB FIELD Peak Elev=326.57' Storage=78,883 cf Inflow=47.65 cfs 178,758 cf
Discarded=0.00 cfs 0 cf Primary=8.43 cfs 173,340 cf Outflow=8.43 cfs 173,340 cf

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Type III 24-hr 100-Year Rainfall=7.24"

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Summary for Subcatchment P-1: TRIB. TO WETLAND SERIES 'A'

Runoff = 5.82 cfs @ 12.09 hrs, Volume= 18,249 cf, Depth= 3.50"

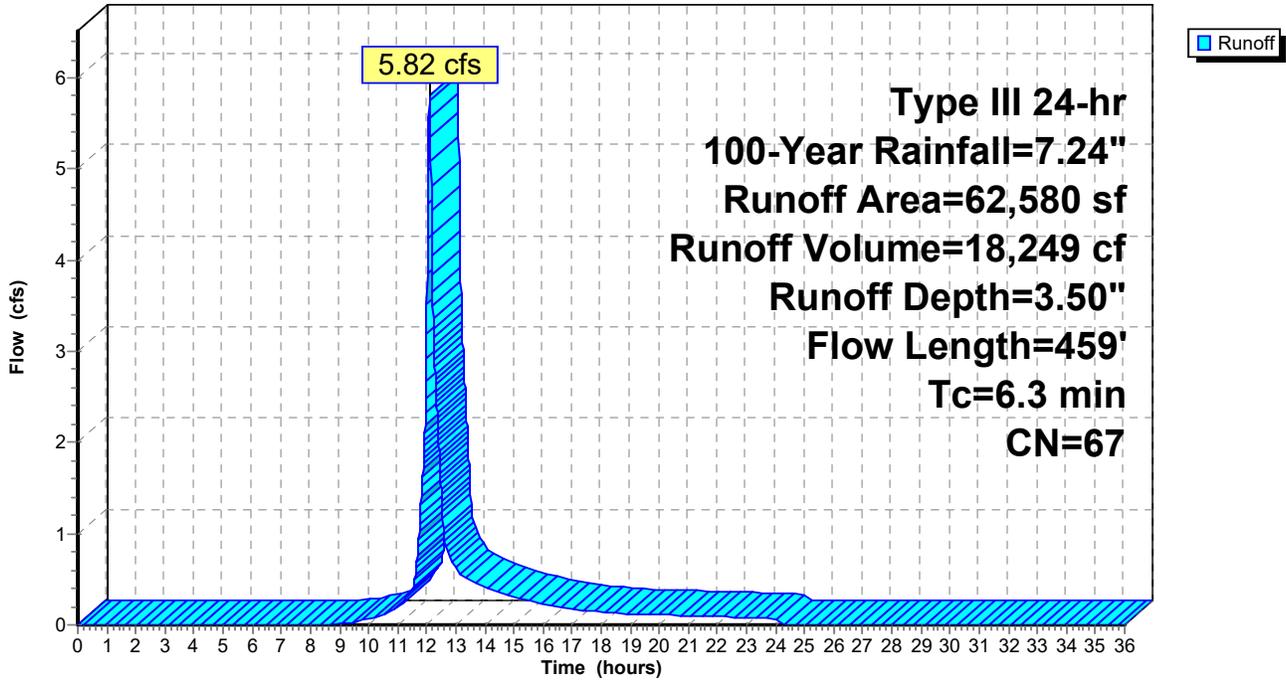
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.24"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 1,283 | 98 | Roofs, HSG A |
| 22,964 | 98 | Paved parking, HSG A |
| 29,273 | 39 | >75% Grass cover, Good, HSG A |
| 2,745 | 98 | Roofs, HSG B |
| 1,256 | 98 | Paved parking, HSG B |
| 4,831 | 61 | >75% Grass cover, Good, HSG B |
| 63 | 98 | Paved parking, HSG C |
| 165 | 74 | >75% Grass cover, Good, HSG C |
| 62,580 | 67 | Weighted Average |
| 34,269 | | 54.76% Pervious Area |
| 28,311 | | 45.24% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|--|
| 4.2 | 50 | 0.1170 | 0.20 | | Sheet Flow, Grass: Dense n= 0.240 P2= 2.99" |
| 1.7 | 202 | 0.0820 | 2.00 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.1 | 26 | 0.0088 | 4.26 | 3.34 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 0.2 | 99 | 0.0280 | 7.59 | 5.96 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 0.1 | 61 | 0.0560 | 10.73 | 8.43 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 0.0 | 21 | 0.0600 | 11.11 | 8.73 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 6.3 | 459 | Total | | | |

Subcatchment P-1: TRIB. TO WETLAND SERIES 'A'

Hydrograph



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Type III 24-hr 100-Year Rainfall=7.24"

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Summary for Subcatchment P-2A: TRIB. TO U/G DETENTION

Runoff = 35.22 cfs @ 12.16 hrs, Volume= 130,398 cf, Depth= 4.03"

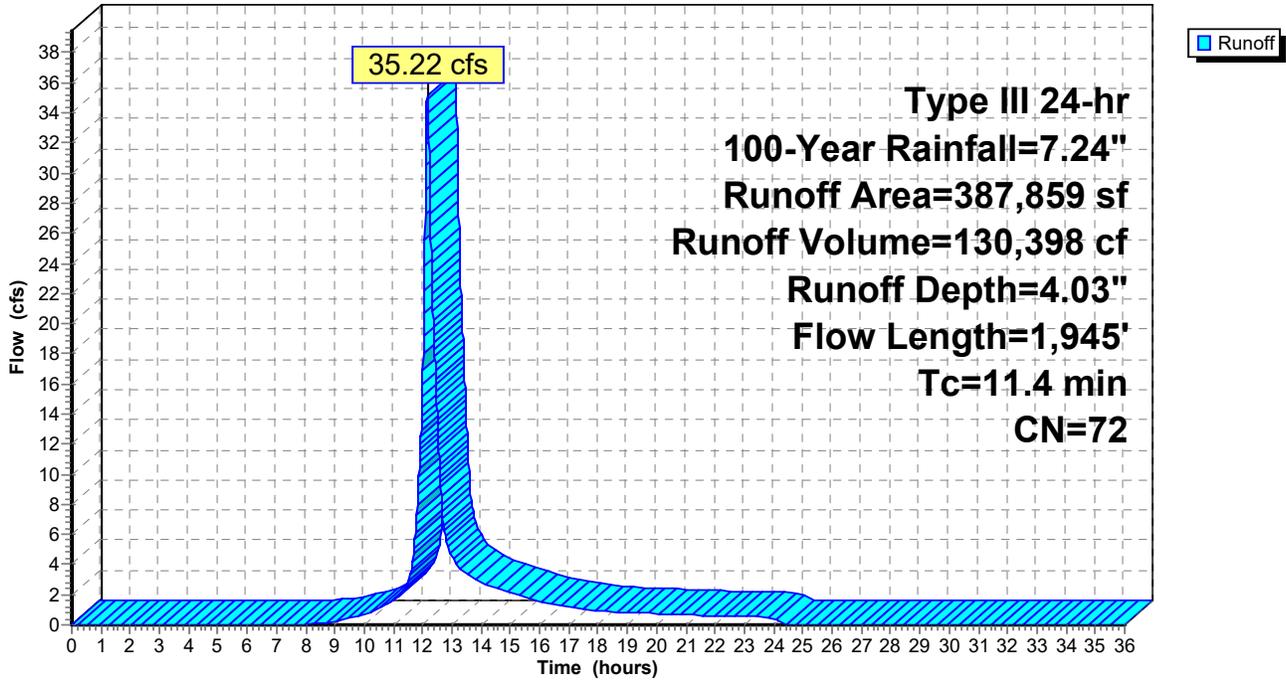
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.24"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 9,845 | 98 | Roofs, HSG A |
| 9,244 | 98 | Paved parking, HSG A |
| 13,046 | 39 | >75% Grass cover, Good, HSG A |
| * 4,417 | 86 | Green Roofs, HSG A |
| 8,713 | 98 | Roofs, HSG B |
| 17,198 | 98 | Paved parking, HSG B |
| 106,168 | 61 | >75% Grass cover, Good, HSG B |
| 789 | 85 | Gravel roads, HSG B |
| 42,693 | 55 | Woods, Good, HSG B |
| * 524 | 98 | Green Roofs, HSG B |
| 16,440 | 98 | Roofs, HSG C |
| 18,177 | 98 | Paved parking, HSG C |
| 89,512 | 74 | >75% Grass cover, Good, HSG C |
| 1,676 | 89 | Gravel roads, HSG C |
| 40,892 | 70 | Woods, Good, HSG C |
| * 8,525 | 86 | Green Roofs, HSG C |
| 387,859 | 72 | Weighted Average |
| 307,718 | | 79.34% Pervious Area |
| 80,141 | | 20.66% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|--|
| 4.9 | 50 | 0.2180 | 0.17 | | Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.99" |
| 3.7 | 885 | 0.3200 | 3.96 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.4 | 273 | 0.1000 | 10.16 | 80.27 | Channel Flow, Area= 7.9 sf Perim= 12.0' r= 0.66' n= 0.035 Earth, dense weeds |
| 1.5 | 189 | 0.0860 | 2.05 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.3 | 53 | 0.0470 | 3.46 | 8.31 | Channel Flow, Area= 2.4 sf Perim= 10.4' r= 0.23' n= 0.035 Earth, dense weeds |
| 0.2 | 309 | 0.1500 | 23.02 | 40.68 | Pipe Channel, 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior |
| 0.4 | 186 | 0.0100 | 7.20 | 22.62 | Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior |
| 11.4 | 1,945 | Total | | | |

Subcatchment P-2A: TRIB. TO U/G DETENTION

Hydrograph



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Type III 24-hr 100-Year Rainfall=7.24"

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Summary for Subcatchment P-2B: TRIB. TO WETLAND SERIES 'C'

Runoff = 16.55 cfs @ 12.16 hrs, Volume= 63,486 cf, Depth= 2.57"

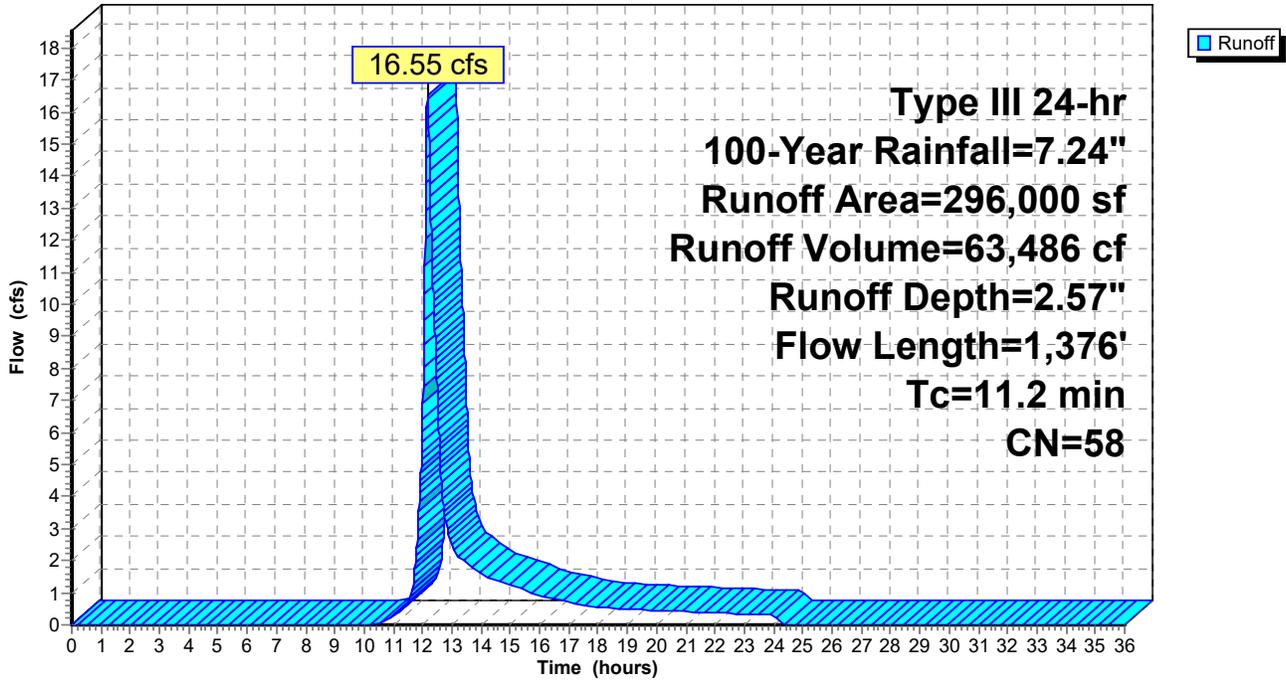
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.24"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 95 | 98 | Roofs, HSG A |
| 1,112 | 98 | Paved parking, HSG A |
| 91,315 | 39 | >75% Grass cover, Good, HSG A |
| * 42,036 | 74 | Sports Field (Runoff), HSG A |
| 32,167 | 30 | Woods, Good, HSG A |
| 6,484 | 61 | >75% Grass cover, Good, HSG B |
| 1,713 | 55 | Woods, Good, HSG B |
| 292 | 98 | Paved parking, HSG C |
| 74,669 | 74 | >75% Grass cover, Good, HSG C |
| 46,117 | 70 | Woods, Good, HSG C |
| 296,000 | 58 | Weighted Average |
| 294,501 | | 99.49% Pervious Area |
| 1,499 | | 0.51% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|--|
| 4.6 | 50 | 0.2500 | 0.18 | | Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.99" |
| 5.1 | 667 | 0.1900 | 2.18 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 0.9 | 165 | 0.1800 | 2.97 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.4 | 245 | 0.0410 | 9.19 | 7.21 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 0.2 | 249 | 0.1840 | 17.38 | 215.52 | Channel Flow, Area= 12.4 sf Perim= 13.3' r= 0.93' n= 0.035 Earth, dense weeds |
| 11.2 | 1,376 | Total | | | |

Subcatchment P-2B: TRIB. TO WETLAND SERIES 'C'

Hydrograph



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Type III 24-hr 100-Year Rainfall=7.24"

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Summary for Subcatchment P-3A: TRIB. TO U/G DETENTION

Runoff = 4.77 cfs @ 12.19 hrs, Volume= 18,953 cf, Depth= 3.08"

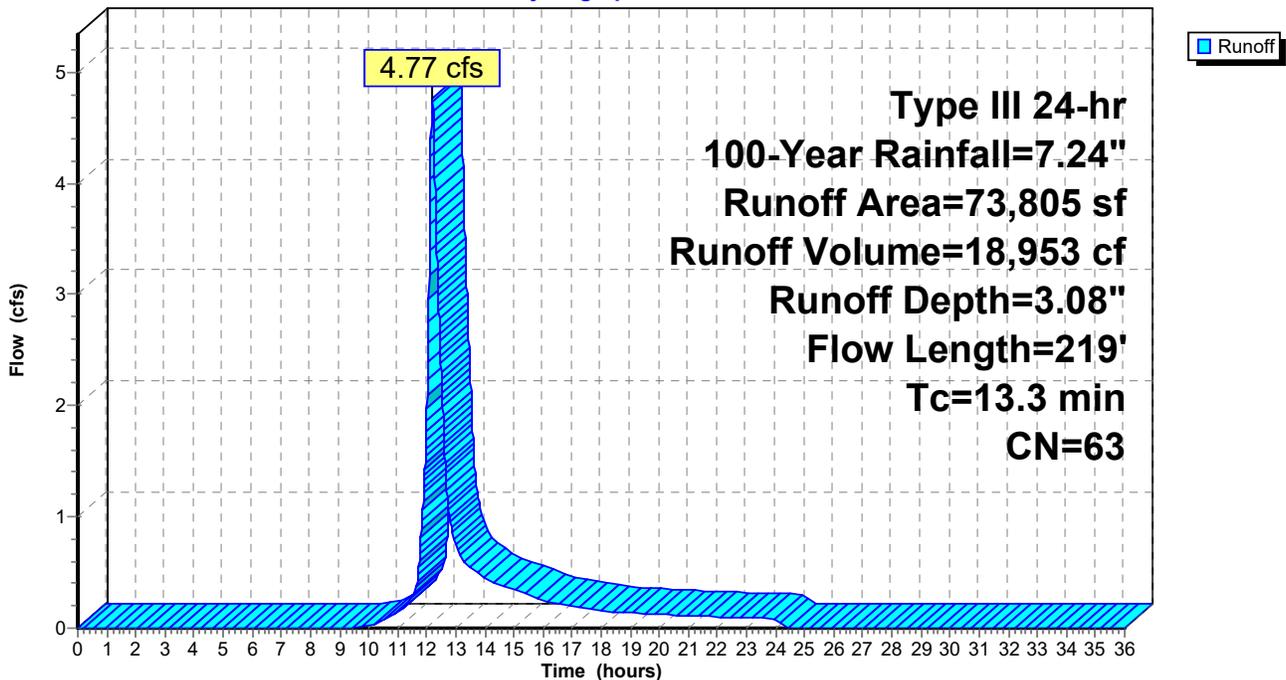
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.24"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 22,446 | 39 | >75% Grass cover, Good, HSG A |
| * 12,840 | 74 | Sports Field (Runoff), HSG A |
| * 38,519 | 74 | Sports Field (UD), HSG A |
| 73,805 | 63 | Weighted Average |
| 73,805 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|--|
| 11.2 | 50 | 0.0100 | 0.07 | | Sheet Flow, Grass: Dense n= 0.240 P2= 2.99" |
| 1.9 | 103 | 0.0165 | 0.90 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.2 | 66 | 0.0200 | 6.42 | 5.04 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 13.3 | 219 | Total | | | |

Subcatchment P-3A: TRIB. TO U/G DETENTION

Hydrograph



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Type III 24-hr 100-Year Rainfall=7.24"

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Summary for Subcatchment P-3B: TRIB. TO WETLAND SERIES 'D'

Runoff = 0.14 cfs @ 12.36 hrs, Volume= 1,318 cf, Depth= 0.50"

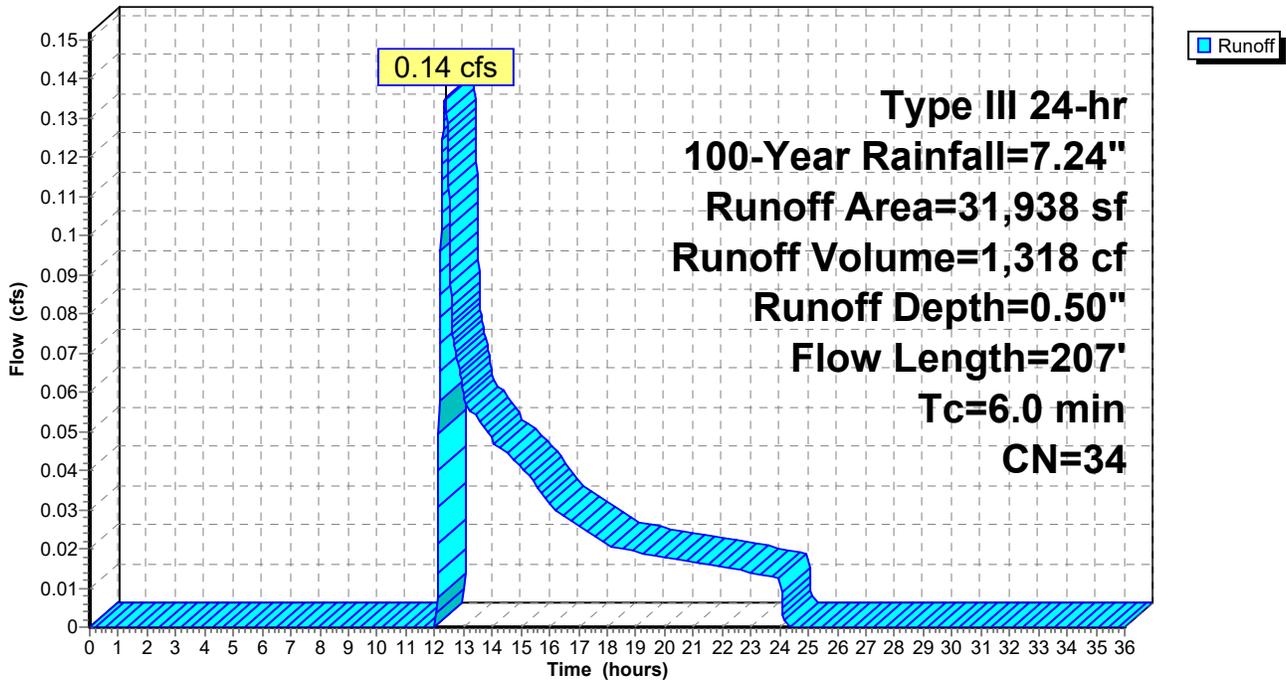
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.24"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 13,356 | 39 | >75% Grass cover, Good, HSG A |
| 18,582 | 30 | Woods, Good, HSG A |
| 31,938 | 34 | Weighted Average |
| 31,938 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|--|-------------------|----------------|---|
| 3.7 | 50 | 0.4500 | 0.23 | | Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.99" |
| 0.2 | 157 | 0.1650 | 12.49 | 96.14 | Channel Flow, Area= 7.7 sf Perim= 12.5' r= 0.62' n= 0.035 Earth, dense weeds |
| 3.9 | 207 | Total, Increased to minimum Tc = 6.0 min | | | |

Subcatchment P-3B: TRIB. TO WETLAND SERIES 'D'

Hydrograph



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Type III 24-hr 100-Year Rainfall=7.24"

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Summary for Subcatchment P-3C: TRIB. TO U/G DETENTION

Runoff = 7.96 cfs @ 12.14 hrs, Volume= 28,112 cf, Depth= 3.08"

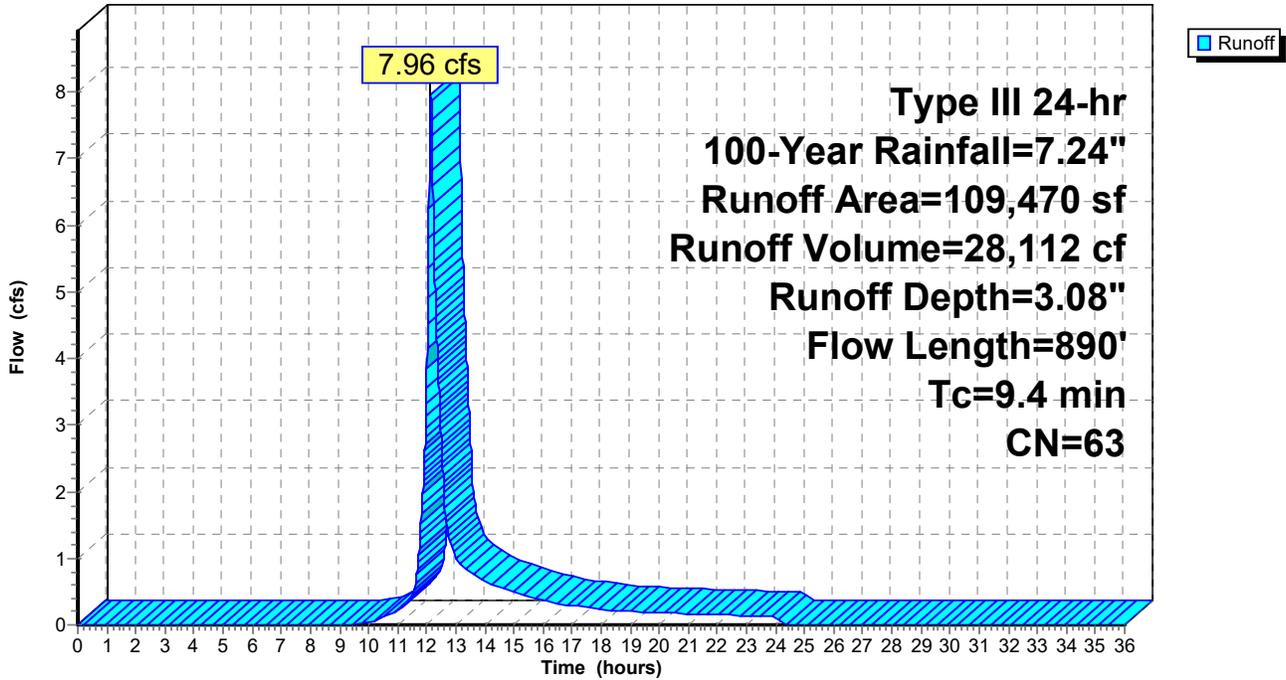
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.24"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 30,634 | 39 | >75% Grass cover, Good, HSG A |
| * 9,115 | 74 | Sports Field (Runoff), HSG A |
| * 13,672 | 74 | Sports Field (UD), HSG A |
| 729 | 61 | >75% Grass cover, Good, HSG B |
| 838 | 55 | Woods, Good, HSG B |
| 17,287 | 74 | >75% Grass cover, Good, HSG C |
| 37,195 | 70 | Woods, Good, HSG C |
| 109,470 | 63 | Weighted Average |
| 109,470 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|--|
| 4.9 | 50 | 0.2180 | 0.17 | | Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.99" |
| 1.1 | 223 | 0.2300 | 3.36 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 2.4 | 348 | 0.2400 | 2.45 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 0.7 | 148 | 0.2400 | 3.43 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.3 | 121 | 0.0200 | 6.42 | 5.04 | Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior |
| 9.4 | 890 | Total | | | |

Subcatchment P-3C: TRIB. TO U/G DETENTION

Hydrograph



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Type III 24-hr 100-Year Rainfall=7.24"

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Summary for Subcatchment P-4: TRIB. TO WETLAND SERIES 'E' & 'W1'

Runoff = 55.87 cfs @ 12.31 hrs, Volume= 273,579 cf, Depth= 2.98"

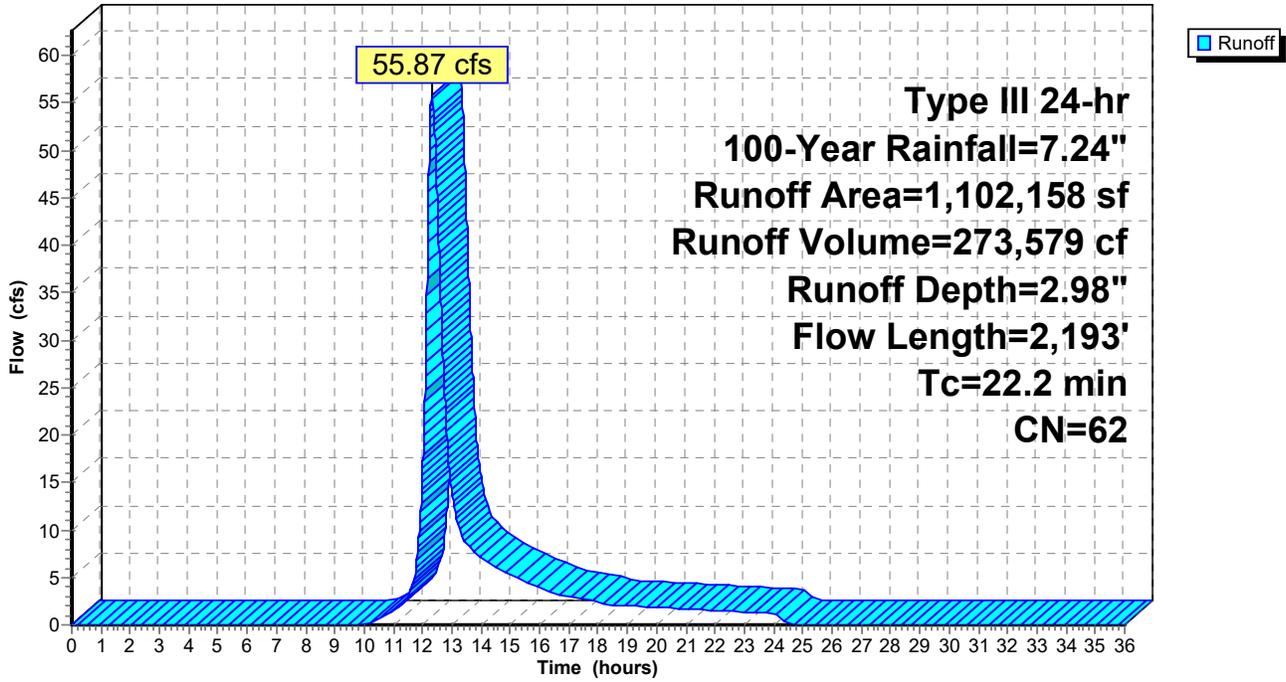
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.24"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 538 | 98 | Roofs, HSG A |
| 70,475 | 39 | >75% Grass cover, Good, HSG A |
| 6,194 | 76 | Gravel roads, HSG A |
| 47,608 | 30 | Woods, Good, HSG A |
| 93,378 | 61 | >75% Grass cover, Good, HSG B |
| 291,775 | 55 | Woods, Good, HSG B |
| 93,088 | 74 | >75% Grass cover, Good, HSG C |
| 499,102 | 70 | Woods, Good, HSG C |
| 1,102,158 | 62 | Weighted Average |
| 1,101,620 | | 99.95% Pervious Area |
| 538 | | 0.05% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|--|
| 7.9 | 50 | 0.0660 | 0.11 | | Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.99" |
| 4.6 | 613 | 0.2000 | 2.24 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 2.1 | 431 | 0.4600 | 3.39 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 4.9 | 729 | 0.2500 | 2.50 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 1.7 | 99 | 0.0200 | 0.99 | | Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps |
| 0.8 | 135 | 0.3000 | 2.74 | | Shallow Concentrated Flow, Woodland Kv= 5.0 fps |
| 0.2 | 136 | 0.0850 | 11.51 | 180.77 | Channel Flow, Area= 15.7 sf Perim= 17.5' r= 0.90' n= 0.035 Earth, dense weeds |
| 22.2 | 2,193 | Total | | | |

Subcatchment P-4: TRIB. TO WETLAND SERIES 'E' & 'W1'

Hydrograph



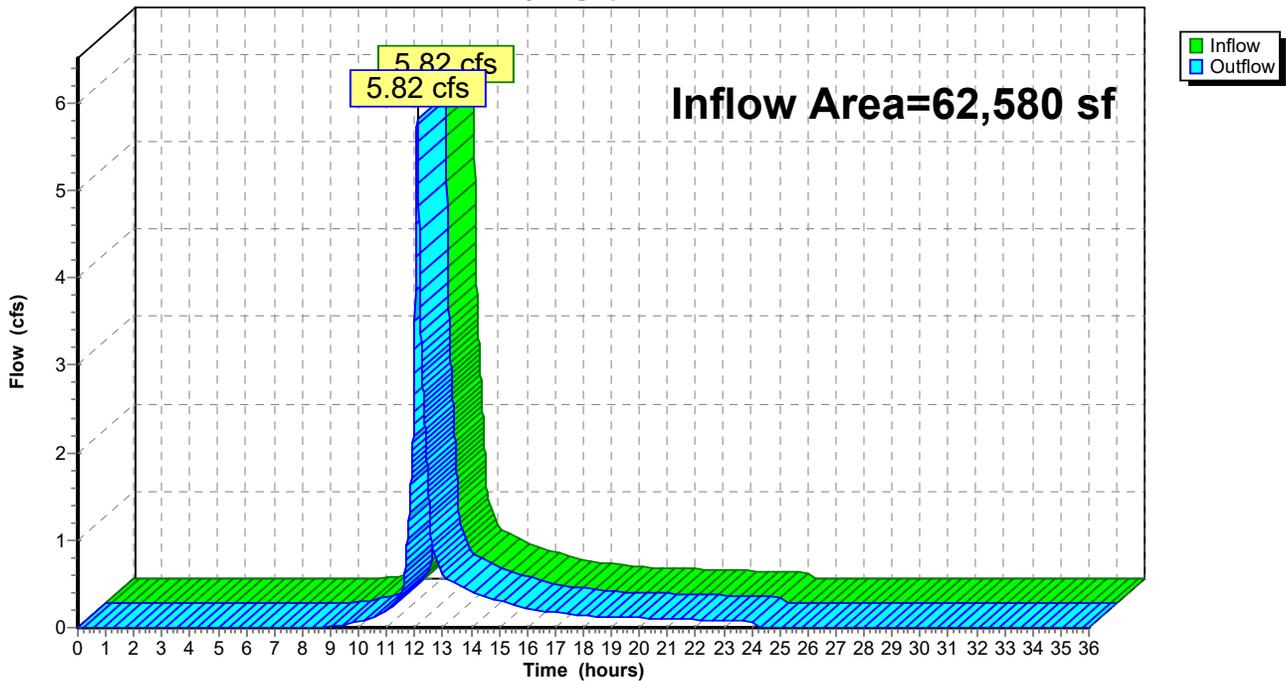
Summary for Reach DP10: DP10

Inflow Area = 62,580 sf, 45.24% Impervious, Inflow Depth = 3.50" for 100-Year event
Inflow = 5.82 cfs @ 12.09 hrs, Volume= 18,249 cf
Outflow = 5.82 cfs @ 12.09 hrs, Volume= 18,249 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach DP10: DP10

Hydrograph



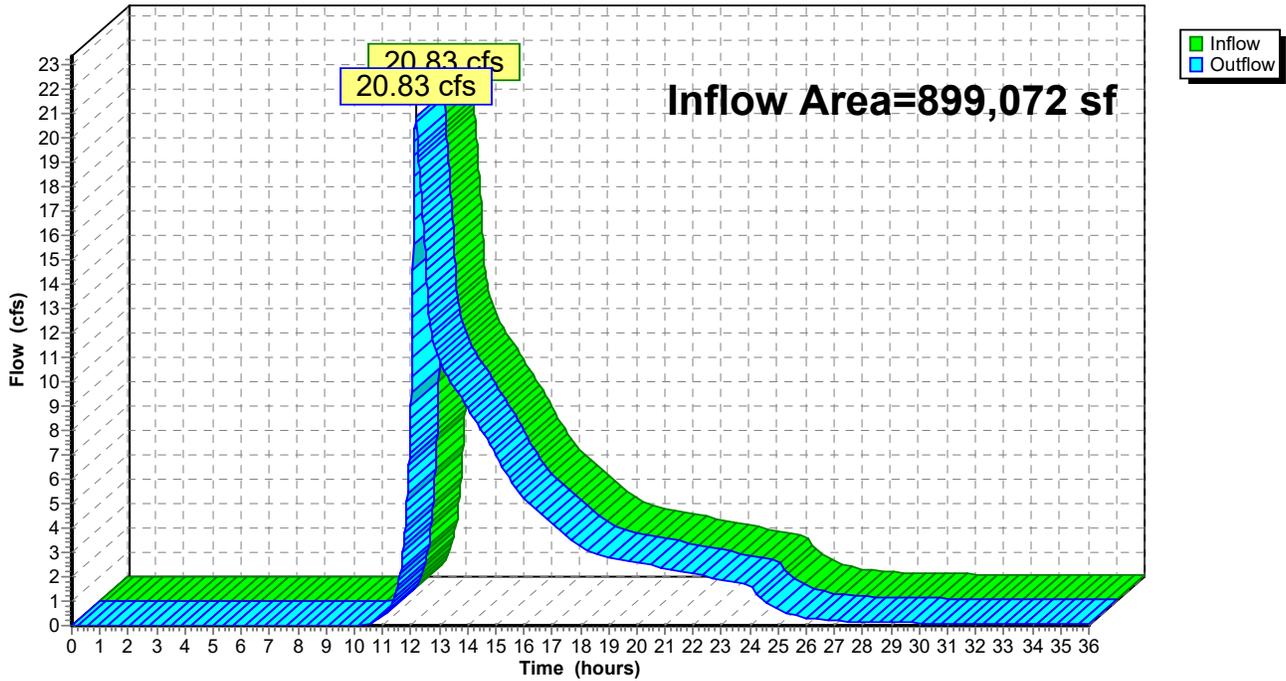
Summary for Reach DP20: DP20

Inflow Area = 899,072 sf, 9.08% Impervious, Inflow Depth > 3.18" for 100-Year event
Inflow = 20.83 cfs @ 12.18 hrs, Volume= 238,144 cf
Outflow = 20.83 cfs @ 12.18 hrs, Volume= 238,144 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach DP20: DP20

Hydrograph



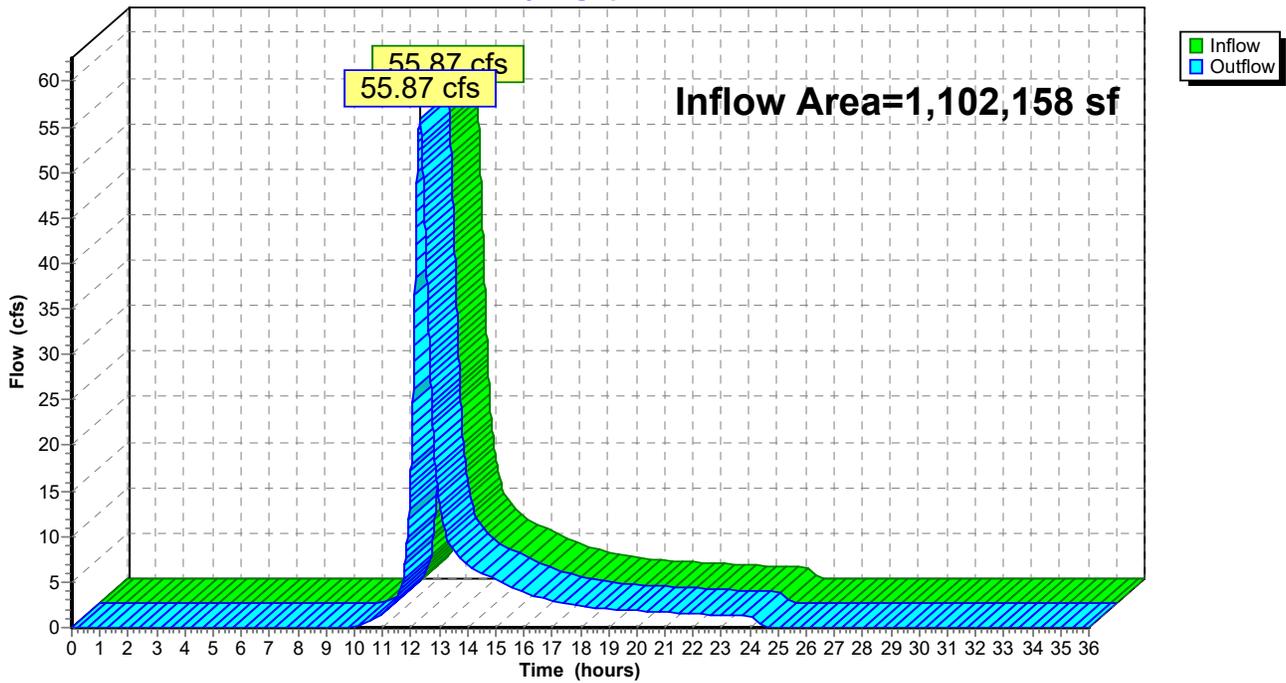
Summary for Reach DP30: DP30

Inflow Area = 1,102,158 sf, 0.05% Impervious, Inflow Depth = 2.98" for 100-Year event
Inflow = 55.87 cfs @ 12.31 hrs, Volume= 273,579 cf
Outflow = 55.87 cfs @ 12.31 hrs, Volume= 273,579 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach DP30: DP30

Hydrograph



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Type III 24-hr 100-Year Rainfall=7.24"

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Summary for Pond 1P: U/G FB FIELD

Inflow Area = 571,134 sf, 14.03% Impervious, Inflow Depth > 3.76" for 100-Year event
 Inflow = 47.65 cfs @ 12.16 hrs, Volume= 178,758 cf, Incl. 0.01 cfs Base Flow
 Outflow = 8.43 cfs @ 12.76 hrs, Volume= 173,340 cf, Atten= 82%, Lag= 36.1 min
 Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Primary = 8.43 cfs @ 12.76 hrs, Volume= 173,340 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 326.57' @ 12.76 hrs Surf.Area= 34,052 sf Storage= 78,883 cf

Plug-Flow detention time= 176.4 min calculated for 173,292 cf (97% of inflow)
 Center-of-Mass det. time= 158.1 min (995.0 - 836.9)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|---------|---------------|---|
| #1A | 323.25' | 15,421 cf | 321.21'W x 103.44'L x 4.17'H Field A 138,437 cf Overall - 99,884 cf Embedded = 38,553 cf x 40.0% Voids |
| #2A | 324.25' | 67,137 cf | StormTrap ST1 SingleTrap 2-6 x 322 Inside #1 Inside= 82.7"W x 30.0"H => 14.83 sf x 14.06'L = 208.5 cf Outside= 82.7"W x 38.0"H => 21.84 sf x 14.06'L = 307.1 cf 322 Chambers in 46 Rows 317.21' x 98.44' Core + 0.00' x 0.50' Border = 317.21' x 99.44' System |
| #3B | 323.25' | 600 cf | 24.69'W x 33.13'L x 4.17'H Field B 3,407 cf Overall - 1,908 cf Embedded = 1,499 cf x 40.0% Voids |
| #4B | 324.25' | 1,251 cf | StormTrap ST1 SingleTrap 2-6 x 6 Inside #3 Inside= 82.7"W x 30.0"H => 14.83 sf x 14.06'L = 208.5 cf Outside= 82.7"W x 38.0"H => 21.84 sf x 14.06'L = 307.1 cf 6 Chambers in 3 Rows 20.69' x 28.13' Core + 0.00' x 0.50' Border = 20.69' x 29.13' System |
| #5 | 324.25' | 93 cf | 18.0" Round Pipe Storage L= 52.6' S= 0.0200 '/ |
| | | 84,502 cf | Total Available Storage |

Storage Group A created with Chamber Wizard
 Storage Group B created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|---------|---|
| #1 | Discarded | 323.25' | 2.410 in/hr Exfiltration X 0.00 over Surface area Phase-In= 0.10' |
| #2 | Primary | 315.36' | 18.0" Round Culvert L= 43.6' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 315.36' / 311.00' S= 0.1000 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf |
| #3 | Device 2 | 323.51' | 4.0" Vert. WQV-RECHARGE Orifice C= 0.600 |
| #4 | Device 2 | 323.81' | 15.0" W x 4.0" H Vert. 2-YR Orifice C= 0.600 |
| #5 | Device 2 | 324.86' | 15.0" W x 4.0" H Vert. 10-YR Orifice C= 0.600 |
| #6 | Device 2 | 325.41' | 15.0" W x 4.0" H Vert. 25-YR Orifice C= 0.600 |
| #7 | Device 2 | 326.57' | 4.0' long x 0.18' rise 100-YR Sharp-Crested Rectangular Weir 2 End Contraction(s) |

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Type III 24-hr 100-Year Rainfall=7.24"

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Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=323.25' (Free Discharge)

└─1=Exfiltration (Controls 0.00 cfs)

Primary OutFlow Max=8.43 cfs @ 12.76 hrs HW=326.57' (Free Discharge)

└─2=Culvert (Passes 8.43 cfs of 27.52 cfs potential flow)

└─3=WQV-RECHARGE Orifice (Orifice Controls 0.71 cfs @ 8.19 fps)

└─4=2-YR Orifice (Orifice Controls 3.23 cfs @ 7.75 fps)

└─5=10-YR Orifice (Orifice Controls 2.49 cfs @ 5.98 fps)

└─6=25-YR Orifice (Orifice Controls 2.00 cfs @ 4.79 fps)

└─7=100-YR Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

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Type III 24-hr 100-Year Rainfall=7.24"

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Pond 1P: U/G FB FIELD - Chamber Wizard Field A

Chamber Model = StormTrap ST1 SingleTrap 2-6 (StormTrap ST1 SingleTrap® Type VI)

Inside= 82.7"W x 30.0"H => 14.83 sf x 14.06'L = 208.5 cf

Outside= 82.7"W x 38.0"H => 21.84 sf x 14.06'L = 307.1 cf

7 Chambers/Row x 14.06' Long = 98.44' Row Length +6.0" Border x 2 +24.0" End Stone x 2 = 103.44' Base Length

46 Rows x 82.7" Wide + 24.0" Side Stone x 2 = 321.21' Base Width

12.0" Base + 38.0" Chamber Height = 4.17' Field Height

322 Chambers x 208.5 cf = 67,137.3 cf Chamber Storage

322 Chambers x 307.1 cf + 1,004.5 cf Border = 99,884.3 cf Displacement

138,437.4 cf Field - 99,884.3 cf Chambers = 38,553.2 cf Stone x 40.0% Voids = 15,421.3 cf Stone Storage

Chamber Storage + Stone Storage = 82,558.6 cf = 1.895 af

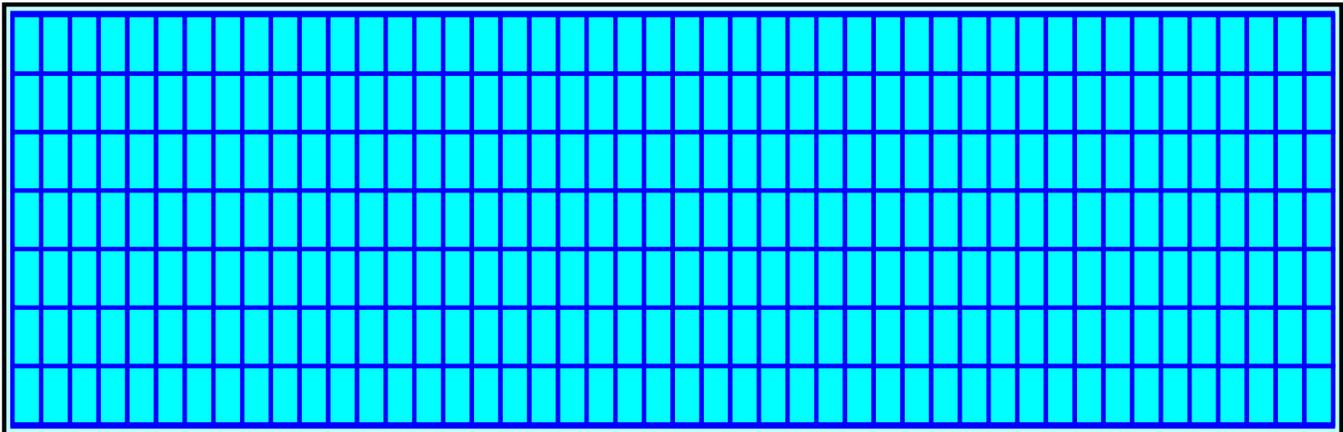
Overall Storage Efficiency = 59.6%

Overall System Size = 103.44' x 321.21' x 4.17'

322 Chambers (plus border)

5,127.3 cy Field

1,427.9 cy Stone



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Type III 24-hr 100-Year Rainfall=7.24"

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Pond 1P: U/G FB FIELD - Chamber Wizard Field B

Chamber Model = StormTrap ST1 SingleTrap 2-6 (StormTrap ST1 SingleTrap® Type VI)

Inside= 82.7"W x 30.0"H => 14.83 sf x 14.06'L = 208.5 cf

Outside= 82.7"W x 38.0"H => 21.84 sf x 14.06'L = 307.1 cf

2 Chambers/Row x 14.06' Long = 28.13' Row Length +6.0" Border x 2 +24.0" End Stone x 2 = 33.13' Base Length

3 Rows x 82.7" Wide + 24.0" Side Stone x 2 = 24.69' Base Width

12.0" Base + 38.0" Chamber Height = 4.17' Field Height

6 Chambers x 208.5 cf = 1,251.0 cf Chamber Storage

6 Chambers x 307.1 cf + 65.5 cf Border = 1,908.0 cf Displacement

3,407.4 cf Field - 1,908.0 cf Chambers = 1,499.4 cf Stone x 40.0% Voids = 599.8 cf Stone Storage

Chamber Storage + Stone Storage = 1,850.8 cf = 0.042 af

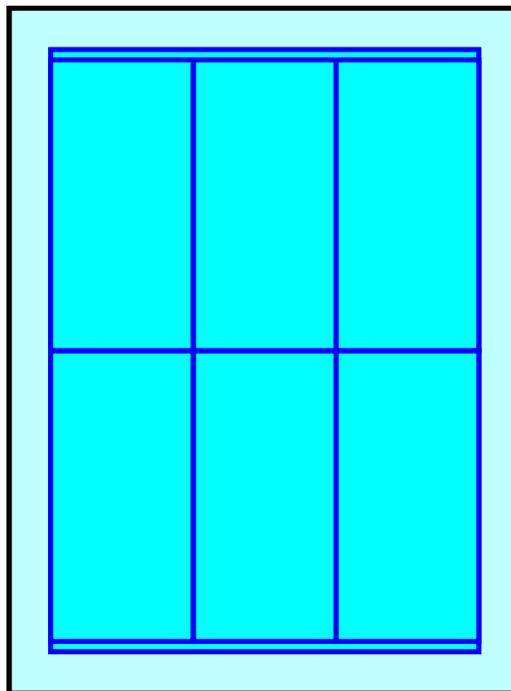
Overall Storage Efficiency = 54.3%

Overall System Size = 33.13' x 24.69' x 4.17'

6 Chambers (plus border)

126.2 cy Field

55.5 cy Stone



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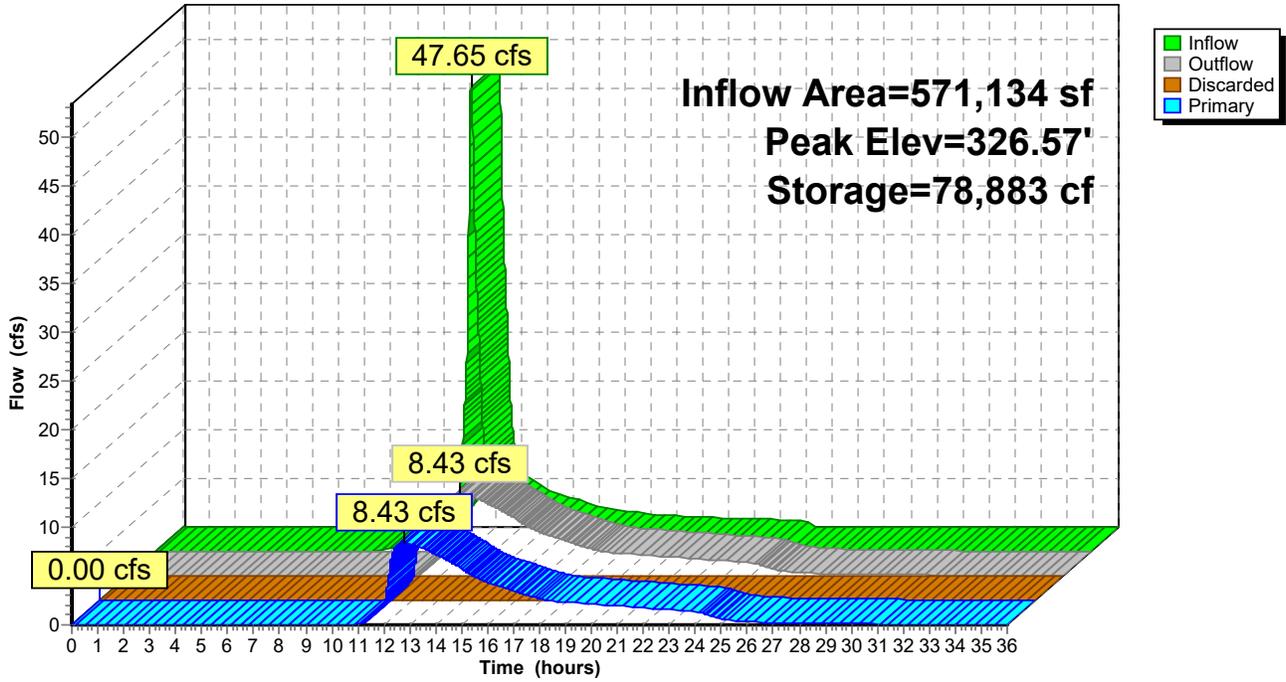
Type III 24-hr 100-Year Rainfall=7.24"

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Pond 1P: U/G FB FIELD

Hydrograph





POST-DRAINAGE PLAN

LEGEND

-  LOCUS PROPERTY LINE
-  ABUTTER PROPERTY LINE
-  DELINEATED WETLAND LINE
-  SUBCATCHMENT BOUNDARY
-  TIME OF CONCENTRATION PATH
-  SUBCATCHMENT DESIGNATION
-  DESIGN POINT DESIGNATION
-  BASIN DESIGNATION

Section 4

Stormwater Management Calculations

| <u>Onsite Imperv</u> | | | | |
|--------------------------|---------------|-----------------------|--------------------------|---|
| | <u>Area*</u> | <u>TSS</u> | <u>Imperv Area * TSS</u> | |
| P-1 | 14,723 | 76 | 1118948 | Water Quality Inlet (Stormceptor) |
| P-1 | 9,558 | 25 | 238950 | Deep Sump & Hooded Catch Basin |
| Total | 24,281 | | 1357898 | |
| Design Point 1/10 | | Weighted TSS = | 56 | Design Point 1/10 |
| P-2A | 6,108 | 76 | 464208 | Water Quality Inlet (Stormceptor) |
| P-2A | 11,987 | 90 | 1078830 | Rain Garden |
| P-2A | 20,339 | 70 | 1423730 | Water Quality Swale |
| P-2A | 10,106 | 25 | 252650 | Deep Sump & Hooded Catch Basin |
| P-2B | 0 | 0 | 0 | No New Impervious |
| P-3A | 0 | 0 | 0 | No New Impervious |
| P-3B | 0 | 0 | 0 | No New Impervious |
| P-3C | 0 | 0 | 0 | No New Impervious |
| Total | 48,540 | | 3219418 | |
| | | Weighted TSS = | 66 | Pretreatment for U/G Infiltration System |
| | 48,540 | 93 | 4514220 | U/G Infiltration System with Pretreatment Train |
| Design Point 2/20 | | Weighted TSS = | 93 | |
| P-4 | 0 | 0 | 0 | No New Impervious |
| | 0 | 0 | 0 | |
| Design Point 3/30 | | Weighted TSS = | 0 | |
| | 72,821 | | 5872118 | |
| Overall Site | | Weighted TSS = | 81 | |

* Impervious areas exclude existing roof runoff and proposed roof runoff collected and piped directly to the stormwater system.

INSTRUCTIONS:

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C value within Row
5. Total TSS Removal = Sum All Values in Column D

Location:

| A | B | C | D | E |
|-----------------------------------|-------------------------------|--------------------|----------------------|----------------------|
| BMP ¹ | TSS Removal Rate ¹ | Starting TSS Load* | Amount Removed (B*C) | Remaining Load (C-D) |
| Weighted Average Pretreatment | 0.66 | 1.00 | 0.66 | 0.34 |
| Subsurface Infiltration Structure | 0.80 | 0.34 | 0.27 | 0.07 |
| | 0.00 | 0.07 | 0.00 | 0.07 |
| | 0.00 | 0.07 | 0.00 | 0.07 |
| | 0.00 | 0.07 | 0.00 | 0.07 |

Separate Form Needs to be Completed for Each Outlet or BMP Train

Total TSS Removal = 93%

Project:

Prepared By:

Date:

*Equals remaining load from previous BMP (E) which enters the BMP

INSTRUCTIONS:

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Eaglebrook School - Dining Hall

| B | C | D | E | F |
|------------------|-------------------------------|--------------------|----------------------|----------------------|
| BMP ¹ | TSS Removal Rate ¹ | Starting TSS Load* | Amount Removed (C*D) | Remaining Load (D-E) |
| Rain Garden | 0.90 | 1.00 | 0.90 | 0.10 |
| | 0.00 | 0.10 | 0.00 | 0.10 |
| | 0.00 | 0.10 | 0.00 | 0.10 |
| | 0.00 | 0.10 | 0.00 | 0.10 |
| | 0.00 | 0.10 | 0.00 | 0.10 |

Total TSS Removal = 90%

Separate Form Needs to be Completed for Each Outlet or BMP Train

| |
|--|
| Proposed Dining Hall & Site Improvements |
| Project: BLM |
| Prepared By: 3/8/2023 |
| Date: |

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Eaglebrook School - Dining Hall

| B | C | D | E | F |
|---------------------------|-------------------------------|--------------------|----------------------|----------------------|
| BMP ¹ | TSS Removal Rate ¹ | Starting TSS Load* | Amount Removed (C*D) | Remaining Load (D-E) |
| Water Quality Swale - Dry | 0.70 | 1.00 | 0.70 | 0.30 |
| | 0.00 | 0.30 | 0.00 | 0.30 |
| | 0.00 | 0.30 | 0.00 | 0.30 |
| | 0.00 | 0.30 | 0.00 | 0.30 |
| | 0.00 | 0.30 | 0.00 | 0.30 |

Total TSS Removal = 70%

Separate Form Needs to be Completed for Each Outlet or BMP Train

| |
|--|
| Proposed Dining Hall & Site Improvements |
| Project: BLM |
| Prepared By: 3/8/2023 |
| Date: |

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
 1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Eaglebrook School - Dining Hall

| B | C | D | E | F |
|------------------|-------------------------------|--------------------|----------------------|----------------------|
| BMP ¹ | TSS Removal Rate ¹ | Starting TSS Load* | Amount Removed (C*D) | Remaining Load (D-E) |
| Rain Garden | 0.90 | 1.00 | 0.90 | 0.10 |
| | 0.00 | 0.10 | 0.00 | 0.10 |
| | 0.00 | 0.10 | 0.00 | 0.10 |
| | 0.00 | 0.10 | 0.00 | 0.10 |
| | 0.00 | 0.10 | 0.00 | 0.10 |

Total TSS Removal = 90%

Separate Form Needs to be Completed for Each Outlet or BMP Train

| |
|--|
| Proposed Dining Hall & Site Improvements |
| Project: BLM |
| Prepared By: 3/8/2023 |
| Date: |

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Eaglebrook School - Dining Hall

| B | C | D | E | F |
|----------------------------------|-------------------------------|--------------------|----------------------|----------------------|
| BMP ¹ | TSS Removal Rate ¹ | Starting TSS Load* | Amount Removed (C*D) | Remaining Load (D-E) |
| Deep Sump and Hooded Catch Basin | 0.25 | 1.00 | 0.25 | 0.75 |
| | 0.00 | 0.75 | 0.00 | 0.75 |
| | 0.00 | 0.75 | 0.00 | 0.75 |
| | 0.00 | 0.75 | 0.00 | 0.75 |
| | 0.00 | 0.75 | 0.00 | 0.75 |

Total TSS Removal = 25%

Separate Form Needs to be Completed for Each Outlet or BMP Train

| |
|--|
| Proposed Dining Hall & Site Improvements |
| Project: |
| Prepared By: BLM |
| Date: 3/8/2023 |

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
 1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Eaglebrook School - Dining Hall

| B | C | D | E | F |
|------------------|-------------------------------|--------------------|----------------------|----------------------|
| BMP ¹ | TSS Removal Rate ¹ | Starting TSS Load* | Amount Removed (C*D) | Remaining Load (D-E) |
| Green Roof | 0.00 | 1.00 | 0.00 | 1.00 |
| | 0.00 | 1.00 | 0.00 | 1.00 |
| | 0.00 | 1.00 | 0.00 | 1.00 |
| | 0.00 | 1.00 | 0.00 | 1.00 |
| | 0.00 | 1.00 | 0.00 | 1.00 |

Total TSS Removal = 0%

Separate Form Needs to be Completed for Each Outlet or BMP Train

| |
|--|
| Proposed Dining Hall & Site Improvements |
| Project: BLM |
| Prepared By: 3/8/2023 |
| Date: |

Project: BLM
Prepared By: 3/8/2023
Date:

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

Detailed Stormceptor Sizing Report – P-1 & P-2A with Expansion

| Project Information & Location | | | |
|--------------------------------|-----------------------------|----------------------------|---------------|
| Project Name | Eaglebrook Dining Hall | Project Number | 49877 |
| City | Deerfield | State/ Province | Massachusetts |
| Country | United States of America | Date | 3/6/2023 |
| Designer Information | | EOR Information (optional) | |
| Name | Jesse Moreno | Name | |
| Company | ProTerra Design Group, LLC | Company | |
| Phone # | 141-332-0491 | Phone # | |
| Email | jmoreno@proterra-design.com | Email | |

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

| | |
|--------------------------------------|---------------------------|
| Site Name | P-1 & P-2A with Expansion |
| Recommended Stormceptor Model | STC 450i |
| Target TSS Removal (%) | 71.0 |
| TSS Removal (%) Provided | 76 |
| PSD | NJDEP |
| Rainfall Station | EAST BRIMFIELD LAKE |

The recommended Stormceptor model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

| Stormceptor Sizing Summary | | |
|----------------------------|------------------------|-----------------------------------|
| Stormceptor Model | % TSS Removal Provided | % Runoff Volume Captured Provided |
| STC 450i | 76 | 89 |
| STC 900 | 81 | 97 |
| STC 1200 | 81 | 97 |
| STC 1800 | 82 | 97 |
| STC 2400 | 85 | 99 |
| STC 3600 | 85 | 99 |
| STC 4800 | 88 | 100 |
| STC 6000 | 88 | 100 |
| STC 7200 | 90 | 100 |
| STC 11000 | 92 | 100 |
| STC 13000 | 93 | 100 |
| STC 16000 | 94 | 100 |

Stormceptor

The Stormceptor oil and sediment separator is sized to treat stormwater runoff by removing pollutants through gravity separation and flotation. Stormceptor’s patented design generates positive TSS removal for each rainfall event, including large storms. Significant levels of pollutants such as heavy metals, free oils and nutrients are prevented from entering natural water resources and the re-suspension of previously captured sediment (scour) does not occur. Stormceptor provides a high level of TSS removal for small frequent storm events that represent the majority of annual rainfall volume and pollutant load. Positive treatment continues for large infrequent events, however, such events have little impact on the average annual TSS removal as they represent a small percentage of the total runoff volume and pollutant load.

Design Methodology

Stormceptor is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology using local historical rainfall data and specified site parameters. With US EPA SWMM’s precision, every Stormceptor unit is designed to achieve a defined water quality objective. The TSS removal data presented follows US EPA guidelines to reduce the average annual TSS load. The Stormceptor’s unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing:

- Site parameters
- Continuous historical rainfall data, including duration, distribution, peaks & inter-event dry periods
- Particle size distribution, and associated settling velocities (Stokes Law, corrected for drag)
- TSS load
- Detention time of the system

Hydrology Analysis

PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of Stormceptor are based on the average annual removal of TSS for the selected site parameters. The Stormceptor is engineered to capture sediment particles by treating the required average annual runoff volume, ensuring positive removal efficiency is maintained during each rainfall event, and preventing negative removal efficiency (scour). Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.

Rainfall Station

| | | | |
|-------------------------------|---------------------|---|--------|
| State/Province | Massachusetts | Total Number of Rainfall Events | 5106 |
| Rainfall Station Name | EAST BRIMFIELD LAKE | Total Rainfall (in) | 1701.4 |
| Station ID # | 2107 | Average Annual Rainfall (in) | 37.8 |
| Coordinates | 42°7'0"N, 72°8'0"W | Total Evaporation (in) | 124.7 |
| Elevation (ft) | 680 | Total Infiltration (in) | 336.3 |
| Years of Rainfall Data | 45 | Total Rainfall that is Runoff (in) | 1240.4 |

Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
- For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

| Drainage Area | |
|--------------------|------|
| Total Area (acres) | 0.5 |
| Imperviousness % | 80.0 |

| Water Quality Objective | |
|--------------------------------|-------|
| TSS Removal (%) | 71.0 |
| Runoff Volume Capture (%) | 85.00 |
| Oil Spill Capture Volume (Gal) | |
| Peak Conveyed Flow Rate (CFS) | |
| Water Quality Flow Rate (CFS) | |

| Up Stream Storage | |
|-------------------|-----------------|
| Storage (ac-ft) | Discharge (cfs) |
| 0.000 | 0.000 |

| Up Stream Flow Diversion | |
|--------------------------------|--|
| Max. Flow to Stormceptor (cfs) | |

| Design Details | |
|-------------------------------------|----|
| Stormceptor Inlet Invert Elev (ft) | |
| Stormceptor Outlet Invert Elev (ft) | |
| Stormceptor Rim Elev (ft) | |
| Normal Water Level Elevation (ft) | |
| Pipe Diameter (in) | |
| Pipe Material | |
| Multiple Inlets (Y/N) | No |
| Grate Inlet (Y/N) | No |

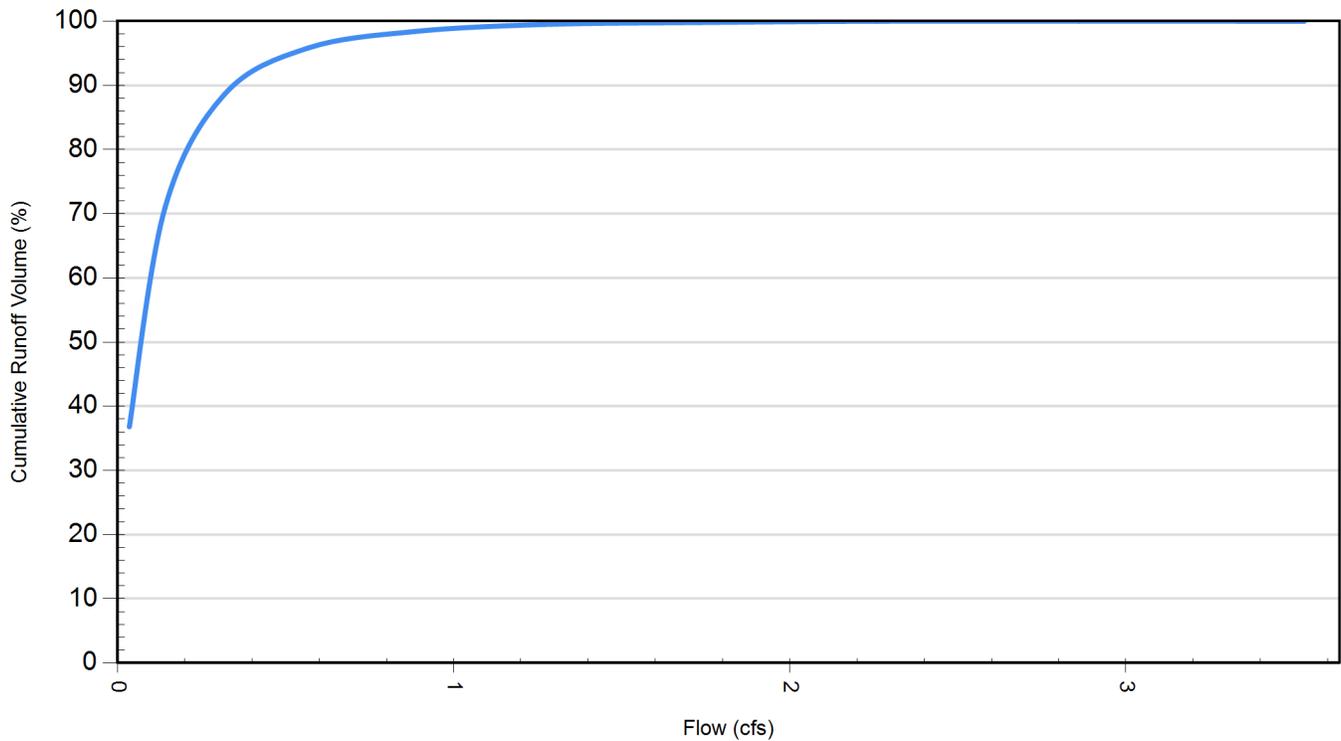
| Particle Size Distribution (PSD) | | |
|---|----------------|------------------|
| Removing the smallest fraction of particulates from runoff ensures the majority of pollutants, such as metals, hydrocarbons and nutrients are captured. The table below identifies the Particle Size Distribution (PSD) that was selected to define TSS removal for the Stormceptor design. | | |
| NJDEP | | |
| Particle Diameter (microns) | Distribution % | Specific Gravity |
| 2.0 | 5.0 | 2.65 |
| 5.0 | 5.0 | 2.65 |
| 8.0 | 10.0 | 2.65 |
| 20.0 | 15.0 | 2.65 |
| 50.0 | 10.0 | 2.65 |
| 75.0 | 5.0 | 2.65 |
| 100.0 | 10.0 | 2.65 |
| 150.0 | 15.0 | 2.65 |
| 250.0 | 15.0 | 2.65 |
| 500.0 | 5.0 | 2.65 |
| 1000.0 | 5.0 | 2.65 |

| | | | |
|------------------------------------|--------|--|---------|
| Site Name | | P-1 & P-2A with Expansion | |
| Site Details | | | |
| Drainage Area | | Infiltration Parameters | |
| Total Area (acres) | 0.5 | Horton's equation is used to estimate infiltration | |
| Imperviousness % | 80.0 | Max. Infiltration Rate (in/hr) | 2.44 |
| Surface Characteristics | | Min. Infiltration Rate (in/hr) | 0.4 |
| Width (ft) | 295.00 | Decay Rate (1/sec) | 0.00055 |
| Slope % | 2 | Regeneration Rate (1/sec) | 0.01 |
| Impervious Depression Storage (in) | 0.02 | Evaporation | |
| Pervious Depression Storage (in) | 0.2 | Daily Evaporation Rate (in/day) | 0.1 |
| Impervious Manning's n | 0.015 | Dry Weather Flow | |
| Pervious Manning's n | 0.25 | Dry Weather Flow (cfs) | 0 |
| Maintenance Frequency | | Winter Months | |
| Maintenance Frequency (months) > | 12 | Winter Infiltration | 0 |
| TSS Loading Parameters | | | |
| TSS Loading Function | | | |
| Buildup/Wash-off Parameters | | TSS Availability Parameters | |
| Target Event Mean Conc. (EMC) mg/L | | Availability Constant A | |
| Exponential Buildup Power | | Availability Factor B | |
| Exponential Washoff Exponent | | Availability Exponent C | |
| | | Min. Particle Size Affected by Availability (micron) | |

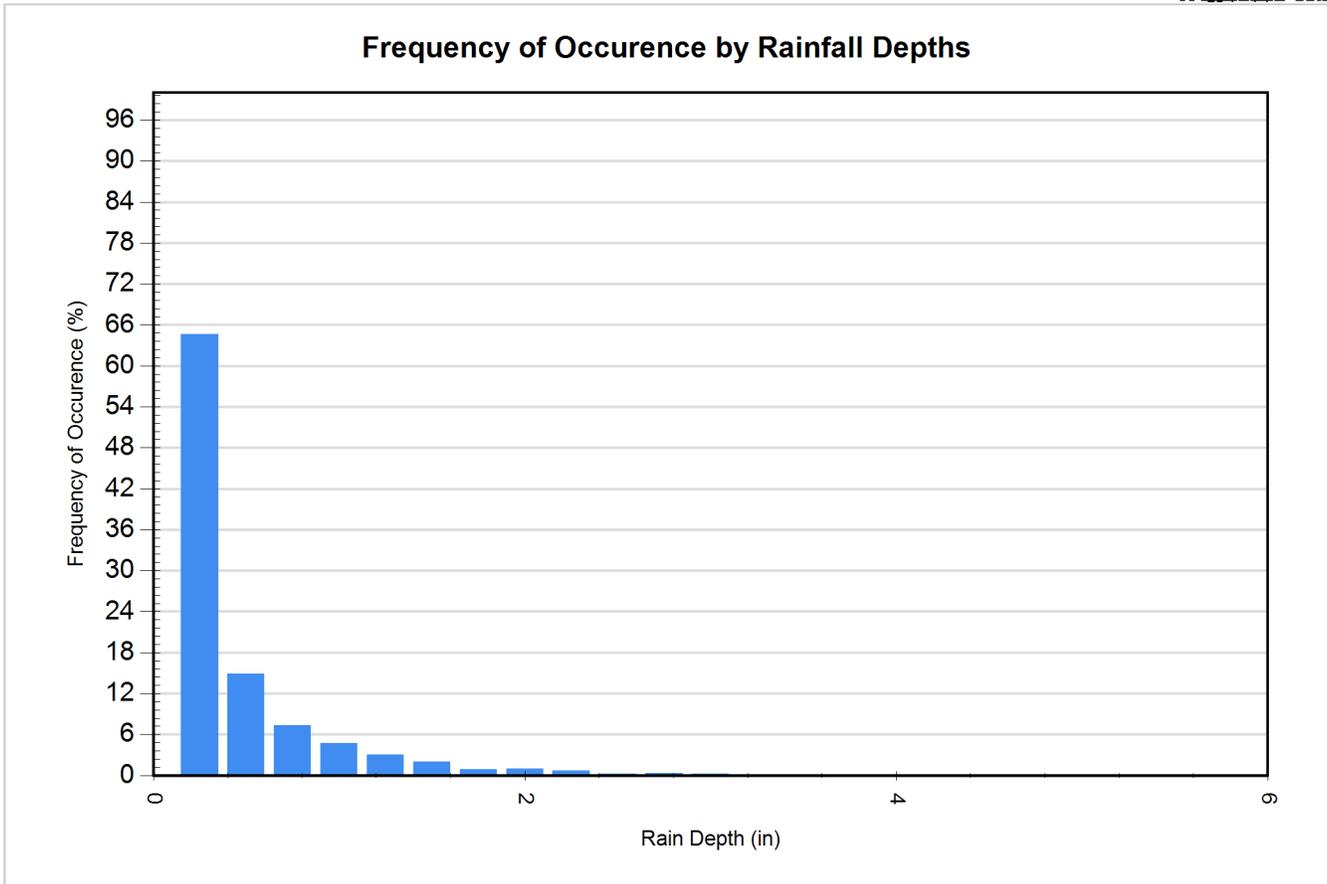
| Cumulative Runoff Volume by Runoff Rate | | | |
|---|---------------------|-------------------|------------------------------|
| Runoff Rate (cfs) | Runoff Volume (ft³) | Volume Over (ft³) | Cumulative Runoff Volume (%) |
| 0.035 | 861223 | 1477589 | 36.8 |
| 0.141 | 1657996 | 680693 | 70.9 |
| 0.318 | 2072194 | 266455 | 88.6 |
| 0.565 | 2239746 | 98889 | 95.8 |
| 0.883 | 2301918 | 36707 | 98.4 |
| 1.271 | 2326304 | 12319 | 99.5 |
| 1.730 | 2334623 | 3999 | 99.8 |
| 2.260 | 2337795 | 826 | 100.0 |
| 2.860 | 2338621 | 0 | 100.0 |
| 3.531 | 2338621 | 0 | 100.0 |

Cumulative Runoff Volume by Runoff Rate

For area: 0.5(ac), imperviousness: 80.0%, rainfall station: EAST BRIMFIELD LAKE



| Rainfall Event Analysis | | | | |
|-------------------------|---------------|--------------------------------|-------------------|---------------------------------|
| Rainfall Depth (in) | No. of Events | Percentage of Total Events (%) | Total Volume (in) | Percentage of Annual Volume (%) |
| 0.25 | 3297 | 64.6 | 282 | 16.6 |
| 0.50 | 761 | 14.9 | 281 | 16.5 |
| 0.75 | 371 | 7.3 | 229 | 13.5 |
| 1.00 | 241 | 4.7 | 211 | 12.4 |
| 1.25 | 154 | 3.0 | 172 | 10.1 |
| 1.50 | 102 | 2.0 | 139 | 8.2 |
| 1.75 | 45 | 0.9 | 73 | 4.3 |
| 2.00 | 50 | 1.0 | 93 | 5.5 |
| 2.25 | 34 | 0.7 | 72 | 4.2 |
| 2.50 | 12 | 0.2 | 29 | 1.7 |
| 2.75 | 14 | 0.3 | 36 | 2.1 |
| 3.00 | 12 | 0.2 | 35 | 2.0 |
| 3.25 | 5 | 0.1 | 16 | 0.9 |
| 3.50 | 1 | 0.0 | 3 | 0.2 |
| 3.75 | 1 | 0.0 | 4 | 0.2 |
| 4.00 | 2 | 0.0 | 8 | 0.5 |
| 4.25 | 1 | 0.0 | 4 | 0.2 |
| 4.50 | 0 | 0.0 | 0 | 0.0 |
| 4.75 | 1 | 0.0 | 5 | 0.3 |
| 5.00 | 1 | 0.0 | 5 | 0.3 |
| 5.25 | 1 | 0.0 | 5 | 0.3 |
| 5.50 | 0 | 0.0 | 0 | 0.0 |
| 5.75 | 0 | 0.0 | 0 | 0.0 |



For Stormceptor Specifications and Drawings Please Visit:
<https://www.conteches.com/technical-guides/search?filter=1WBC005EYX>

U/G Infiltration Basin

(Water Quality Volume)

$$WQV = WQD * Imperv_{(area)}$$

WQV = Water Quality Volume

WQD = Water Quality Depth

Imperv_(area) = Proposed Tributary Impervious Area to Treatment Train

WQD Based on Status of Tributary Area

WQD = 0.50 IN (for Non-Critical Areas)

WQD = 1.00 IN (for Critical Areas)

Project Input

Critical Area = YES

Imperv_(area) = 32,194 SF

WQD = 1.00 IN

WQV = 2683 CF

Volume provided in
the u/g detention
basin below the
lowest outlet = **3540 CF**
(See HydroCAD calculations)

3540 > 2683 THEREFORE OK

U/G Basin - Required Surface Area

$$\text{Surface Area}_{\text{U/G Basin}} = \frac{\text{WQV}}{(D + K * T / 12)}$$

WQV = Water Quality Volume or Volume Below Lowest Orifice (CF)

D = Basin Depth (FT) below lowest outlet orifice

K = Saturated Hydraulic Conductivity, Rawls Rate (IN/HR)

T = Fill Time (HR)

V = 3540 CF

D = 0.51 FT

K = 2.41 IN/HR (1982 Rawls Rate HSG 'A')

T = 2 HR

Surface Area_{U/G Basin} = 3,883 SF

U/G Area Provided = 33,625 SF

U/G Infiltration Basin

(Recharge to Groundwater)

Rv = F * ImperV_(area)
 Rv = Required Recharge Volume (CF)
 F = Target Depth Factor associated with each Hydrologic Soil Group (HSG)
 ImperV_(area) = Proposed Tributary Impervious Area to Design Point

Table 2.3.2, Volume 3, Ch 1, Page 16

F = 0.60 IN (for A soils)
 F = 0.35 IN (for B soils)
 F = 0.25 IN (for C soils)
 F = 0.10 IN (for D soils)

Project Input

| | | | |
|--------------------------------------|-------------------------------------|--------------------------------------|---------------------------------|
| Soil Group = A | Soil Group = B | Soil Group = C | Soil Group = D |
| ImperV _(area) = -5,304 SF | ImperV _(area) = 4,207 SF | ImperV _(area) = 27,987 SF | ImperV _(area) = 0 SF |
| Rv(A) 0.0 CF | Rv(B) 122.7 CF | Rv(C) 583.1 CF | Rv(D) 0.0 CF |

Does all proposed impervious area drain to infiltration BMP = YES
 Impervious area draining to infiltration BMP = 0 SF
 Rv(Adjustment) Factor = 1.00

Adjusted Rv(Total) = 0.0 CF

U/G Basin - Drawdown Time

$$\text{Time}_{\text{drawdown}} = \frac{V}{K * \text{Basin Area}}$$

V = Total Storage Volume Below Lowest Orifice
K = Saturated Hydraulic Conductivity, Rawls Rate
Basin Area = Area of Basin at Water Surface Elevation

V = 3540 CF
K = 2.41 IN/HR (1982 Rawls Rate HSG 'A')
Basin Area = 33625 SF

| |
|---|
| Time_{drawdown} = 0.5 HR |
|---|

The calculation shows that the u/g basin will drawdown within the required 40 hours between storm events (assuming linear application of infiltration rate & no mounding occurs).

Outlet Culvert Riprap Apron Design Haul Road (Sta. 5+65)

$$L_a = \frac{1.8 * Q}{D_o * 1.5} + 7 * D_o$$

Apron Length

Q_{25} (pipe flow) = 10.44 CFS
 D_o = 2.50 FT
 TW = 0.25 FT (Assumed)
 L_a = 23 FT

Apron Width

$$W_{\text{outlet end of apron}} = 3 * D_o + L_a$$

$W_{\text{outlet end of apron}} = 31$ FT

$$W_{\text{culvert end of apron}} = 3 * D_o$$

$W_{\text{culvert end of apron}} = 8$ FT use 5' min.

Riprap Diameter

$$D_{50} = \frac{0.02 * Q^{1.3}}{TW * D_o}$$

$D_{50} = 0.68$ FT
 $D_{50} = 8.1$ IN **USE $D_{50} = 9"$ min.**

LEVEL SPREADER DESIGN

Based upon Level Spreader Design Guidelines from the Massachusetts Stormwater Handbook, Volume 2, Chapter 2

| Location | At Least 25-YR | Sharp-crested | Design Width (ft) | Design Velocity (fps) |
|--|-------------------|---|-------------------|-----------------------|
| | Max Flow (cfs) | Weir Width ¹ Calculated (ft) | | |
| Level Spreader at Driveway Drainage Discharge Toward Wetland Series 'A' | 3.25 | 10.5 | 14.0 | 1.2 |
| Level Spreader at U/G Stormwater Detention Discharge Toward Wetland Series 'C' & 'D' | 8.43 | 27.2 | 28.0 | 1.5 |
| Level Spreader South of Sports Fields Discharge Toward Wetland Series 'E' | 7.74 | 24.9 | 25.0 | 1.5 |
| Level Spreader Haul Road (Sta 3+50) Discharge Toward Sports Field | 0.72 | 2.3 | 10.0 | 0.4 |

¹ calculated weir width for max 2-3" Height over sharp crested weir on 25-year event

$$Q = CLe H^{3/2} = 25 \text{ yr SCS 24-hr Design Storm}$$

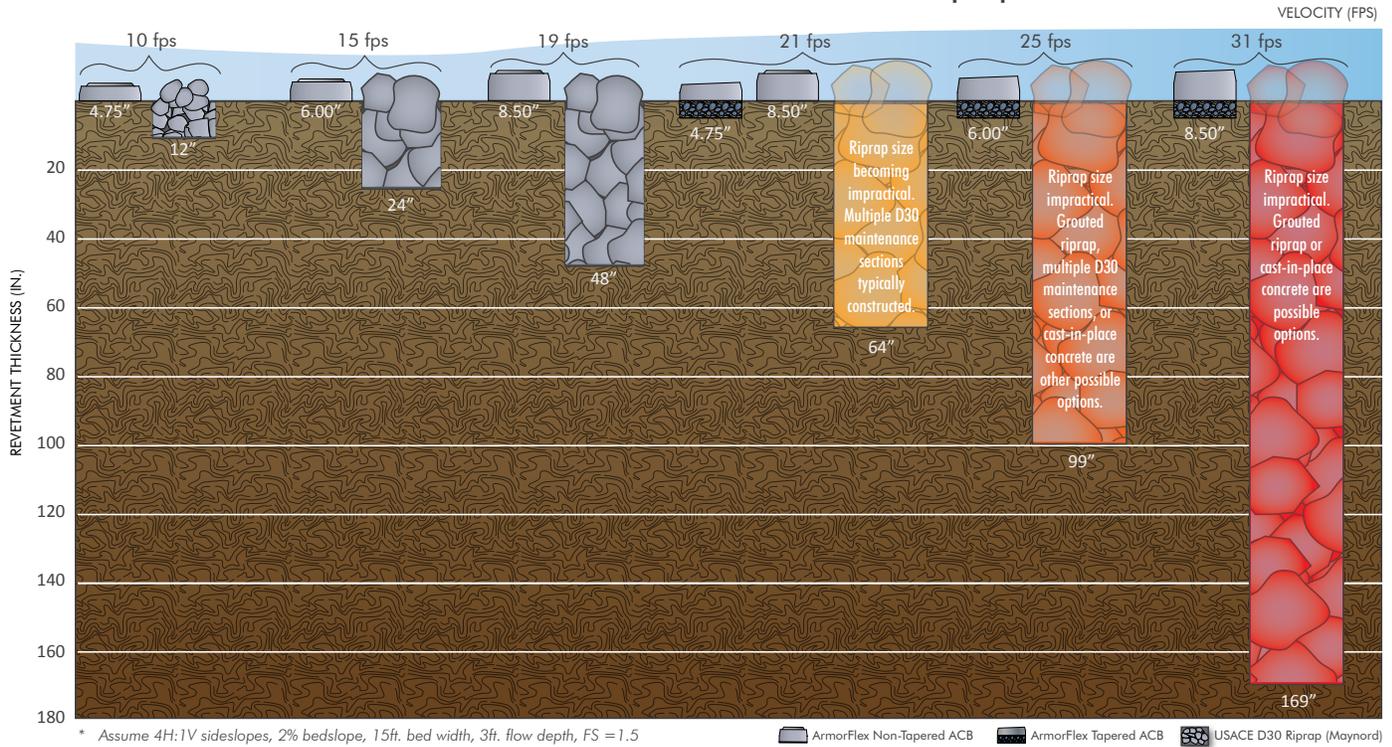
C = Coefficient, 3.47

Le= Effective Length Variable, Solve

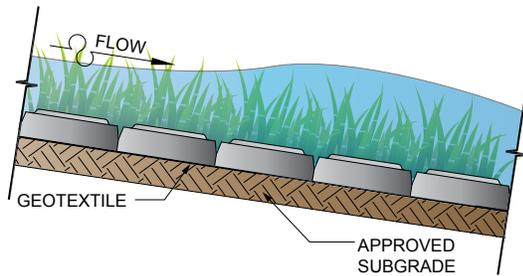
H = 0.2' (2"-3" height over spreader)

SIZING

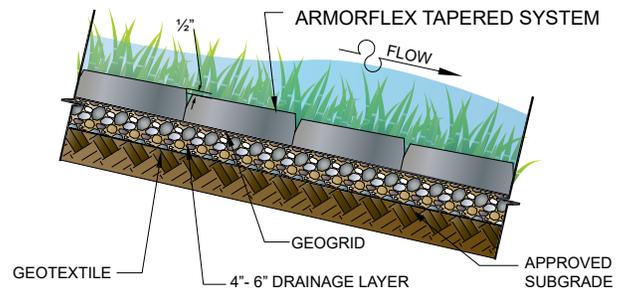
ArmorFlex® ACB vs Traditional Riprap*



TYPICAL CROSS SECTIONS (not to scale)



Standard Cross Section

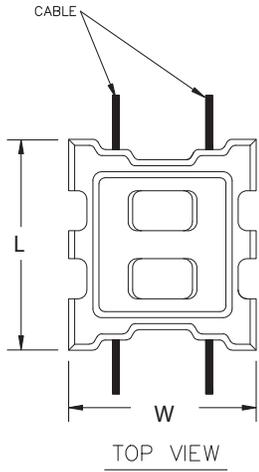


Tapered Series - Cross Section

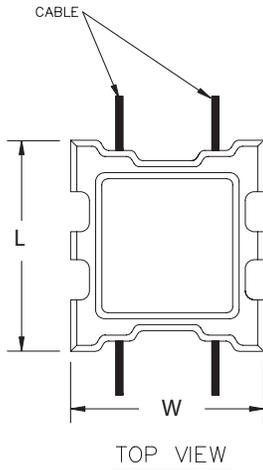
REFERENCES AND STANDARDS

- National Concrete Masonry Association (2010), "Design Manual for Articulating Concrete Block (ACB) Revetment Systems", NCMA Publication TR 220A
- ASTM D 7276 – Standard Guide for Analysis and Interpretation of Test Data for ACB Revetment Systems in Open Channel Flow
- ASTM D 7277 – Standard Test Method for Performance Testing of ACB Revetment Systems for Hydraulic Stability in Open Channel Flow
- ASTM D 6684 – Standard Specification for Materials and Manufacture of Articulating Concrete Block (ACB) Revetment Systems
- ASTM D 6884 – Standard Practice for Installation of Articulating Concrete Block (ACB) Revetment Systems
- FHWA Hydraulic Engineering Circular NO. 23: Bridge Scour and Stream Instability Countermeasures: Experience, Selection and Design Guidance – Third Edition, Volume II, Design Guideline 8.
- USDOT Federal Highway Administration Hydraulic Engineering Circular NO. 15, Third Edition (2005) "Design of Roadside Channels with Flexible Linings" National Highway Institute.
- Julien, Pierre Y. (2010) "Erosion and Sedimentation", 2nd Edition, Cambridge University Press

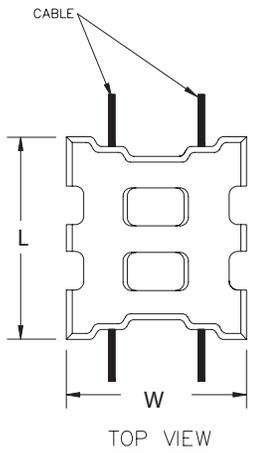
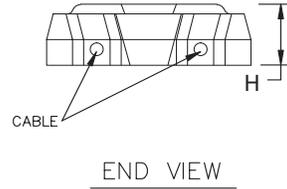
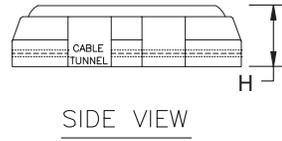
ArmorFlex® (not to scale)



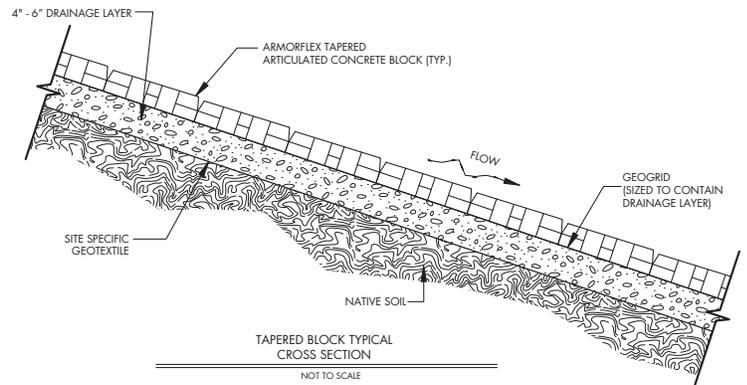
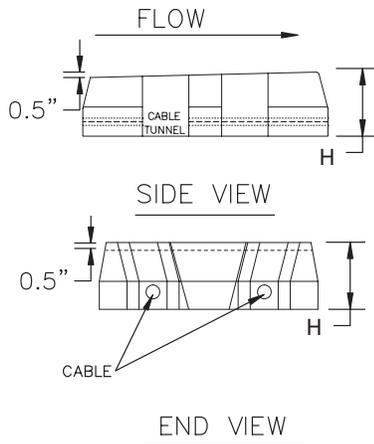
Open Cell Block



Closed Cell Block

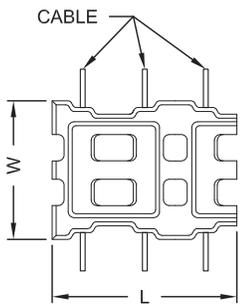


Tapered Series

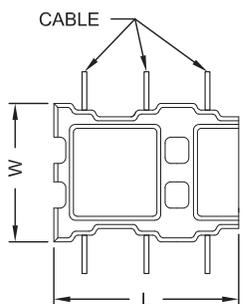


Tapered Series - Cross Section

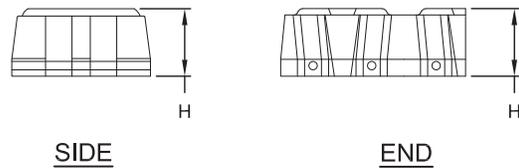
ArmorFlex® Block and a Half® (not to scale)



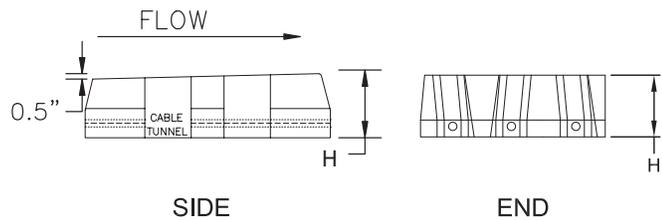
Open Cell Block



Closed Cell Block

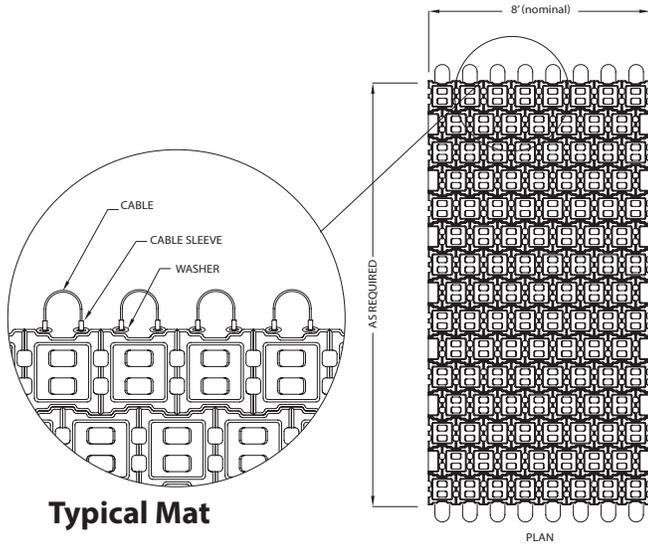


Standard Block and a Half

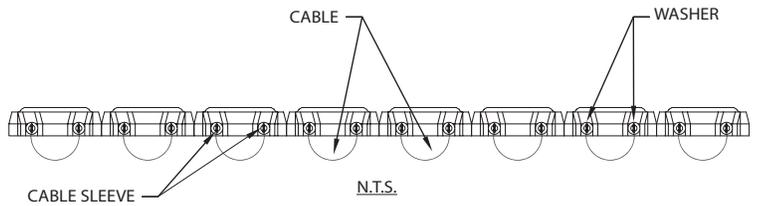


Tapered Block and a Half

ArmorFlex® cont. (not to scale)



Typical Mat

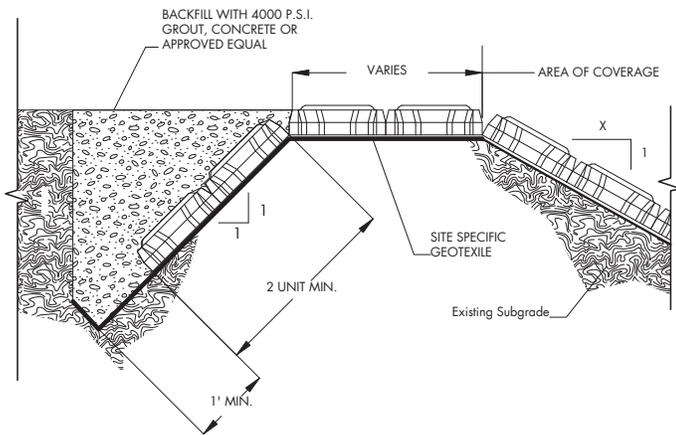


ArmorFlex Unit Specification

| Concrete Block Class | Open/Closed Cell | Nom. Dimensions (in.) | | | Gross Area/ (sq. ft.) | Min. Block Weight | | Open Area % |
|----------------------|------------------|-----------------------|------|------|-----------------------|-------------------|-------------|-------------|
| | | L | W | H | | lbs | lbs/sq. ft. | |
| 30S | Open | 13 | 11.6 | 4.75 | 0.98 | 33 | 35 | 20 |
| 50S | Open | 13 | 11.6 | 6 | 0.98 | 42 | 50 | 20 |
| 40 | Open | 17.4 | 15.5 | 4.75 | 1.77 | 59 | 40 | 20 |
| 50 | Open | 17.4 | 15.5 | 6 | 1.77 | 76 | 50 | 20 |
| 70 | Open | 17.4 | 15.5 | 8.5 | 1.77 | 108 | 70 | 20 |
| 40L | Open | 17.4 | 23.6 | 4.75 | 2.58 | 97 | 40 | 20 |
| 50L | Open | 17.4 | 23.6 | 6 | 2.58 | 116 | 50 | 20 |
| 70L | Open | 17.4 | 23.6 | 8.5 | 2.58 | 174 | 70 | 20 |
| 45S | Closed | 13 | 11.6 | 4.75 | 0.98 | 39 | 45 | 10 |
| 55S | Closed | 13 | 11.6 | 6 | 0.98 | 50 | 55 | 10 |
| 45 | Closed | 17.4 | 15.5 | 4.75 | 1.77 | 71 | 45 | 10 |
| 55 | Closed | 17.4 | 15.5 | 6 | 1.77 | 91 | 55 | 10 |
| 85 | Closed | 17.4 | 15.5 | 8.5 | 1.77 | 136 | 85 | 10 |
| 45L | Closed | 17.4 | 23.6 | 4.75 | 2.58 | 109 | 45 | 10 |
| 55L | Closed | 17.4 | 23.6 | 6 | 2.58 | 138 | 55 | 10 |
| 85L | Closed | 17.4 | 23.6 | 8.5 | 2.58 | 207 | 85 | 10 |

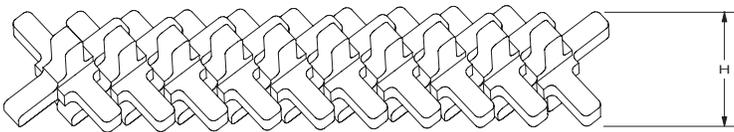
High Velocity Application Block Classes

| | | | | | | | | |
|------|------|------|------|------|------|-----|----|----|
| 40-T | Open | 17.4 | 15.5 | 4.75 | 1.77 | 58 | 40 | 20 |
| 50-T | Open | 17.4 | 15.5 | 6.00 | 1.77 | 75 | 50 | 20 |
| 70-T | Open | 17.4 | 15.5 | 8.50 | 1.77 | 109 | 70 | 20 |

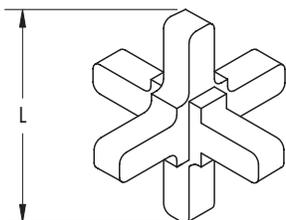


Top of Slope - Standard Detail

A-Jacks® (not to scale)



A-Jacks Placement Profile



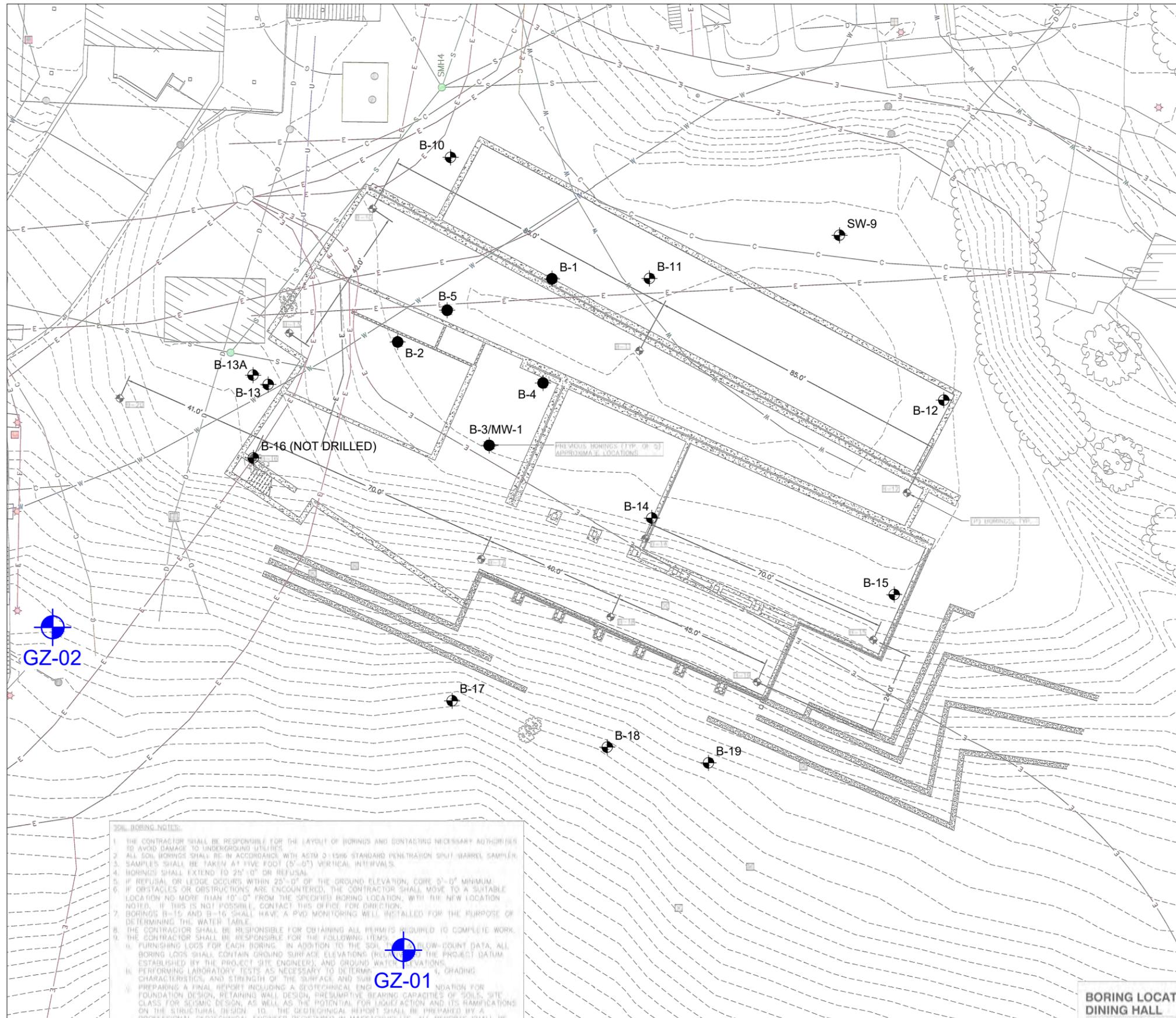
A-Jacks Unit

A-Jacks Unit Specification

| A-JACKS | L(FT) | H(FT) | WT (LBS) |
|---------|-------|-------|----------|
| AJ-24 | 2 | 1.5 | 78 |
| AJ-48 | 4 | 3.0 | 629 |
| AJ-72 | 6 | 4.5 | 2,120 |
| AJ-96 | 8 | 6.0 | 5,022 |
| AJ-120 | 10 | 7.5 | 9,699 |

Section 5

Soil Data



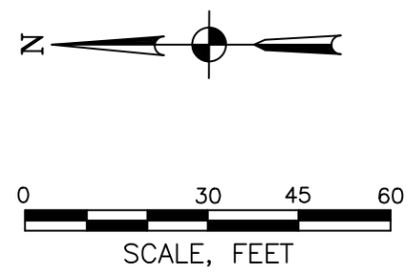
LEGEND:

-  B-10 APPROXIMATE LOCATION OF SOIL BORING DRILLED 14 THROUGH 17 JUNE 2022.
-  B-1 APPROXIMATE LOCATION OF SOIL BORING DRILLED BY SEABOARD DRILLING, INC. FOR O'REILLY, TALBUT, & OKUN ASSOCIATES, INC. IN 2014.

SOURCE:

DRAWING NO. B-1, TITLED "BORING LOCATION PLAN - DINING HALL", PREPARED BY, WINDIGO ARCHITECTURE,LLC, PROTERRA DESIGN GROUP, LLC, DATED 06/08/22, MARKED "FOR REVIEW, PROGRESS SET NOT FOR CONSTRUCTION".

 **GZ-01** TEST BORING DRILLED BY SEABOARD ON 10/18/2022



NOTES:

1. EXCEPT AS OTHERWISE NOTED, BACKGROUND INFORMATION NOTES, AND OTHER INFORMATION TAKEN FROM "FIGURE 2, EXPLORATION LOCATION PLAN - DINING HALL GEOTECHNICAL EVALUATION" DATED JULY 2022 AND PREPARED BY RW GILLESPIE & ASSOCIATES.
2. BORINGS GZ-1 AND GZ-2 DRILLED BY SEABOARD DRILLING OF CHICOPEE, MA ON 10/18/2022 AND OBSERVED BY GZA. BORING LOCATIONS BASED ON LINE OF SIGHT AND MEASUREMENT FROM EXISTING FEATURES AND SHOULD BE CONSIDERED ACCURATE ONLY TO THE EXTENT IMPLIED BY THE METHOD USED.

SOIL BORING NOTES:

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE LAYOUT OF BORINGS AND CONTACTING NECESSARY AUTHORITIES TO AVOID DAMAGE TO UNDERGROUND UTILITIES.
2. ALL SOIL BORINGS SHALL BE IN ACCORDANCE WITH ASTM D-1586 STANDARD PENETRATION SPIG-BARREL SAMPLER.
3. SAMPLES SHALL BE TAKEN AT FIVE FOOT (5'-0") VERTICAL INTERVALS.
4. BORINGS SHALL EXTEND TO 25'-0" OR REFUSAL.
5. IF REFUSAL OR LEDGE OCCURS WITHIN 25'-0" OF THE GROUND ELEVATION, CORE 5'-0" MINIMUM.
6. IF OBSTACLES OR OBSTRUCTIONS ARE ENCOUNTERED, THE CONTRACTOR SHALL MOVE TO A SUITABLE LOCATION NO MORE THAN 10'-0" FROM THE SPECIFIED BORING LOCATION, WITH THE NEW LOCATION NOTED. IF THIS IS NOT POSSIBLE, CONTACT THIS OFFICE FOR DIRECTION.
7. BORINGS B-15 AND B-16 SHALL HAVE A PVD MONITORING WELL INSTALLED FOR THE PURPOSE OF DETERMINING THE WATER TABLE.
8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL PERMITS REQUIRED TO COMPLETE WORK.
9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE FOLLOWING ITEMS:
 - i. FURNISHING LOGS FOR EACH BORING. IN ADDITION TO THE SOIL LOGS, FLOW-COUNT DATA, ALL BORING LOGS SHALL CONTAIN GROUND SURFACE ELEVATIONS (RELATIVE TO THE PROJECT DATUM ESTABLISHED BY THE PROJECT SITE ENGINEER), AND GROUND WATER ELEVATIONS.
 - ii. PERFORMING LABORATORY TESTS AS NECESSARY TO DETERMINE SOIL CLASSIFICATION, GRADING CHARACTERISTICS, AND STRENGTH OF THE SURFACE AND SUBSURFACE SOILS.
 - iii. PREPARING A FINAL REPORT INCLUDING A GEOTECHNICAL ENGINEERING RECOMMENDATION FOR FOUNDATION DESIGN, RETAINING WALL DESIGN, PRESUMPTIVE BEARING CAPACITIES OF SOILS, SITE CLASS FOR SEISMIC DESIGN, AS WELL AS THE POTENTIAL FOR LIQUIDATION AND ITS RAMIFICATIONS ON THE STRUCTURAL DESIGN. TO THE GEOTECHNICAL REPORT SHALL BE PREPARED BY A PROFESSIONAL GEOTECHNICAL ENGINEER REGISTERED IN MASSACHUSETTS. ALL REPORTS SHALL BE

BORING LOCATION PLAN - DINING HALL

| | | |
|--|---|---------------|
| Prepared By:  GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com | PROPOSED DINING HALL EAGLEBROOK SCHOOL DEERFIELD, MA | |
| Client: EAGLEBROOK | Title: EXPLORATION LOCATION PLAN | Report No.: - |
| Project No.: 15.0167107.00 | | |
| Date: DECEMBER 2022 | | |

The groundwater level measurement made in the observation well on 06 July 2022 is considered representative of stabilized groundwater conditions when the measurements were made.

Stormwater Management Area: Seasonal high groundwater table (SHWT) levels were estimated using observed redoximorphic features of recovered SPT samples. Gradations were run on samples of naturally deposited soil from 4 to 6 feet below ground surface. The gradations indicate the material consists of poorly graded sand with silt, silty sand, and sandy silt (USCS Classification SP-SM, SM, and ML) depending on location. The *Massachusetts Stormwater Handbook* indicates this soil is of Hydrologic Soil Group A for the SP-SM and SM and Hydrologic Soil Group C for the ML soils. The following table contains the observed groundwater and interpreted SHWT depth, fill thickness, depth to refusal, and Rawls infiltration rate.

| Boring | Estimated Depth to SHWT (feet) | Measured Depth to Groundwater (feet) | Fill Thickness (feet) | Depth to Refusal (feet) | Rawls Infiltration Rate (inches/hour) |
|--------|--------------------------------|--------------------------------------|-----------------------|-------------------------|---------------------------------------|
| SW-1 | Below 4 | Not Observed | -- | 4.2 | -- |
| SW-2 | 7 | Not Observed | 5.0 | Below 9 | 2.41 |
| SW-3 | 8 | 5.5 | 6.0 | Below 9 | 2.41 |
| SW-5 | 3 | 3.5 | 2.0 | Below 9 | 8.27 |
| SW-6 | Below 9 | Not Observed | -- | Below 9 | 0.27 |
| SW-7 | 6 | Not Observed | -- | Below 9 | 2.41 |
| SW-8 | 6 | Not Observed | -- | Below 9 | 2.41 |
| SW-9 | Below 9 | Not Observed | 8 | Below 9 | 2.41 |

The Natural Resource Conservation Service medium-intensity soil survey indicates the depth to the water table is about 20 to 42 inches below ground surface for the soil types mapped in the boring area.

5.0 EVALUATION OF GEOTECHNICAL DATA

5.01 General

Engineering evaluations for this project are based on the subsurface explorations, laboratory testing data, and the design information currently available to RWG&A. This report addresses the geotechnical aspects of the design and construction of the proposed dining hall building as illustrated on Drawing A1.05, *Dining Hall Upper Level Plan* and Drawing 3.00 and 3.01, *Dining Hall Elevations*, prepared by Windigo Architecture, LLC, revision dated 01 April 2022. RWG&A should review the following engineering evaluations to confirm their continued applicability if changes are made to the proposed finished floor elevations, site layout, structural loading, tolerable settlement amounts, and site grading. It is recommended that foundation design and construction comply with the requirements of applicable ordinances, regulations, and codes.

USCS and the USDA Soil Classification System

Development of a Mapping Scheme

Rubén A. García-Gaines

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Final Report

Approved for public release; distribution is unlimited.

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(ARTEMIS)"

Table 17. Consensus of the most probable (MP) and possible (P) USCS classification per USDA texture classification.

| USDA Classification | USCS classification | | | | | | | | | | Consensus | | | |
|---------------------|-----------------------|--------|--------------------|----|-------------------------------|----|---------------------------------------|----|------------------------|----|-----------|------------------------------|-------------------------------|-----------------------|
| | SSURGO (2014) Table 8 | | WES (1961) Table 9 | | Wilson et al. (1965) Table 10 | | Rollings and Rollings (1996) Table 11 | | Curtis (2005) Table 12 | | | Ayers et al. (2011) Table 13 | Baylot et al. (2013) Table 14 | FASST (2004) Table 15 |
| | MP | P | MP | P | MP | P | MP | P | MP | P | | | | |
| Sand | SM | SP-SM | SW, SP | - | MP | P | MP | P | MP | P | MP | MP | MP | SP |
| Loamy Sand | SM | CL | SM | SC | SM | SC | SM | SC | SM | SC | SM | SM | SM | SM |
| Sandy Loam | SM | ML, CL | SM | - | SM | - | SM | - | SM | - | SM | SC | SM | SM |
| Sandy Clay Loam | CL | SC | SC | SC | SC | - | SC | - | SC | - | SC | SC | SC | SC |
| Sandy Clay | SC, CL | - | SC | CL | SC | CL | SC | CL | SC | CL | SC | SC | SC | SC, CL |
| Loam | CL | ML | ML | - | ML | - | ML | - | ML | - | ML | CL | ML | CL |
| Silt Loam | CL | ML | ML | ML | ML | - | ML | - | ML | - | ML | SM | ML | ML |
| Silt | ML | - | ML | - | ML | - | ML | - | ML | - | ML | ML | ML | ML |
| Clay Loam | CL | - | CL, MH | - | CL, MH | - | CL, MH | - | CL, MH | - | CL | CL | CL | CL |
| Silty Clay Loam | CL | ML, CH | MH | - | MH | - | MH | - | MH | - | CL | CL | CL | CL |
| Clay | CH, CL | GC | CH | CL | CH | CL | CH | CL | CH | CL | CH | CH | CH | CH |
| Silty Clay | CH, CL | - | CL, MH | - | CL, MH | - | CL, MH | - | CL, MH | - | CL | CL | CH | CH |

5 Conclusion

We downloaded and organized data according to the USDA and USCS soil types from the SSURGO database. We then compared our results with four other USDA to USCS soil mapping schema and determined the most frequent USDA classifications occurring in USCS. We found good consensus between the data sources for most of the soil types. Based on our results we recommend the following:

1. **Sand** in USDA textural classification should be classified as **SP** in USCS.
2. **Loamy Sand** in USDA textural classification should be classified as **SM** in USCS.
3. **Sandy Loam** in USDA textural classification should be classified as **SM** in USCS.
4. **Sandy Clay Loam** in USDA textural classification should be classified as **SC** in USCS.
5. **Sandy Clay** in USDA textural classification should be classified as **SC** in USCS. No significant difference in occurrence exists between both USCS classifications.
6. **Loam** in USDA textural classification should be classified as **CL** in USCS.
7. **Silt Loam** in USDA textural classification should be classified as **ML** in USCS.
8. **Silt** in USDA textural classification should be classified as **ML** in USCS.
9. **Clay Loam** in USDA textural classification should be classified as **CL** in USCS.
10. **Silty Clay Loam** in USDA textural classification should be classified as **CL** in USCS.



Project Name: Proposed Dining Hall
 RWG&A Project No. 1829-002
 Location: Deerfield, Massachusetts
 Client: Eaglebrook School
 RWG&A Representative: Tom Snow
 Boring Location: See Exploration Location Plan
 Boring Abandonment Method: Backfilled with cuttings
 Observed Water Depth: Not Obs.

Drilling Co.: Northern Test Boring
 Drill Rig: Diedrich D-50 Rubber Track
 Driller Rep.: Mike Nadeau
 Date Started: 06/17/2022
 Date Completed: 06/17/2022
 Surface Elevation:
 Drilling Method: SSA
 Casing Type: N/A

| DEPTH, FT. | SYMBOL SAMPLES | SAMPLE NUMBER | DESCRIPTION OF MATERIAL | SAMPLE RECOVERY, IN. | BLOWS PER 6" | SPT-N BLOWS PER FT. | MOISTURE CONTENT % | LAB TESTS | PID (PPM) |
|------------|----------------|---------------|---|----------------------|--------------|---------------------|--------------------|-----------|-----------|
| 0 | | S-1 | TOPSOIL AND ORGANIC MATERIAL (8 inches). | 13 | 4 | 21 | | | |
| | | S-2 | SILTY SAND (SM); Medium dense, dry, fine sand, little silt, yellow-brown. | 10 | 9 | 58 | | | |
| | | | SILTY SAND (SM); Very dense, dry, coarse to fine sand, little silt, few gravel, red-brown. Dense, moist. | | 12 | | | | |
| 5 | | | Bottom of Exploration at 4.2'; Auger refusal on possible bedrock or boulder. | | | | | | |
| 10 | | | | | | | | | |
| 15 | | | | | | | | | |
| 20 | | | | | | | | | |
| 25 | | | | | | | | | |
| 30 | | | | | | | | | |

Notes:



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 Observed Water Depth: Not Obs.

Drilling Co.: Northern Test Boring
 Drill Rig: Diedrich D-50 Rubber Track
 Driller Rep.: Mike Nadeau
 Date Started: 06/17/2022
 Date Completed: 06/17/2022
 Surface Elevation:
 Drilling Method: SSA
 Casing Type: N/A

| DEPTH, FT. | SYMBOL SAMPLES | SAMPLE NUMBER | DESCRIPTION OF MATERIAL | SAMPLE RECOVERY, IN. | BLOWS PER 6" | SPT-N BLOWS PER FT. | MOISTURE CONTENT % | LAB TESTS | PID (PPM) |
|------------|------------------------|---------------|--|----------------------|----------------------------------|---------------------|--------------------|-----------|-----------|
| 0 | [Cross-hatched symbol] | S-1 | FILL; TOPSOIL AND ORGANIC MATERIAL (6 inches). | 8 | 4 | | | | |
| | | S-2 | FILL: Coarse to fine sand, few to little silt, trace to few gravel, red-brown to tan.. | 10 | 4 4 5 3 3 3 3 | | 6 | GS NM | |
| 5 | [Vertical line symbol] | S-3 | SILTY SAND (SM); Medium dense, dry, medium to fine sand, little silt, tan to orange-brown. | 12 | 4 | 13 | | | |
| | | S-4 | Strong orange oxidation seam (1/4"). Orange-brown, few silt seams (1/4" - 1/8"), moist. | 15 | 9 11 16 14 147 18 | 28 | | | |
| 10 | | | Bottom of Exploration at 9'; Not refusal. | | | | | | |

Notes: 5' Offset towards woods.



Project Name: Proposed Dining Hall
 RWG&A Project No. 1829-002
 Location: Deerfield, Massachusetts
 Client: Eaglebrook School
 RWG&A Representative: Tom Snow
 Boring Location: See Exploration Location Plan
 Boring Abandonment Method: Backfilled with cuttings
 Observed Water Depth: 5.5'

Drilling Co.: Northern Test Boring
 Drill Rig: Diedrich D-50 Rubber Track
 Driller Rep.: Mike Nadeau
 Date Started: 06/17/2022
 Date Completed: 06/17/2022
 Surface Elevation:
 Drilling Method: SSA
 Casing Type: N/A

| DEPTH, FT. | SYMBOL SAMPLES | SAMPLE NUMBER | DESCRIPTION OF MATERIAL | SAMPLE RECOVERY, IN. | BLOWS PER 6" | SPT-N BLOWS PER FT. | MOISTURE CONTENT % | LAB TESTS | PID (PPM) |
|------------|----------------|---------------|---|----------------------|--------------|---------------------|--------------------|-----------|-----------|
| 0 | | S-1 | FILL: TOPSOIL AND ORGANIC MATERIAL (6 inches). | 8 | 5 | | | | |
| | | S-2 | FILL: Coarse to fine sand, little silt, few gravel, brown to red-brown. Trace gravel. | 8 | 4 | | | | |
| | | | | | 2 | | | | |
| | | | | | 2 | | | | |
| 5 | | S-3 | | 17 | 1 | 2 | | | |
| | | | | | 1 | | | | |
| | | | | | 1 | | | | |
| | | S-4 | SILTY SAND (SM); Very loose, wet, fine sand, little silt, trace roots, yellow-brown to tan. | 7 | 4 | 17 | | | |
| | | | SILT WITH SAND (ML); Medium dense, moist, few fine sand, orange-brown. Oxidation seams, gray-brown to orange-brown. | | 8 | | | | |
| | | | | | 8 | | | | |
| | | | | | 9 | | | | |
| | | | | | 8 | | | | |
| 10 | | | Bottom of Exploration at 9'; Not refusal. | | | | | | |
| | | | | | | | | | |
| 15 | | | | | | | | | |
| | | | | | | | | | |
| 20 | | | | | | | | | |
| | | | | | | | | | |
| 25 | | | | | | | | | |
| | | | | | | | | | |
| 30 | | | | | | | | | |

Notes:



Project Name: Proposed Dining Hall
 RWG&A Project No. 1829-002
 Location: Deerfield, Massachusetts
 Client: Eaglebrook School
 RWG&A Representative: Tom Snow
 Boring Location: See Exploration Location Plan
 Boring Abandonment Method: Backfilled with cuttings
 Observed Water Depth: 3.5'

Drilling Co.: Northern Test Boring
 Drill Rig: Diedrich D-50 Rubber Track
 Driller Rep.: Mike Nadeau
 Date Started: 06/17/2022
 Date Completed: 06/17/2022
 Surface Elevation:
 Drilling Method: SSA
 Casing Type: N/A

| DEPTH, FT. | SYMBOL SAMPLES | SAMPLE NUMBER | DESCRIPTION OF MATERIAL | SAMPLE RECOVERY, IN. | BLOWS PER 6" | SPT-N BLOWS PER FT. | MOISTURE CONTENT % | LAB TESTS | PID (PPM) |
|------------|----------------|---------------|--|----------------------|--------------|---------------------|--------------------|-----------|-----------|
| 0 | | S-1 | TOPSOIL AND ORGANIC MATERIAL (8 inches). | 20 | 2 | | | | |
| | | S-2 | FILL; Coarse to fine sand, little silt, few gravel, brown to red-brown, possibly mix of reworked native and imported fill. | 18 | 4 | 4 | | | |
| | | S-3 | SILTY SAND (SM); Very loose, moist to wet, medium to fine sand, little silt, trace roots, yellow-brown to tan. | 15 | 2 | 19 | 15 | GS | |
| | | S-4 | SAND WITH SILT (SP-SM); Medium dense, wet, coarse to fine sand, few gravel, few silt, red-brown. | 15 | 8 | 11 | | NM | |
| 10 | | | Bottom of Exploration at 9'; Not refusal. | | 9 | | | | |
| 15 | | | | | 5 | | | | |
| 20 | | | | | 5 | | | | |
| 25 | | | | | 5 | | | | |
| 30 | | | | | 5 | | | | |

Notes:



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 Boring Location: See Exploration Location Plan
 Boring Abandonment Method: Backfilled with cuttings
 Observed Water Depth: Not Obs.

Drilling Co.: Northern Test Boring
 Drill Rig: Diedrich D-50 Rubber Track
 Driller Rep.: Mike Nadeau
 Date Started: 06/17/2022
 Date Completed: 06/17/2022
 Surface Elevation:
 Drilling Method: SSA
 Casing Type: N/A

| DEPTH, FT. | SYMBOL SAMPLES | SAMPLE NUMBER | DESCRIPTION OF MATERIAL | SAMPLE RECOVERY, IN. | BLOWS PER 6" | SPT-N BLOWS PER FT. | MOISTURE CONTENT % | LAB TESTS | PID (PPM) |
|------------|----------------|---------------|--|----------------------|--------------|---------------------|--------------------|-----------|-----------|
| 0 | | S-1 | TOPSOIL AND ORGANIC MATERIAL (4 inches). | 18 | 2 | 4 | | | |
| | | S-2 | SILTY SAND (SM); Very loose, dry, fine sand, little silt, yellow-brown to tan. | 12 | 2 | 4 | | | |
| | | | SAND WITH SILT (SP-SM); Very loose, dry, medium to fine sand, few silt, tan, bedding structure. | | 2 | | | | |
| 5 | | S-3 | SILT WITH SAND (ML); Medium dense, moist to wet, silt, with fine sand, tan. | 12 | 4 | 21 | 24 | GS | |
| | | S-4 | SILTY SAND WITH GRAVEL (SM); Dense to very dense, moist, coarse to fine sand, some gravel, little silt, red-brown. | 6 | 7 | 55 | | NM | |
| | | | Bottom of Exploration at 9'; Not refusal. | | 9 | | | | |
| | | | | | 12 | | | | |
| | | | | | 10 | | | | |
| | | | | | 14 | | | | |
| | | | | | 41 | | | | |
| | | | | | 42 | | | | |
| 10 | | | | | | | | | |
| | | | | | | | | | |
| 15 | | | | | | | | | |
| | | | | | | | | | |
| 20 | | | | | | | | | |
| | | | | | | | | | |
| 25 | | | | | | | | | |
| | | | | | | | | | |
| 30 | | | | | | | | | |

Notes:



Project Name: Proposed Dining Hall
 RWG&A Project No. 1829-002
 Location: Deerfield, Massachusetts
 Client: Eaglebrook School
 RWG&A Representative: Tom Snow
 Boring Location: See Exploration Location Plan
 Boring Abandonment Method: Backfilled with cuttings
 Observed Water Depth: Not Obs.

Drilling Co.: Northern Test Boring
 Drill Rig: Diedrich D-50 Rubber Track
 Driller Rep.: Mike Nadeau
 Date Started: 06/17/2022
 Date Completed: 06/17/2022
 Surface Elevation:
 Drilling Method: SSA
 Casing Type: N/A

| DEPTH, FT. | SYMBOL SAMPLES | SAMPLE NUMBER | DESCRIPTION OF MATERIAL | SAMPLE RECOVERY, IN. | BLOWS PER 6" | SPT-N BLOWS PER FT. | MOISTURE CONTENT % | LAB TESTS | PID (PPM) |
|------------|----------------|---------------|--|----------------------|----------------------------------|---------------------|--------------------|-----------|-----------|
| 0 | | S-1 | TOPSOIL AND ORGANIC MATERIAL (4 inches). | 14 | 2 | 4 | | | |
| | | S-2 | SILTY SAND (SM); Loose, dry, fine sand, little silt, yellow-brown to tan. Layered bedding structure, tan. | 12 | 2 2 2 2 3 6 | 9 | 5 | GS NM | |
| 5 | | S-3 | Little orange-brown oxidation staining. | 16 | 6 9 | 23 | | | |
| | | S-4 | SILTY SAND (SM); Medium dense to dense, moist, coarse to fine sand, little silt, few gravel, red-brown. | 20 | 11 12 12 15 16 18 | 31 | | | |
| 10 | | | Bottom of Exploration at 9'; Not refusal. | | | | | | |

Notes:



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 Boring Abandonment Method: Backfilled with cuttings
 Observed Water Depth: Not Obs.

Drilling Co.: Northern Test Boring
 Drill Rig: Diedrich D-50 Rubber Track
 Driller Rep.: Mike Nadeau
 Date Started: 06/17/2022
 Date Completed: 06/17/2022
 Surface Elevation:
 Drilling Method: SSA
 Casing Type: N/A

| DEPTH, FT. | SYMBOL SAMPLES | SAMPLE NUMBER | DESCRIPTION OF MATERIAL | SAMPLE RECOVERY, IN. | BLOWS PER 6" | SPT-N BLOWS PER FT. | MOISTURE CONTENT % | LAB TESTS | PID (PPM) |
|------------|----------------|---------------|--|----------------------|--------------|---------------------|--------------------|-----------|-----------|
| 0 | | S-1 | TOPSOIL AND ORGANIC MATERIAL (5 inches). | 15 | 2 | 4 | | | |
| | | S-2 | SILTY SAND (SM); Very loose to loose, dry, fine sand, little silt, yellow-brown to tan. | 12 | 2 | 6 | | | |
| 5 | | S-3 | Little orange-brown oxidation staining. | 12 | 3 | 28 | | | |
| | | S-4 | SILTY SAND (SM); Medium dense, moist, coarse to fine sand, little silt, few gravel, red-brown. | | 3 | 45 | | | |
| | | | Bottom of Exploration at 9'; Not refusal. | | 11 | | | | |
| | | | | | 12 | | | | |
| | | | | | 16 | | | | |
| | | | | | 17 | | | | |
| | | | | | 19 | | | | |
| | | | | | 21 | | | | |
| | | | | | 24 | | | | |
| | | | | | 27 | | | | |

Notes:



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 Boring Location: See Exploration Location Plan
 Boring Abandonment Method: Backfilled with cuttings
 Observed Water Depth: Not Obs.

Drilling Co.: Northern Test Boring
 Drill Rig: Diedrich D-50 Rubber Track
 Driller Rep.: Mike Nadeau
 Date Started: 06/17/2022
 Date Completed: 06/17/2022
 Surface Elevation:
 Drilling Method: SSA
 Casing Type: N/A

| DEPTH, FT. | SYMBOL SAMPLES | SAMPLE NUMBER | DESCRIPTION OF MATERIAL | SAMPLE RECOVERY, IN. | BLOWS PER 6" | SPT-N BLOWS PER FT. | MOISTURE CONTENT % | LAB TESTS | PID (PPM) |
|------------|----------------|---------------|--|----------------------|--------------|---------------------|--------------------|-----------|-----------|
| 0 | | S-1 | FILL; TOPSOIL AND ORGANIC MATERIAL (6 inches). | 14 | 2 | 6 | | | |
| | | S-2 | FILL; Dry, medium to fine sand, few silt, tan. Tan to brown. | 12 | 2 | | | | |
| | | S-3 | Coarse to fine sand, little silt, few gravel, red-brown, reworked native. | 15 | 4 | | | | |
| 5 | | S-4 | | 10 | 4 | | | | |
| | | | SILTY SAND (SM); Dense, dry, coarse to fine sand, little silt, little gravel, red-brown. | | 5 | 34 | | | |
| | | | Bottom of Exploration at 9'; Not refusal. | | 5 | | | | |
| 10 | | | | | 10 | | | | |
| | | | | | 12 | | | | |
| | | | | | 14 | | | | |
| | | | | | 17 | | | | |
| | | | | | 16 | | | | |
| | | | | | 19 | | | | |
| | | | | | 21 | | | | |

Notes:

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Eaglebrook School
271 Pine Nook Road
Deerfield, Massachusetts

EXPLORATION NO.: GZ-2
SHEET: 1 of 1
PROJECT NO: 15.0167107.00
REVIEWED BY: NLR

Logged By: J. Hyslip
Drilling Co.: Seaboard Drilling
Foreman: J. Nitsch

Type of Rig: ATV
Rig Model: Diedrich D50
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 381
Final Boring Depth (ft.): 15.3
Date Start - Finish: 10/18/2022 - 10/18/2022

H. Datum: NAD 83
V. Datum: NAVD 88

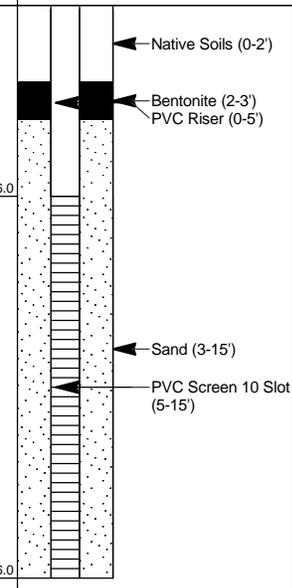
Hammer Type: Safety
Hammer Weight (lb.): 140 lbs
Hammer Fall (in.): 30"
Auger or Casing O.D./I.D Dia (in.): 7.63"/4.25"

Sampler Type: Split Spoon
Sampler O.D. (in.): 1.375"/2"
Sampler Length (in.): 30"
Rock Core Size: N/A

Groundwater Depth (ft.)

| Date | Time | Water Depth | Stab. Time |
|----------|---------|-------------|------------|
| 11/11/22 | 4:30 pm | 12.3 | ~24 days |

| Depth (ft) | Casing Blows/ Core Rate | Sample | | | | | SPT Value | Sample Description Modified Burmister | Remark | Field Test Data | Stratum | |
|------------|-------------------------|--------|-------------|-----------|-----------|--------------|-----------|---------------------------------------|--------|-----------------|-------------|-------------------------|
| | | No. | Depth (ft.) | Pen. (in) | Rec. (in) | Blows per 6" | | | | | Depth (ft.) | Description Elev. (ft.) |
| 0-0 | | | | | | | | : (See Note 1) | 1 | | | |
| 5 | | | | | | | | | 2 | 5 | 376.0 | |
| 10 | | | | | | | | | | | | |
| 15 | | | | | | | | | 3 | 15 | 366.0 | |
| | | | | | | | | End of exploration at 15.3 feet. | 4 | | | |



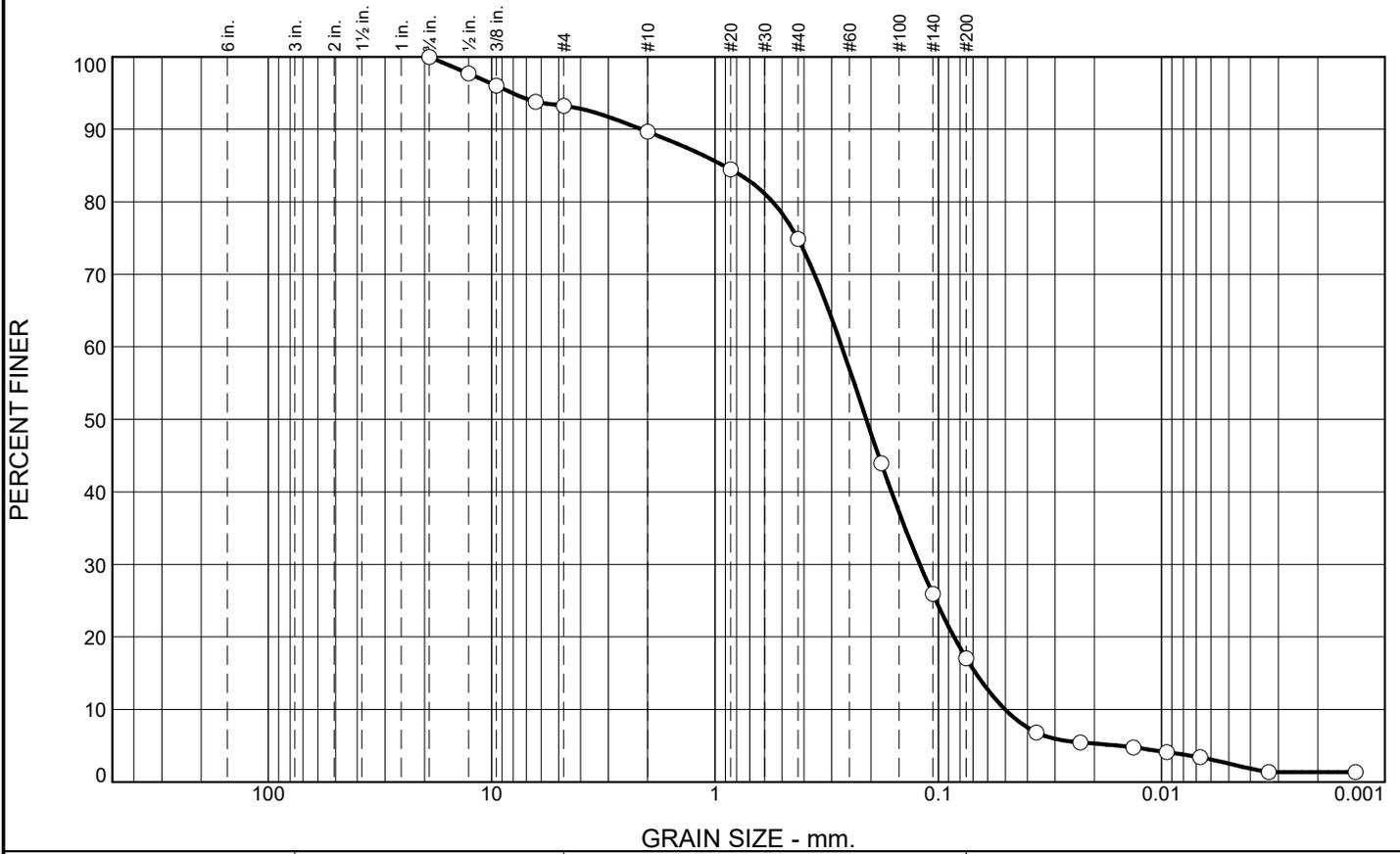
REMARKS

1 - Borehole advanced without sampling due to drilling tim constraints.
 2 - Increased rig chatter at 5 feet and 14 feet below ground surface. Bottom of fill elevation inferred from drilling action.
 3 - Auger/sampler spoon refusal encountered at 15 feet and 15 feet 3 inches below ground surface respectively.
 4 - 10 feet of 2 inch diameter, Schedule 40, threaded, flush joint, 10-slot PVC well screen set at approximately 15 feet below grade. Well completed to ground surface with a 2 inch diameter, Schedule 40, threaded, flush joint, PVC riser. Filter sand placed in annulus around well from 3 to 15 feet below grade. Bentonite seal installed from 2 to 3 feet below grade. Remaining annulus filled with native soils from 0 to 2 feet below grade. Well protected with flush mount roadbox.

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-2

Particle Size Distribution Report



| % +3" | % Gravel | | % Sand | | | % Fines | |
|-------|----------|------|--------|--------|------|---------|------|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 6.7 | 3.6 | 14.8 | 57.8 | 15.7 | 1.4 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|------------|---------------|----------------|--------------|
| 3/4" | 100.0 | | |
| 1/2" | 97.7 | | |
| 3/8" | 96.0 | | |
| 1/4" | 93.8 | | |
| #4 | 93.3 | | |
| #10 | 89.7 | | |
| #20 | 84.5 | | |
| #40 | 74.9 | | |
| #80 | 44.0 | | |
| #140 | 25.9 | | |
| #200 | 17.1 | | |
| 0.0363 mm. | 6.8 | | |
| 0.0231 mm. | 5.5 | | |
| 0.0134 mm. | 4.8 | | |
| 0.0095 mm. | 4.1 | | |
| 0.0067 mm. | 3.4 | | |
| 0.0033 mm. | 1.4 | | |
| 0.0014 mm. | 1.4 | | |

Soil Description
silty sand

Atterberg Limits
 PL= LL= NV PI=

Coefficients
 D₉₀= 2.1347 D₈₅= 0.9152 D₆₀= 0.2705
 D₅₀= 0.2100 D₃₀= 0.1211 D₁₅= 0.0680
 D₁₀= 0.0502 C_u= 5.39 C_c= 1.08

Classification
 USCS= AASHTO=

Remarks
 Moisture Content: 5.8%

* (no specification provided)

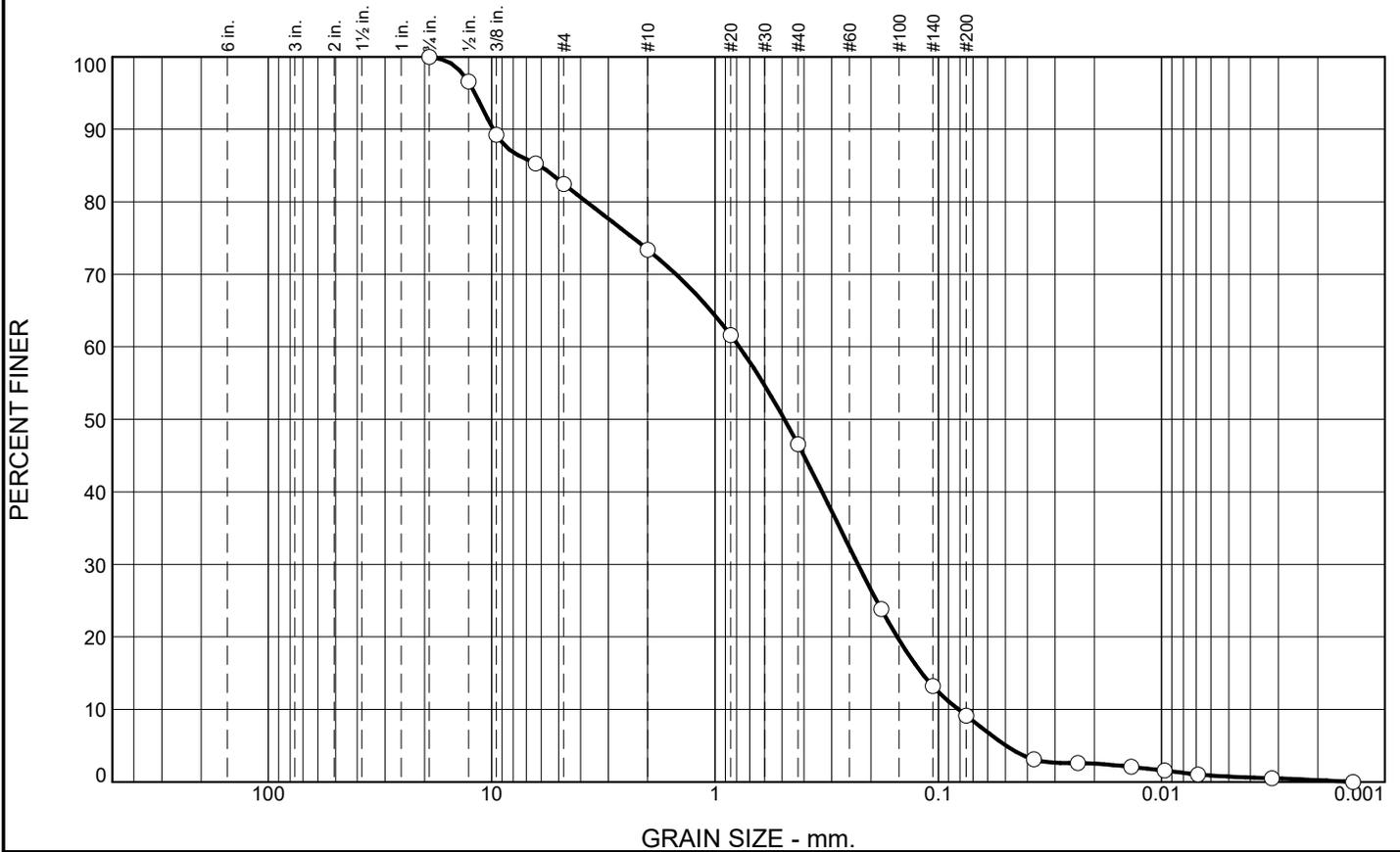
Location: SW-2 **Sample Number:** S-2 **Depth:** 2-4' **Date:** 07/07/2022

| | |
|---|--|
| R.W. Gillespie & Associates, Inc. Biddeford, Maine | Client: Eaglebrook School Project: Proposed Dining Hall Deerfield, MA Project No: 1829-002 Lab No. 17088-01 |
|---|--|

Tested By: LMJ **Checked By:** MTG

MTG

Particle Size Distribution Report



| % +3" | % Gravel | | % Sand | | | % Fines | |
|-------|----------|------|--------|--------|------|---------|------|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 17.6 | 9.0 | 26.8 | 37.4 | 9.0 | 0.2 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|------------|---------------|----------------|--------------|
| 3/4" | 100.0 | | |
| 1/2" | 96.6 | | |
| 3/8" | 89.2 | | |
| 1/4" | 85.3 | | |
| #4 | 82.4 | | |
| #10 | 73.4 | | |
| #20 | 61.6 | | |
| #40 | 46.6 | | |
| #80 | 23.8 | | |
| #140 | 13.2 | | |
| #200 | 9.2 | | |
| 0.0373 mm. | 3.1 | | |
| 0.0237 mm. | 2.6 | | |
| 0.0137 mm. | 2.1 | | |
| 0.0097 mm. | 1.6 | | |
| 0.0069 mm. | 1.0 | | |
| 0.0032 mm. | 0.5 | | |
| 0.0014 mm. | 0.0 | | |

Soil Description

Poorly graded sand with silt and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D₉₀= 9.8558 D₈₅= 6.1144 D₆₀= 0.7790
D₅₀= 0.4888 D₃₀= 0.2291 D₁₅= 0.1186
D₁₀= 0.0813 C_u= 9.59 C_c= 0.83

Classification

USCS= SP-SM AASHTO=

Remarks

Moisture Content: 14.7%

* (no specification provided)

Location: SW-5 Sample Number: S-3 Depth: 5-7' Date: 07/07/2022

| | |
|---|--|
| R.W. Gillespie & Associates, Inc. Biddeford, Maine | Client: Eaglebrook School Project: Proposed Dining Hall Deerfield, MA Project No: 1829-002 Lab No. 17088-02 |
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Tested By: LMJ Checked By: MTG

MTG



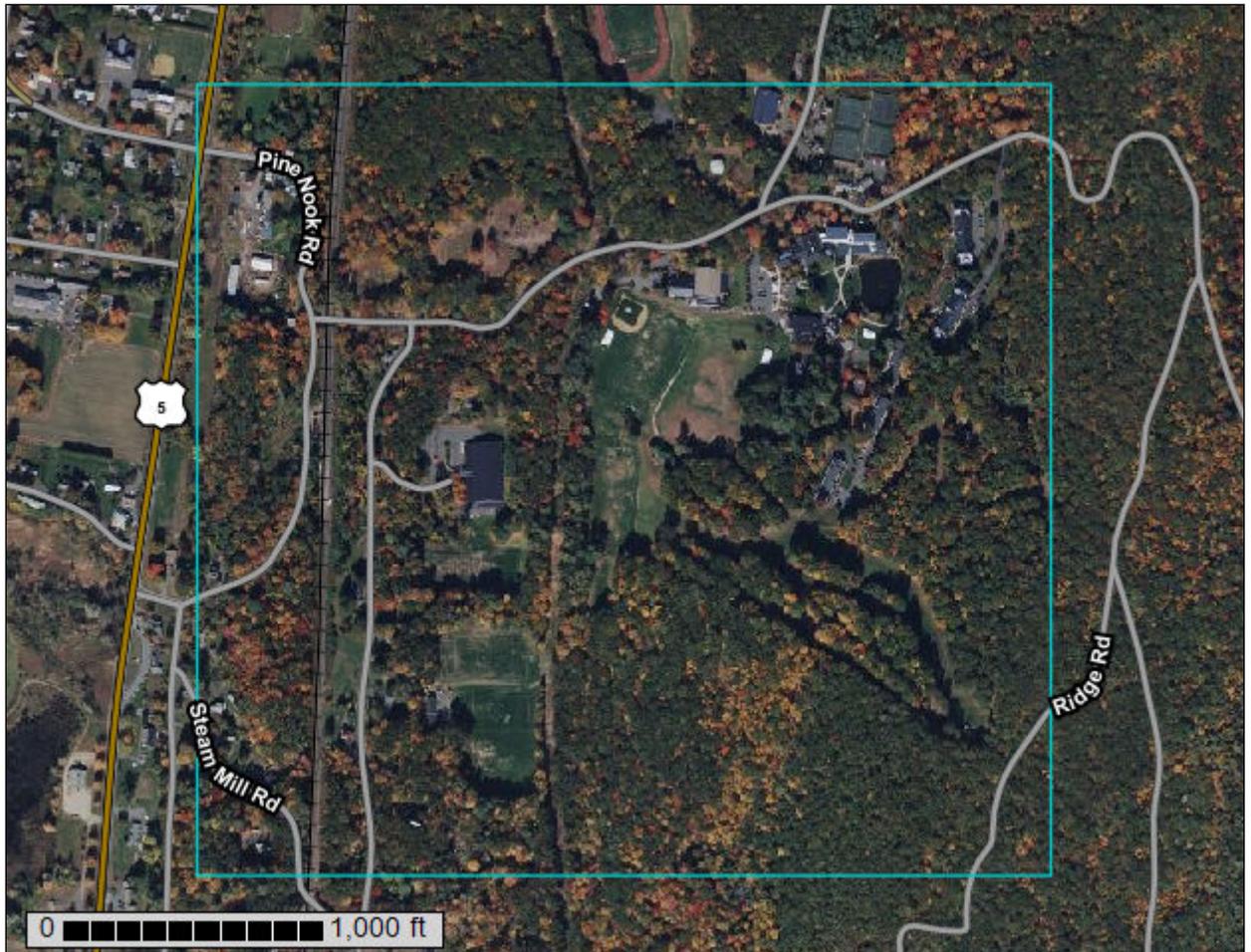
United States
Department of
Agriculture

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 Franklin County, Massachusetts



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MAP LEGEND

| | | |
|-------------------------------|--|---|
| Area of Interest (AOI) |  Area of Interest (AOI) |  Spoil Area |
| Soils |  Soil Map Unit Polygons |  Stony Spot |
| |  Soil Map Unit Lines |  Very Stony Spot |
| |  Soil Map Unit Points |  Wet Spot |
| Special Point Features |  Blowout |  Other |
| |  Borrow Pit |  Special Line Features |
| |  Clay Spot | Water Features |
| |  Closed Depression |  Streams and Canals |
| |  Gravel Pit | Transportation |
| |  Gravelly Spot |  Rails |
| |  Landfill |  Interstate Highways |
| |  Lava Flow |  US Routes |
| |  Marsh or swamp |  Major Roads |
| |  Mine or Quarry |  Local Roads |
| |  Miscellaneous Water | Background |
| |  Perennial Water |  Aerial Photography |
| |  Rock Outcrop | |
| |  Saline Spot | |
| |  Sandy Spot | |
| |  Severely Eroded Spot | |
| |  Sinkhole | |
| |  Slide or Slip | |
| |  Sodic Spot | |

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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: Franklin County, Massachusetts
 Survey Area Data: Version 16, Sep 2, 2021

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

Date(s) aerial images were photographed: Oct 15, 2020—Oct 31, 2020

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

Map Unit Legend

| Map Unit Symbol | Map Unit Name | Acres in AOI | Percent of AOI |
|------------------------------------|---|--------------|----------------|
| 2A | Pootatuck very fine sandy loam, 0 to 3 percent slopes, occasionally flooded | 0.1 | 0.0% |
| 131B | Yalesville-Holyoke complex, 3 to 8 percent slopes, rocky | 8.9 | 3.9% |
| 131C | Yalesville-Holyoke complex, 8 to 15 percent slopes, rocky | 10.8 | 4.7% |
| 131D | Yalesville-Holyoke complex, 15 to 25 percent slopes, rocky | 18.0 | 7.8% |
| 131F | Yalesville-Holyoke complex, 25 to 50 percent slopes, rocky | 21.5 | 9.3% |
| 223C | Scio silt loam, 8 to 15 percent slopes | 0.0 | 0.0% |
| 229F | Windsor and Merrimac soils, 25 to 60 percent slopes | 37.1 | 16.1% |
| 230A | Unadilla silt loam, 0 to 3 percent slopes | 5.0 | 2.2% |
| 235F | Poocham silt loam, 25 to 60 percent slopes | 3.6 | 1.5% |
| 254B | Merrimac fine sandy loam, 3 to 8 percent slopes | 2.0 | 0.9% |
| 254C | Merrimac fine sandy loam, 8 to 15 percent slopes | 2.2 | 1.0% |
| 254D | Merrimac fine sandy loam, 15 to 25 percent slopes | 0.3 | 0.1% |
| 255C | Windsor loamy sand, 8 to 15 percent slopes | 0.1 | 0.1% |
| 258B | Amostown fine sandy loam, 3 to 8 percent slopes | 28.6 | 12.4% |
| 260A | Sudbury sandy loam, 0 to 3 percent slopes | 2.4 | 1.0% |
| 275A | Agawam fine sandy loam, 0 to 3 percent slopes | 7.8 | 3.4% |
| 397D | Wethersfield very fine sandy loam, 15 to 25 percent slopes | 37.5 | 16.3% |
| 420B | Canton fine sandy loam, 3 to 8 percent slopes | 1.1 | 0.5% |
| 420D | Canton fine sandy loam, 15 to 25 percent slopes | 14.3 | 6.2% |
| 421F | Canton fine sandy loam, 25 to 45 percent slopes, very stony | 0.8 | 0.3% |
| 651 | Udorthents, smoothed | 16.9 | 7.3% |
| 656 | Udorthents-Urban land complex | 11.4 | 4.9% |
| Totals for Area of Interest | | 230.4 | 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

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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.

Minor Components

Occum, occasionally flooded

Percent of map unit: 5 percent
Landform: Flood plains, terraces
Landform position (three-dimensional): Tread, rise
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Limerick, frequently flooded

Percent of map unit: 5 percent
Landform: Terraces, flood plains
Landform position (three-dimensional): Tread, dip
Down-slope shape: Linear
Across-slope shape: Linear, concave
Hydric soil rating: Yes

Winooski, occasionally flooded

Percent of map unit: 2 percent
Landform: Terraces, flood plains
Landform position (three-dimensional): Tread, dip
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: No

131B—Yalesville-Holyoke complex, 3 to 8 percent slopes, rocky

Map Unit Setting

National map unit symbol: 9c5h
Elevation: 100 to 1,060 feet
Mean annual precipitation: 37 to 51 inches
Mean annual air temperature: 37 to 59 degrees F
Frost-free period: 135 to 182 days
Farmland classification: Not prime farmland

Map Unit Composition

Yalesville, rocky, and similar soils: 50 percent
Holyoke, rocky, and similar soils: 30 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Yalesville, Rocky

Setting

Landform: Moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex

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Parent material: Loamy supraglacial till derived from conglomerate and/or sandstone

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 3 inches: loam
Bw1 - 3 to 8 inches: loam
Bw2 - 8 to 17 inches: fine sandy loam
Bw3 - 17 to 22 inches: sandy loam
2C - 22 to 33 inches: stony sandy loam
R - 33 to 65 inches: bedrock

Properties and qualities

Slope: 3 to 8 percent
Surface area covered with cobbles, stones or boulders: 2.1 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 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 4.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: F145XY013CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Holyoke, Rocky

Setting

Landform: Moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Loamy supraglacial till derived from conglomerate and/or sandstone

Typical profile

A - 0 to 3 inches: fine sandy loam
Bw1 - 3 to 6 inches: loam
Bw2 - 6 to 17 inches: stony loam
R - 17 to 65 inches: bedrock

Properties and qualities

Slope: 3 to 8 percent
Surface area covered with cobbles, stones or boulders: 2.1 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)

Custom Soil Resource Report

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: F145XY011CT - Well Drained Shallow Till Uplands
Hydric soil rating: No

Minor Components

Cheshire, very stony

Percent of map unit: 14 percent
Landform: — error in exists on —
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Wilbraham, very stony

Percent of map unit: 5 percent
Landform: Ground moraines
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: Yes

Rock outcrop

Percent of map unit: 1 percent
Hydric soil rating: Unranked

131C—Yalesville-Holyoke complex, 8 to 15 percent slopes, rocky

Map Unit Setting

National map unit symbol: 9c5j
Elevation: 100 to 1,060 feet
Mean annual precipitation: 37 to 51 inches
Mean annual air temperature: 37 to 59 degrees F
Frost-free period: 135 to 182 days
Farmland classification: Not prime farmland

Map Unit Composition

Yalesville, rocky, and similar soils: 55 percent
Holyoke, rocky, and similar soils: 35 percent
Minor components: 10 percent

Custom Soil Resource Report

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Yalesville, Rocky

Setting

Landform: Moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Loamy supraglacial till derived from conglomerate and/or sandstone

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 3 inches: loam
Bw1 - 3 to 8 inches: loam
Bw2 - 8 to 17 inches: fine sandy loam
Bw3 - 17 to 22 inches: sandy loam
2C - 22 to 33 inches: stony sandy loam
R - 33 to 65 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Surface area covered with cobbles, stones or boulders: 2.1 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 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 4.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: F145XY013CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Holyoke, Rocky

Setting

Landform: Moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Loamy supraglacial till derived from conglomerate and/or sandstone

Typical profile

A - 0 to 3 inches: fine sandy loam
Bw1 - 3 to 6 inches: loam
Bw2 - 6 to 17 inches: stony loam

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R - 17 to 65 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent

Surface area covered with cobbles, stones or boulders: 2.1 percent

Depth to restrictive feature: 10 to 20 inches to lithic bedrock

Drainage class: Somewhat excessively drained

Runoff class: Very high

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 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: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6s

Hydrologic Soil Group: D

Ecological site: F145XY011CT - Well Drained Shallow Till Uplands

Hydric soil rating: No

Minor Components

Cheshire, very stony

Percent of map unit: 8 percent

Landform: — error in exists on —

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Linear

Hydric soil rating: No

Rock outcrop

Percent of map unit: 2 percent

Hydric soil rating: Unranked

131D—Yalesville-Holyoke complex, 15 to 25 percent slopes, rocky

Map Unit Setting

National map unit symbol: 9c5k

Elevation: 140 to 1,240 feet

Mean annual precipitation: 37 to 51 inches

Mean annual air temperature: 37 to 59 degrees F

Frost-free period: 135 to 182 days

Farmland classification: Not prime farmland

Map Unit Composition

Yalesville, rocky, and similar soils: 65 percent

Holyoke, rocky, and similar soils: 25 percent

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Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Yalesville, Rocky

Setting

Landform: Moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Loamy supraglacial till derived from conglomerate and/or sandstone

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 3 inches: loam
Bw1 - 3 to 8 inches: loam
Bw2 - 8 to 17 inches: fine sandy loam
Bw3 - 17 to 22 inches: sandy loam
2C - 22 to 33 inches: stony sandy loam
R - 33 to 65 inches: bedrock

Properties and qualities

Slope: 15 to 25 percent
Surface area covered with cobbles, stones or boulders: 2.1 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 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 4.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: F145XY013CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Holyoke, Rocky

Setting

Landform: Moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Loamy supraglacial till derived from conglomerate and/or sandstone

Typical profile

A - 0 to 3 inches: fine sandy loam
Bw1 - 3 to 6 inches: loam

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Bw2 - 6 to 17 inches: stony loam

R - 17 to 65 inches: bedrock

Properties and qualities

Slope: 15 to 25 percent

Surface area covered with cobbles, stones or boulders: 2.1 percent

Depth to restrictive feature: 10 to 20 inches to lithic bedrock

Drainage class: Somewhat excessively drained

Runoff class: Very high

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 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: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6s

Hydrologic Soil Group: D

Ecological site: F145XY011CT - Well Drained Shallow Till Uplands

Hydric soil rating: No

Minor Components

Cheshire, very stony

Percent of map unit: 8 percent

Landform: — error in exists on —

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Linear

Hydric soil rating: No

Rock outcrop

Percent of map unit: 2 percent

Hydric soil rating: Unranked

131F—Yalesville-Holyoke complex, 25 to 50 percent slopes, rocky

Map Unit Setting

National map unit symbol: 9c5l

Elevation: 100 to 1,240 feet

Mean annual precipitation: 37 to 51 inches

Mean annual air temperature: 37 to 59 degrees F

Frost-free period: 135 to 182 days

Farmland classification: Not prime farmland

Map Unit Composition

Yalesville, rocky, and similar soils: 60 percent

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Bw - 3 to 25 inches: loamy sand

C - 25 to 65 inches: sand

Properties and qualities

Slope: 25 to 60 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Excessively drained

Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 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 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: A

Ecological site: F144AY022MA - Dry Outwash

Hydric soil rating: No

Description of Merrimac

Setting

Landform: Outwash plains, outwash terraces, moraines, eskers, kames

Landform position (two-dimensional): Backslope, footslope, summit, shoulder

Landform position (three-dimensional): Side slope, crest, riser, tread

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Loamy glaciofluvial deposits derived from granite, schist, and gneiss over sandy and gravelly glaciofluvial deposits derived from granite, schist, and gneiss

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material

A - 1 to 10 inches: fine sandy loam

Bw1 - 10 to 22 inches: fine sandy loam

Bw2 - 22 to 26 inches: stratified gravel to gravelly loamy sand

2C - 26 to 65 inches: stratified gravel to very gravelly sand

Properties and qualities

Slope: 25 to 60 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Somewhat excessively drained

Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 2 percent

Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)

Sodium adsorption ratio, maximum: 1.0

Available water supply, 0 to 60 inches: Low (about 4.7 inches)

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Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

254D—Merrimac fine sandy loam, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: 2tyrg
Elevation: 0 to 1,890 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Merrimac and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Merrimac

Setting

Landform: Outwash plains, outwash terraces, moraines, eskers, kames
Landform position (two-dimensional): Backslope, footslope, summit, shoulder
Landform position (three-dimensional): Side slope, crest, riser, tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy glaciofluvial deposits derived from granite, schist, and gneiss over sandy and gravelly glaciofluvial deposits derived from granite, schist, and gneiss

Typical profile

Ap - 0 to 10 inches: fine sandy loam
Bw1 - 10 to 22 inches: fine sandy loam
Bw2 - 22 to 26 inches: stratified gravel to gravelly loamy sand
2C - 26 to 65 inches: stratified gravel to very gravelly sand

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline (0.0 to 1.4 mmhos/cm)

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Sodium adsorption ratio, maximum: 1.0

Available water supply, 0 to 60 inches: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2e

Hydrologic Soil Group: A

Ecological site: F145XY008MA - Dry Outwash

Hydric soil rating: No

Minor Components

Hinckley

Percent of map unit: 10 percent

Landform: Deltas, kames, eskers, outwash plains

Landform position (two-dimensional): Summit, shoulder, backslope

Landform position (three-dimensional): Nose slope, side slope, crest, head slope, rise

Down-slope shape: Convex

Across-slope shape: Convex, linear

Hydric soil rating: No

Windsor

Percent of map unit: 5 percent

Landform: Outwash terraces, dunes, outwash plains, deltas

Landform position (three-dimensional): Tread, riser

Down-slope shape: Linear, convex

Across-slope shape: Linear, convex

Hydric soil rating: No

Agawam

Percent of map unit: 5 percent

Landform: Kame terraces, outwash plains, outwash terraces, moraines, kames

Landform position (two-dimensional): Backslope, shoulder, footslope, summit

Landform position (three-dimensional): Side slope, crest, tread, riser, rise

Down-slope shape: Convex

Across-slope shape: Convex

Hydric soil rating: No

255C—Windsor loamy sand, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2svkq

Elevation: 0 to 1,260 feet

Mean annual precipitation: 36 to 71 inches

Mean annual air temperature: 39 to 55 degrees F

Frost-free period: 140 to 240 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Windsor and similar soils: 85 percent

Walpole

Percent of map unit: 3 percent
Landform: Deltas, depressions, outwash terraces, depressions, outwash plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, talf, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Hinckley

Percent of map unit: 3 percent
Landform: Deltas, kames, eskers, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest, head slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

397D—Wethersfield very fine sandy loam, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: 9cf1
Elevation: 120 to 660 feet
Mean annual precipitation: 37 to 51 inches
Mean annual air temperature: 37 to 59 degrees F
Frost-free period: 135 to 182 days
Farmland classification: Not prime farmland

Map Unit Composition

Wethersfield and similar soils: 87 percent
Minor components: 13 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wethersfield

Setting

Landform: Ground moraines, drumlins
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Parent material: Loamy lodgment till derived from conglomerate and/or sandstone

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 5 inches: very fine sandy loam
Bw1 - 5 to 12 inches: fine sandy loam
Bw2 - 12 to 23 inches: sandy loam
BC - 23 to 38 inches: sandy loam

Custom Soil Resource Report

2Cd1 - 38 to 50 inches: sandy loam

2Cd2 - 50 to 65 inches: gravelly sandy loam

Properties and qualities

Slope: 15 to 25 percent

Surface area covered with cobbles, stones or boulders: 0.0 percent

Depth to restrictive feature: 30 to 40 inches to densic material

Drainage class: Well drained

Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)

Depth to water table: About 25 to 35 inches

Frequency of flooding: None

Frequency of ponding: None

Available water supply, 0 to 60 inches: Low (about 5.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: C

Ecological site: F145XY012CT - Well Drained Dense Till Uplands

Hydric soil rating: No

Minor Components

Ludlow

Percent of map unit: 10 percent

Landform: Ground moraines, drumlins

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope

Down-slope shape: Convex

Across-slope shape: Linear

Hydric soil rating: No

Canton

Percent of map unit: 2 percent

Landform: Hillslopes, valley sides, ground moraines

Landform position (two-dimensional): Footslope

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Convex

Hydric soil rating: No

Wilbraham

Percent of map unit: 1 percent

Landform: Drumlins, moraines

Landform position (two-dimensional): Toeslope, backslope

Landform position (three-dimensional): Base slope, side slope

Down-slope shape: Concave, linear

Across-slope shape: Linear, convex

Hydric soil rating: Yes

420B—Canton fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2w81b
Elevation: 0 to 1,180 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Canton and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canton

Setting

Landform: Hills, moraines, ridges
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Side slope, crest, nose slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Coarse-loamy over sandy melt-out till derived from gneiss, granite, and/or schist

Typical profile

Ap - 0 to 7 inches: fine sandy loam
Bw1 - 7 to 15 inches: fine sandy loam
Bw2 - 15 to 26 inches: gravelly fine sandy loam
2C - 26 to 65 inches: gravelly loamy sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 19 to 39 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Low
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
Available water supply, 0 to 60 inches: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands

Custom Soil Resource Report

Hydric soil rating: No

Minor Components

Scituate

Percent of map unit: 10 percent

Landform: Hills, drumlins, ground moraines

Landform position (two-dimensional): Backslope, footslope, summit

Landform position (three-dimensional): Side slope, crest

Down-slope shape: Convex, linear

Across-slope shape: Convex

Hydric soil rating: No

Montauk

Percent of map unit: 5 percent

Landform: Moraines, ground moraines, hills, drumlins

Landform position (two-dimensional): Backslope, shoulder, summit

Landform position (three-dimensional): Side slope, crest

Down-slope shape: Convex, linear

Across-slope shape: Convex

Hydric soil rating: No

Charlton

Percent of map unit: 4 percent

Landform: Ridges, ground moraines, hills

Landform position (two-dimensional): Backslope, shoulder, summit

Landform position (three-dimensional): Side slope, crest

Down-slope shape: Convex, linear

Across-slope shape: Convex

Hydric soil rating: No

Swansea

Percent of map unit: 1 percent

Landform: Marshes, depressions, bogs, swamps, kettles

Down-slope shape: Concave

Across-slope shape: Concave

Hydric soil rating: Yes

420D—Canton fine sandy loam, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: 9c8j

Elevation: 210 to 1,050 feet

Mean annual precipitation: 38 to 52 inches

Mean annual air temperature: 35 to 58 degrees F

Frost-free period: 127 to 178 days

Farmland classification: Not prime farmland

Map Unit Composition

Canton and similar soils: 78 percent

Minor components: 22 percent

Custom Soil Resource Report

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canton

Setting

Landform: Hillslopes, valley sides, ground moraines

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Convex

Parent material: Loamy supraglacial till derived from gneiss and/or schist over sandy till derived from gneiss and/or schist

Typical profile

O_i - 0 to 0 inches: slightly decomposed plant material

A - 0 to 2 inches: fine sandy loam

B_{w1} - 2 to 9 inches: fine sandy loam

B_{w2} - 9 to 24 inches: fine sandy loam

B_{w3} - 24 to 28 inches: fine sandy loam

2C₁ - 28 to 34 inches: gravelly loamy sand

2C₂ - 34 to 43 inches: gravelly loamy sand

2C₃ - 43 to 65 inches: gravelly loamy sand

Properties and qualities

Slope: 15 to 25 percent

Surface area covered with cobbles, stones or boulders: 0.0 percent

Depth to restrictive feature: 18 to 36 inches to strongly contrasting textural stratification

Drainage class: Well drained

Runoff class: Medium

Capacity of the most limiting layer to transmit water (K_{sat}): Moderately high to high (0.60 to 6.00 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 3.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: A

Hydric soil rating: No

Minor Components

Gloucester

Percent of map unit: 10 percent

Landform: Upland slopes, moraines

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Convex

Hydric soil rating: No

Montauk

Percent of map unit: 5 percent

Landform: Drumlins, ground moraines

Custom Soil Resource Report

Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Charlton

Percent of map unit: 5 percent
Landform: Toes on moraines, valley sides on moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Newfields

Percent of map unit: 2 percent
Landform: Swales on ground moraines, depressions on ground moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

421F—Canton fine sandy loam, 25 to 45 percent slopes, very stony

Map Unit Setting

National map unit symbol: 9cf8
Elevation: 220 to 1,100 feet
Mean annual precipitation: 38 to 52 inches
Mean annual air temperature: 35 to 58 degrees F
Frost-free period: 127 to 178 days
Farmland classification: Not prime farmland

Map Unit Composition

Canton, very stony, and similar soils: 70 percent
Minor components: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canton, Very Stony

Setting

Landform: Hillslopes, valley sides, ground moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Loamy supraglacial till derived from gneiss and/or schist over sandy till derived from gneiss and/or schist

Custom Soil Resource Report

Typical profile

O_i - 0 to 0 inches: slightly decomposed plant material
A - 0 to 2 inches: fine sandy loam
Bw1 - 2 to 9 inches: fine sandy loam
Bw2 - 9 to 24 inches: fine sandy loam
Bw3 - 24 to 28 inches: fine sandy loam
2C1 - 28 to 34 inches: gravelly loamy sand
2C2 - 34 to 43 inches: gravelly loamy sand
2C3 - 43 to 65 inches: gravelly loamy sand

Properties and qualities

Slope: 25 to 45 percent
Surface area covered with cobbles, stones or boulders: 2.1 percent
Depth to restrictive feature: 18 to 36 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (K_{sat}): Moderately high to high (0.60 to 6.00 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 3.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Charlton, very stony

Percent of map unit: 10 percent
Landform: Toes on moraines, valley sides on moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Montauk, very stony

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

Gloucester, very stony

Percent of map unit: 10 percent
Landform: Upland slopes, moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope

Custom Soil Resource Report

Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

651—Udorthents, smoothed

Map Unit Setting

National map unit symbol: 9c8v
Elevation: 130 to 1,670 feet
Mean annual precipitation: 37 to 53 inches
Mean annual air temperature: 33 to 59 degrees F
Frost-free period: 127 to 182 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents, smoothed, and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents, Smoothed

Setting

Landform position (two-dimensional): Summit
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Human reworked till and/or alluvium and/or glaciofluvial deposits

Typical profile

^A - 0 to 6 inches: fine sandy loam
^C1 - 6 to 23 inches: stratified loamy very fine sand to fine sandy loam
^C2 - 23 to 42 inches: stratified loamy very fine sand to fine sandy loam
^C3 - 42 to 46 inches: fine sand
^C4 - 46 to 65 inches: loamy fine sand

Properties and qualities

Slope: 0 to 15 percent
Surface area covered with cobbles, stones or boulders: 0.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (0.60 to 20.00 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 5.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4s

Custom Soil Resource Report

Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Hinckley

Percent of map unit: 4 percent
Landform: Deltas, kames, eskers, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest, head slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Urban land

Percent of map unit: 4 percent

Paxton

Percent of map unit: 4 percent
Landform: Ground moraines, drumlins
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Shelburne

Percent of map unit: 4 percent
Landform: Ground moraines, drumlins
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Windsor

Percent of map unit: 4 percent
Landform: Terraces, outwash plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, rise
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

656—Udorthents-Urban land complex

Map Unit Setting

National map unit symbol: 9c8s
Elevation: 100 to 1,670 feet
Mean annual precipitation: 37 to 53 inches

Custom Soil Resource Report

Mean annual air temperature: 33 to 59 degrees F
Frost-free period: 127 to 182 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents and similar soils: 50 percent
Urban land: 45 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting

Landform position (two-dimensional): Summit
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Human reworked till and/or alluvium and/or glaciofluvial deposits

Typical profile

^A - 0 to 6 inches: fine sandy loam
^C1 - 6 to 23 inches: stratified loamy very fine sand to fine sandy loam
^C2 - 23 to 42 inches: stratified loamy very fine sand to fine sandy loam
^C3 - 42 to 46 inches: fine sand
^C4 - 46 to 65 inches: loamy fine sand

Properties and qualities

Slope: 0 to 15 percent
Surface area covered with cobbles, stones or boulders: 0.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (0.60 to 20.00 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 5.9 inches)

Interpretive groups

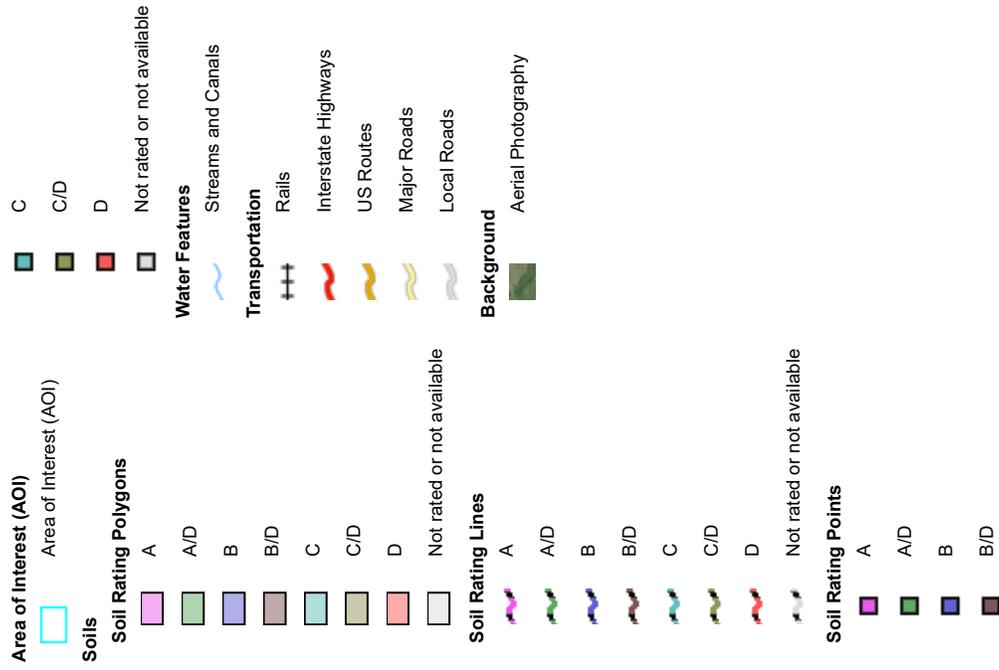
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Windsor

Percent of map unit: 5 percent
Landform: Terraces, outwash plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, rise
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

MAP LEGEND



MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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: Franklin County, Massachusetts
 Survey Area Data: Version 16, Sep 2, 2021

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

Date(s) aerial images were photographed: Oct 15, 2020—Oct 31, 2020

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

Custom Soil Resource Report

Table—Hydrologic Soil Group

| Map unit symbol | Map unit name | Rating | Acres in AOI | Percent of AOI |
|-----------------|---|--------|--------------|----------------|
| 2A | Pootatuck very fine sandy loam, 0 to 3 percent slopes, occasionally flooded | B/D | 0.1 | 0.0% |
| 131B | Yalesville-Holyoke complex, 3 to 8 percent slopes, rocky | B | 8.9 | 3.9% |
| 131C | Yalesville-Holyoke complex, 8 to 15 percent slopes, rocky | B | 10.8 | 4.7% |
| 131D | Yalesville-Holyoke complex, 15 to 25 percent slopes, rocky | B | 18.0 | 7.8% |
| 131F | Yalesville-Holyoke complex, 25 to 50 percent slopes, rocky | B | 21.5 | 9.3% |
| 223C | Scio silt loam, 8 to 15 percent slopes | B/D | 0.0 | 0.0% |
| 229F | Windsor and Merrimac soils, 25 to 60 percent slopes | A | 37.1 | 16.1% |
| 230A | Unadilla silt loam, 0 to 3 percent slopes | B | 5.0 | 2.2% |
| 235F | Poocham silt loam, 25 to 60 percent slopes | C | 3.6 | 1.5% |
| 254B | Merrimac fine sandy loam, 3 to 8 percent slopes | A | 2.0 | 0.9% |
| 254C | Merrimac fine sandy loam, 8 to 15 percent slopes | A | 2.2 | 1.0% |
| 254D | Merrimac fine sandy loam, 15 to 25 percent slopes | A | 0.3 | 0.1% |
| 255C | Windsor loamy sand, 8 to 15 percent slopes | A | 0.1 | 0.1% |
| 258B | Amostown fine sandy loam, 3 to 8 percent slopes | C/D | 28.6 | 12.4% |
| 260A | Sudbury sandy loam, 0 to 3 percent slopes | C/D | 2.4 | 1.0% |
| 275A | Agawam fine sandy loam, 0 to 3 percent slopes | B | 7.8 | 3.4% |
| 397D | Wethersfield very fine sandy loam, 15 to 25 percent slopes | C | 37.5 | 16.3% |
| 420B | Canton fine sandy loam, 3 to 8 percent slopes | B | 1.1 | 0.5% |

Custom Soil Resource Report

| Map unit symbol | Map unit name | Rating | Acres in AOI | Percent of AOI |
|------------------------------------|---|--------|--------------|----------------|
| 420D | Canton fine sandy loam, 15 to 25 percent slopes | A | 14.3 | 6.2% |
| 421F | Canton fine sandy loam, 25 to 45 percent slopes, very stony | A | 0.8 | 0.3% |
| 651 | Udorthents, smoothed | A | 16.9 | 7.3% |
| 656 | Udorthents-Urban land complex | A | 11.4 | 4.9% |
| Totals for Area of Interest | | | 230.4 | 100.0% |

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Water Features

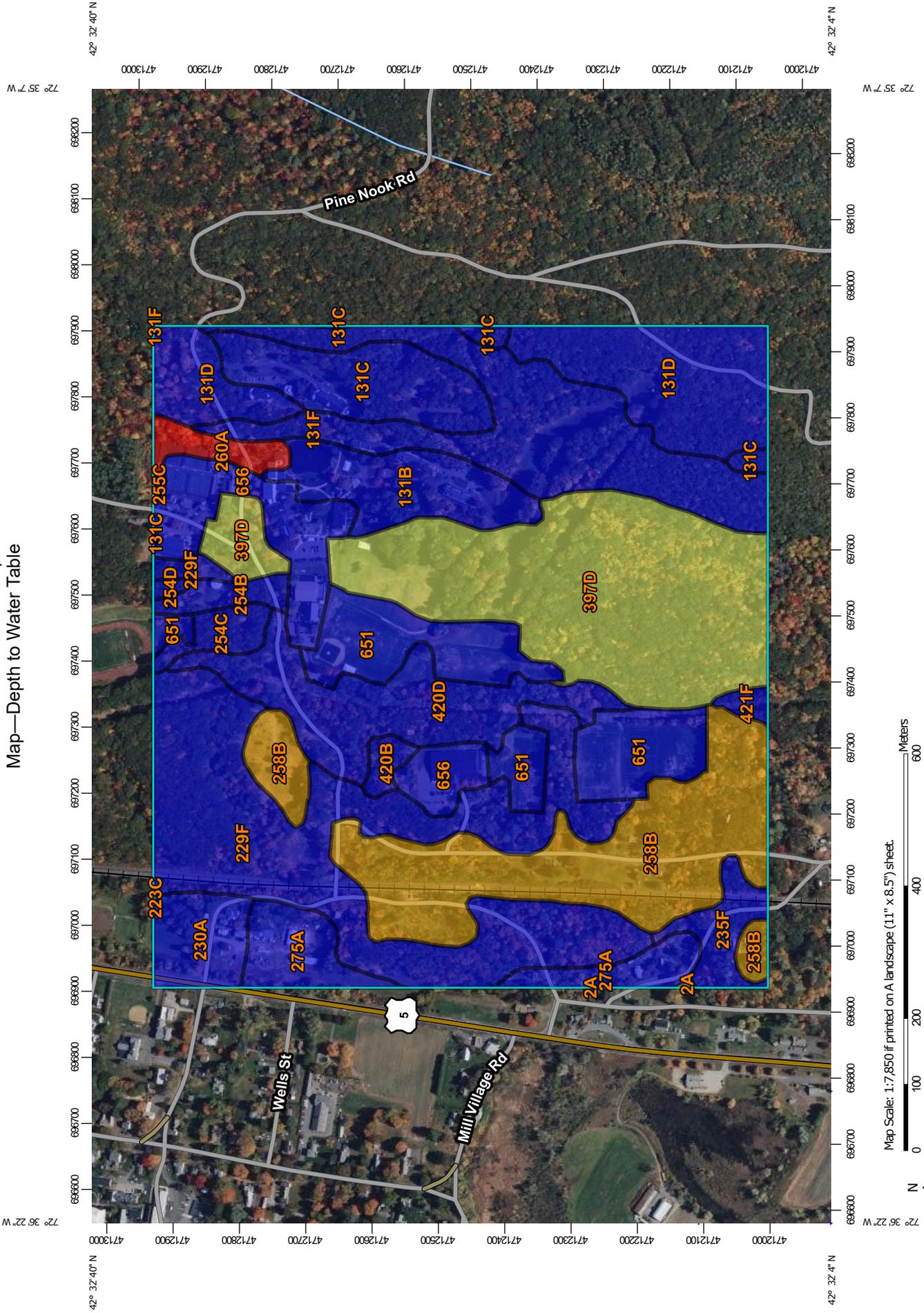
Water Features include ponding frequency, flooding frequency, and depth to water table.

Depth to Water Table

"Water table" refers to a saturated zone in the soil. It occurs during specified months. Estimates of the upper limit are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Custom Soil Resource Report
Map—Depth to Water Table

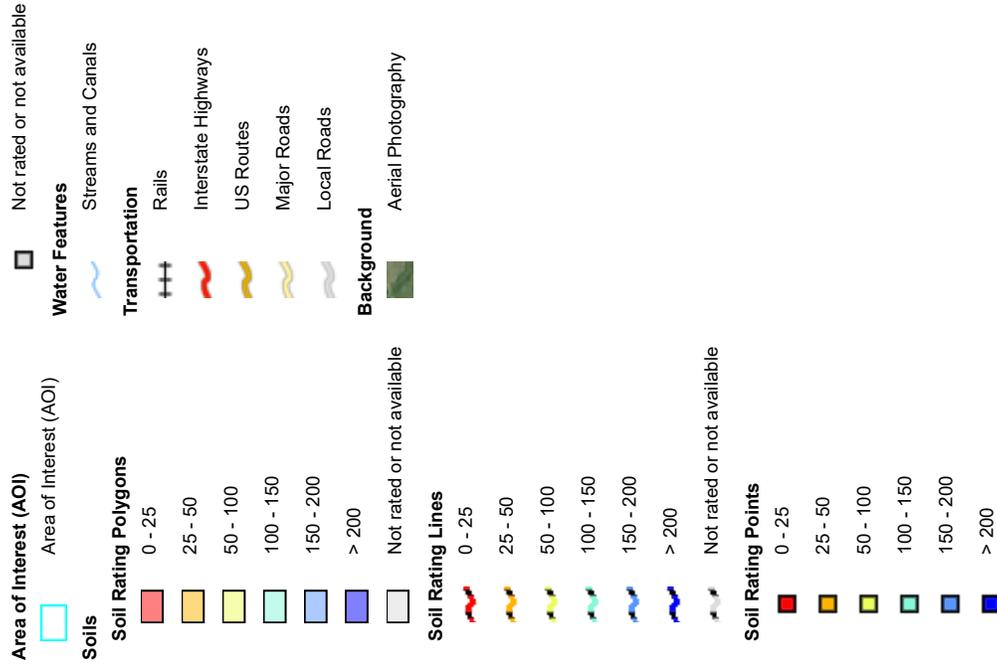


Map Scale: 1:7,850 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND



MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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: Franklin County, Massachusetts
 Survey Area Data: Version 16, Sep 2, 2021

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

Date(s) aerial images were photographed: Oct 15, 2020—Oct 31, 2020

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

Custom Soil Resource Report

Table—Depth to Water Table

| Map unit symbol | Map unit name | Rating (centimeters) | Acres in AOI | Percent of AOI |
|-----------------|---|----------------------|--------------|----------------|
| 2A | Pootatuck very fine sandy loam, 0 to 3 percent slopes, occasionally flooded | 53 | 0.1 | 0.0% |
| 131B | Yalesville-Holyoke complex, 3 to 8 percent slopes, rocky | >200 | 8.9 | 3.9% |
| 131C | Yalesville-Holyoke complex, 8 to 15 percent slopes, rocky | >200 | 10.8 | 4.7% |
| 131D | Yalesville-Holyoke complex, 15 to 25 percent slopes, rocky | >200 | 18.0 | 7.8% |
| 131F | Yalesville-Holyoke complex, 25 to 50 percent slopes, rocky | >200 | 21.5 | 9.3% |
| 223C | Scio silt loam, 8 to 15 percent slopes | 56 | 0.0 | 0.0% |
| 229F | Windsor and Merrimac soils, 25 to 60 percent slopes | >200 | 37.1 | 16.1% |
| 230A | Unadilla silt loam, 0 to 3 percent slopes | >200 | 5.0 | 2.2% |
| 235F | Poocham silt loam, 25 to 60 percent slopes | >200 | 3.6 | 1.5% |
| 254B | Merrimac fine sandy loam, 3 to 8 percent slopes | >200 | 2.0 | 0.9% |
| 254C | Merrimac fine sandy loam, 8 to 15 percent slopes | >200 | 2.2 | 1.0% |
| 254D | Merrimac fine sandy loam, 15 to 25 percent slopes | >200 | 0.3 | 0.1% |
| 255C | Windsor loamy sand, 8 to 15 percent slopes | >200 | 0.1 | 0.1% |
| 258B | Amostown fine sandy loam, 3 to 8 percent slopes | 38 | 28.6 | 12.4% |
| 260A | Sudbury sandy loam, 0 to 3 percent slopes | 20 | 2.4 | 1.0% |
| 275A | Agawam fine sandy loam, 0 to 3 percent slopes | >200 | 7.8 | 3.4% |
| 397D | Wethersfield very fine sandy loam, 15 to 25 percent slopes | 85 | 37.5 | 16.3% |
| 420B | Canton fine sandy loam, 3 to 8 percent slopes | >200 | 1.1 | 0.5% |

Custom Soil Resource Report

| Map unit symbol | Map unit name | Rating (centimeters) | Acres in AOI | Percent of AOI |
|------------------------------------|---|----------------------|--------------|----------------|
| 420D | Canton fine sandy loam, 15 to 25 percent slopes | >200 | 14.3 | 6.2% |
| 421F | Canton fine sandy loam, 25 to 45 percent slopes, very stony | >200 | 0.8 | 0.3% |
| 651 | Udorthents, smoothed | >200 | 16.9 | 7.3% |
| 656 | Udorthents-Urban land complex | >200 | 11.4 | 4.9% |
| Totals for Area of Interest | | | 230.4 | 100.0% |