Drainage Calculations

FOR

Town Line Estate
Permanent Private Way
At
22 Populatic St.
Medway, Massachusetts

Applicant
Robert & Lisa Lapinsky
62 Allston Ave.
Worcester, Ma 01604

Owner
Robert, Ronald & Richard Wasnewski
22 Populatic St.
Medway, Ma 02053

Prepared By:

L.A.L. Engineering Group
730 Main St. – Suite 1F
Millis, Ma 02054
P: (781) 248-1133 F: (508) 376-8440

December, 2017

TABLE OF CONTENTS

Subject **Page**

Attachments

SECTION 1

Project Narrative

Project Narrative

The 2.9 acre development site located at 22 Populatic Street is currently a single-family home lot. The home is served by town water, overhead electric and an on-site septic system. The on-site house was constructed in 1961 and has been in the Wasnewski family since that time. Prior to the Wasnewki family home, the parcel was utilized for sand/gravel mining. The parcel is bounded by Populatic Street on the east and single family home lots to the north, south and west. The homes to the west front on Walker Street.

The front portion of the lot consists of the house structure with associated driveway and cleared lawn area. The front portion of the lot is level, the central portion of the lot dips to an on-site depression and the rear of the lot gently rises to toward the rear of the homes located along Walker St.

The existing drainage catchment for the site is well defined by Walker Street to the west, a ridge associated with power line to the south, Populatic Street to the east and the adjacent yards to the north. There is no outlet from the site, as the on-site depression, located mid lot, serves as an infiltration area for this entire described catchment area. This depression may have been an area utilized for sand/gravel mining as the soils exhibit sand/gravel texture with little topsoil.

It should be noted that in the over 50 years the Wasnewski family members have lived on the property, the only time standing water was observed in this depression was prior to the construction of the drain system in Walker St. This drain system, constructed in the late 60's, intercepts the flow from Walker St and the uphill area west of Walker St. that had previously discharged to this on-site depression. This "new" system now discharges via swale and pipe, directly into the Charles River at the lower section of Walker St. and has, sub sequentially, removed a large portion of the previous watershed. This firm has observed this area directly following significant rainfalls events during May 2017 and October 2017 and during rainfall associated with snowmelt during December 2016. At no time was standing water observed. These Historic and direct observations, coupled with the on-site soils investigation performed in June, 2017, make it apparent all horizons/layers of the underlying soils exhibit rapid infiltration. The presence of an Organic horizon of leaf litter and plant debris over the top of these soils allows the area to function as a natural "raingarden".

Under the submitted project, the parcel will be divided into two (2) buildable lots. The existing home associated with 22 Populatic will be maintained, along with the necessary frontage along Populatic St.; a new lot will be created the rear of the parcel with frontage provided by the creation of a 250' "Hammerhead" roadway connecting to Populatic St at northern portion of the existing lot. This new lot will be served by underground electric, town water and an on-site septic system.

The proposed drainage catchment will maintain the existing pattern with the drainage for the new roadway being routed through roadside swales and a level spread prior to discharge to the

existing infiltration area. A stone "French mattress" section under the roadway will be used to ensure the limited drainage emanating from adjacent yards will be able to continue to reach the infiltration area. The roadway elevation is set so in case of any failure/blockage of the stone mattress, the new road will be overtopped a prior to any yard flooding. The intent of this design is to retain the natural "Raingarden" effect of the existing depression and, to that end, disturb as little of this area as possible.

Summary of Resource Areas

Wetland Resource Areas

There are no Wetland Resource areas on the parcel. The closest wetland, the Charles River, is over 600' away. The on-site depression has no hydraulic connection to 100-year flood plain nor does it hold standing water within any time frame of the year.

Natural Heritage

The Parcel and surrounding area do not appear on the most current Natural Heritage Map for Estimated Area of Rare Wildlife or Estimated Area for Endangered Species. There are no certified or potential vernal pools associated with the parcel.

Land Subject to Flooding

Bordering

The parcel is outside the All mapped FEMA flood plains per the Flood Insurance Rate Map (FIRM) #25021C0144E (Attachment A).

Isolated

Area does not meet the criteria per 310 CMR 10.00 Section 10.57(b) Isolated Land Subject to Flooding:

> 1. Isolated Land Subject to Flooding is an isolated depression or closed basin without an inlet or an outlet. It is an area which at least once a year confines standing water to a volume of at least ¼ acre-feet and to an average depth of at least six inches.

Soils

The National Resources Conservation Services (NRCS) data, verified by field investigation, indicate the site is composed of Hinckley Loamy Sand and Windsor Loamy Sand. Typical Soil properties are:

Hinckley Loamy Sand, 8 to 15 percent slopes

Properties and qualities

- *Slope:* 8 to 15 percent
- *Depth to restrictive feature:* More than 80 inches
- *Natural drainage class:* 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
- *Salinity, maximum in profile:* Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
- *Available water storage in profile:* Low (about 3.1 inches)

Interpretive groups

- *Land capability classification (irrigated):* None specified
- *Land capability classification (nonirrigated):* 4e
- *Hydrologic Soil Group:* A
- *Hydric soil rating:* No

Windsor Loamy Sand, 3 to 8 percent slopes

Properties and qualities

- *Slope:* 3 to 8 percent
- *Depth to restrictive feature:* More than 80 inches
- *Natural drainage class:* Excessively drained
- *Runoff class:* 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
- *Salinity, maximum in profile:* Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
- *Available water storage in profile:* Low (about 4.5 inches)

Interpretive groups

- *Land capability classification (irrigated):* None specified
- *Land capability classification (nonirrigated):* 2s
- *Hydrologic Soil Group:* A
- *Hydric soil rating:* No

Soil types were corroborated and Estimated Seasonal High Groundwater Elevations (ESHGW) determined through on-site test pits conducted in June, 2017.

Stormwater Design Summary

(HydroCAD Calculations Included under separate cover entitled *Drainage Calculations*)

Design Rationale

The project has been modeled in both the Existing and Proposed Conditions using HydroCAD modeling software. This program utilizes the Soil Conservation Service (SCS) method of determining peak flows and associated flow volumes based on 24-Hour Rainfall data for various return frequency storm events. The flow rates for 2, 10, 25 and 100-year storm events have been modeled to show conformance with the relative portions of the Ma DEP 2008 Stormwater Policy.

Existing Watershed

See Pre Development Subcatchment Plan E-1

The watershed for the parcel consists of one (1) subcatchment areas:

Exist Subcatchment #1 (1S)

This watershed encompasses the entire development parcel, along with surrounding portions of Populatic St., Walker St, Private house lots to the north and south. The drains from the highest point of the hill landform that dominates the western part of the site. This subcatchment drains northeast to the on-site depression. From here stormwater is infiltrated back to the groundwater. The subcatchment consists of Hinckley and Windsor soils and has the surface characteristics of an upland wooded forest mixed with single family developed lots comprised of modest single and two-story dwellings with associated lawns and drives.

Proposed Watersheds

See Post Development Subcatchment Plan P-1

Once developed, the site's drainage pattern will remain unchanged. The new roadway portion of the subcatchment area will utilize Best Management Practices (BMP's) to ensure compliance with the provisions of the Massachusetts Environmental Protection Agency's (MEPA) *2008 Stormwater Policy* (The Policy).

The proposed watershed for the parcel also consists of one (1) subcatchment areas:

Proposed Subcatchment # (2S)

This watershed remains unchanged from the existing (see above) with the exception of the addition of a 250' dead end roadway and one single-family home. The roadway will utilize roadside swales and a level spreader to route runoff into the existing, maintained infiltration area.

Pre/Post Development Summary of Flows

The pre post development flows have been investigated at one location within the study area:

Study Point #A- This location is where the runoff from subcatchment area discharges into the site low point/infiltration area. There is discharge into this infiltration area, but there **is no Discharge** out of the site beyond infiltration. Due to this situation, groundwater recharge will be fortuitously maximized and only Pre/Post development volume and ponding heights will be reviewed to determine the extent of the recharge area.

Pre/Post Development Summary of Flows (From HydroCAD Calculations)

Table 1 –Off-Site Discharge

Study Point	Pre development Discharge (CF)				
	Design Storm	2 yr	10yr	25yr	100yr
#A		0	0	0	0

Study Point	Post development Discharge (CFS)				
	Design Storm	2 yr	10yr	25yr	100yr
#A		0	0	0	0

Table 2- Storage Volume

Study Point	Pre development Storage Volume (CF)				
	Design Storm	2 yr	10yr	25yr	100yr
#A		0	17	180	1308

Study Point	Post development Storage Volume (CFS)				
	Design Storm	2 yr	10yr	25yr	100yr
#A		8	404	905	2746

Study Point	Post development Volume Difference (CFS)				
	Design Storm	2 yr	10yr	25yr	100yr
#A		*+8.00*	*+387*	*+725*	*+1438*

Table 2 - Storage Elevation

Study Point	Pre development Storage Elevation (Ft)			
Design Storm	2 yr	10yr	25yr	100yr
#A	134.00	134.04	134.25	134.81

Study Point	Post development Storage Elevation (Ft)			
Design Storm	2 yr	10yr	25yr	100yr
#A	134.02	134.42	134.68	135.25

Study Point	Post development Elevation Difference (Ft)			
Design Storm	2 yr	10yr	25yr	100yr
#A	0.02	+0.38	+0.43	+0.44

Conclusion

By maintaining the use of the existing on-site infiltration area, the proposed development ensure no off site flooding concerns, meet the DEP 2008 Stormwater Policy, as well as maximize groundwater recharge. Whereas HydroCAD model shows an anticipated standing water depth during 10 year-100 year storms, this does not coincide with historic and direct observations of the area which indicate no standing water for these runoff volumes. This discrepancy can be attributed to the conservative nature of the model and modeling software and the potential presence of localized depressions, dips and ground undulations that may not be significant enough to be recorded during the 2' contour survey.

The topography and on site soil evaluation would indicate the on-site depression was used for gravel removal in the past. This coincided with the family member recollections of site use prior to the 1960 house construction. The soil evaluation within the depression would indicate the past removal of the B Horizon and the subsequent evolution of a new A Horizon overlaying the sandy soil. The soil profile of the depression, as it exists, mimics the requirements of an infiltration basin design as specified in the *Ma DEP 2008 Stormwater Policy, Volume 2, Chapter 2*. The existing sand in overlaid by a mixed A & B Horizons material (Loamy Sand) with organics (Leaf Litter) to allow plant growth within the basin. For this reason, the depression will not be altered in order to allow for its continued natural function.

SECTION 2

2008 DEP Stormwater Policy Checklist & Calculations

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

Checklist for Stormwater Report

A. Introduction

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

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

The Stormwater Report must include:

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

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

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

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

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

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

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

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

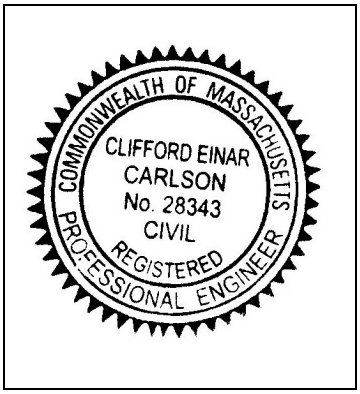
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



Clifford E. Carlson 12/12/17

Signature and Date

Checklist

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

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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

☒ No disturbance to any Wetland Resource Areas

☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)

☐ Reduced Impervious Area (Redevelopment Only)

☒ Minimizing disturbance to existing trees and shrubs

☐ LID Site Design Credit Requested:

- ☐ Credit 1
- ☐ Credit 2
- ☐ Credit 3

☒ Use of "country drainage" versus curb and gutter conveyance and pipe

☐ Bioretention Cells (includes Rain Gardens)

☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☐ Treebox Filter

☐ Water Quality Swale

☒ Grass Channel

☐ Green Roof

☒ Other (describe): Reduce paved (Impervious) area by Minimizing roadway width & no sidewalks, Retain existing Forested Infiltration Area

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

☐ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth

☐ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

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

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

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

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

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

☐ Static ☒ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

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

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

Standard 4: Water Quality

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

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

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

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

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

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

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

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

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

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

☐ All exposure has been eliminated.

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

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

Standard 6: Critical Areas

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

Standard 9: Operation and Maintenance Plan

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

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

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

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

Standard 10: Prohibition of Illicit Discharges

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

☐ An Illicit Discharge Compliance Statement is attached;

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

The 2008 DEP Stormwater Management Standards (Bold)

1. **No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.**

No Discharge to or adjacent to Wetland Resource Areas. √

2. **Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.**

No Discharge from property boundary for pre/post development. √

---

3. **Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.**

•Per the Policy:

Rv = F x impervious area

Rv = *Required Recharge Volume*, expressed in Ft^3, cubic yards,or acre-feet

F = Target Depth Factor associated with each Hydrologic Soil Group

Impervious Area = pavement and rooftop area on site

=4,600 sf (Tannery Way) + 6,000 sf (House & Drive)

=10,600 sf

Rv=(0.60 in (HG A)/12) x 10,600 sf =**530 Ft^3 Required**

Provided (Per HydroCAD Infiltration Volume Calculations):

Infiltration Area Storage Volume= 905 Ft^3 (25-Year Storm)

905 Ft^3 >530 Ft^3 √

Drawdown Time <72 Hours (From HydroCAD Calculations):

Infiltration Area (100 Year Storm)=25 Hours √

4. **Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This Standard is met when:**

   a. **Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained;**

   b. **Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and**

   c. **Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.**

a. Required Water Quality Volume:

W_{QV}=(1.00") x A_{Imp}

=(1.00/12) x 4,600 s.f.

=**383 Ft^3**

Infiltration Area Storage Volume Provided= 404 Ft^3 (10-Year Storm)

404 Ft^3 > 383 Ft^3 √

b. TSS Removal:

Infiltration (Rapid Rate) requires 44%TSS Removal Prior to Infiltration Structure:

At Level Spreader=51% (See Attachment C)

Infiltration Area =90% (See Attachment C)

5. **For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt, and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53 and**

the regulations promulgated there under at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.

•Not Applicable. The proposed project does not constitute a Land use with Higher Potential Pollutant Load (LUHPPL) as defined by 310 CMR 10.04 and 314 CMR 9.02 and the Policy.

6. **Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A "storm water discharge" as defined in 314 CMR 3.04(2)(a)1 or (b) to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of a public water supply.**

   • 1" Rule used for Required Water Volume (See Standard #4(a).
   • 44% TSS removal must be achieved prior to discharge to the infiltration BMP. (See Standard 4 (b).

7. A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.

•Not Applicable. The proposed project does not constitute a redevelopment project.

8. A plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.

•See Erosion & Sediment Control Plan, Sheet EC-1.

9. A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed.

•See BMP Operation and Control Manual. (Attachment D)

10. All illicit discharges to the stormwater management system are prohibited.

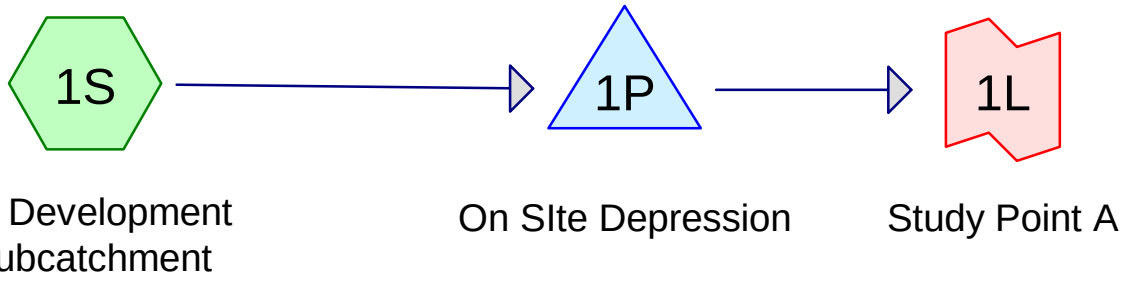
•No illicit discharges will be allowed. An "Illicit Discharge Compliance Statement" is supplied within the Long Term operation and Maintenance Plan.

Best Management Practice Sizing Calculation

Level Spreader Sizing (Per Ma DEP 2008 Stormwater Policy Vol. 2)
5 Ac Drainage Area=20' Min.
Provided (4.5 Ac. Drainage Area)=38' > 20' √

SECTION 3

HydroCAD Stormwater Calculation for Pre/Post Development



Subcat Reach Pond Link

Drainage Diagram for Medway Exist
Prepared by L.A.L. Engineering Group

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
188,000	36	Woods, Fair, HSG A (1S)
28,000	51	1 acre lots, 20% imp, HSG A (1S)
1,100	98	Paved roads w/curbs & sewers (1S)
217,100		**TOTAL AREA**

Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Pre Development Runoff Area=217,100 sf 3.09% Impervious Runoff Depth=0.00"
Flow Length=760' Tc=20.3 min CN=38 Runoff=0.00 cfs 0 cf

Pond 1P: On SIte Depression Peak Elev=134.00' Storage=0 cf Inflow=0.00 cfs 0 cf
Outflow=0.00 cfs 0 cf

Link 1L: Study Point A Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Total Runoff Area = 217,100 sf Runoff Volume = 0 cf Average Runoff Depth = 0.00"
96.91% Pervious = 210,400 sf 3.09% Impervious = 6,700 sf

Summary for Subcatchment 1S: Pre Development Subcatchment

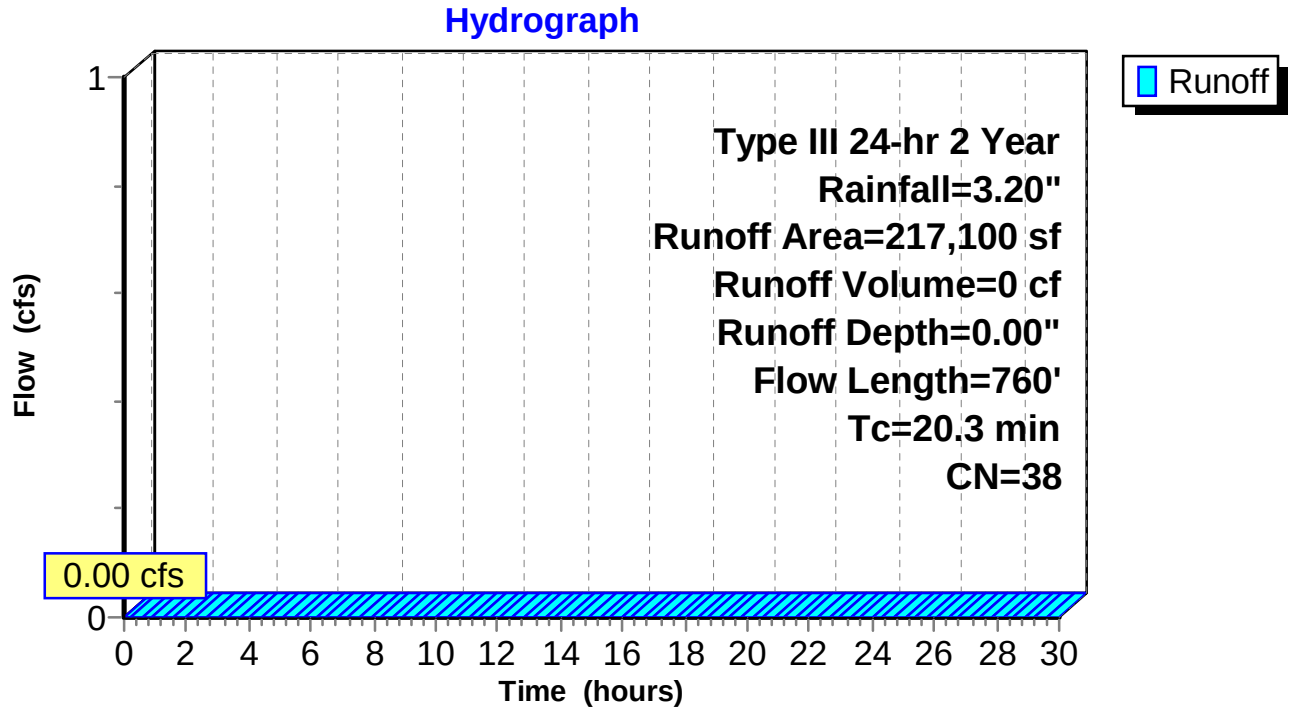
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.20"

Area (sf)	CN	Description
98,000	36	Woods, Fair, HSG A
28,000	51	1 acre lots, 20% imp, HSG A
90,000	36	Woods, Fair, HSG A
1,100	98	Paved roads w/curbs & sewers
217,100	38	Weighted Average
210,400		Pervious Area
6,700		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	100	0.1000	0.15		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
9.0	660	0.0600	1.22		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
20.3	760	Total			

Subcatchment 1S: Pre Development Subcatchment



Summary for Pond 1P: On SIte Depression

Inflow Area = 217,100 sf, 3.09% Impervious, Inflow Depth = 0.00" for 2 Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 134.00' @ 0.00 hrs Surf.Area= 300 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	134.00'	29,000 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

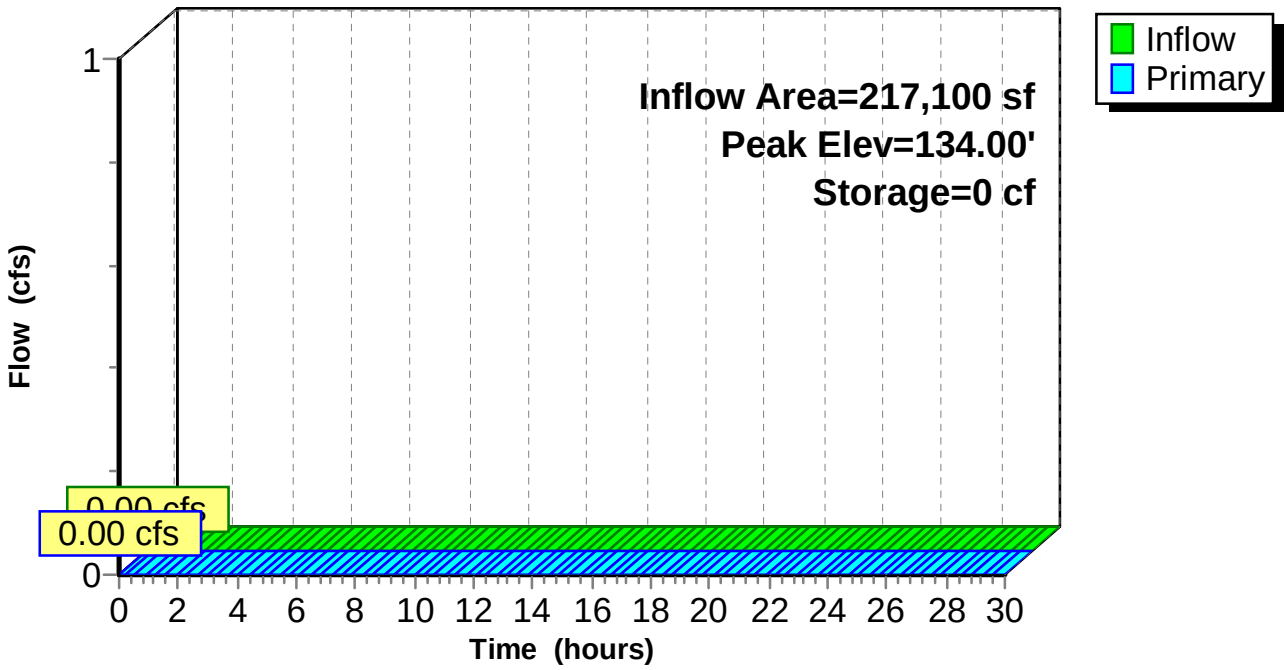
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
134.00	300	0	0
136.00	6,350	6,650	6,650
138.00	16,000	22,350	29,000

Device	Routing	Invert	Outlet Devices
#1	Primary	134.00'	**8.270 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=134.00' (Free Discharge)
↑—**1=Exfiltration** (Passes 0.00 cfs of 0.06 cfs potential flow)

Pond 1P: On SIte Depression

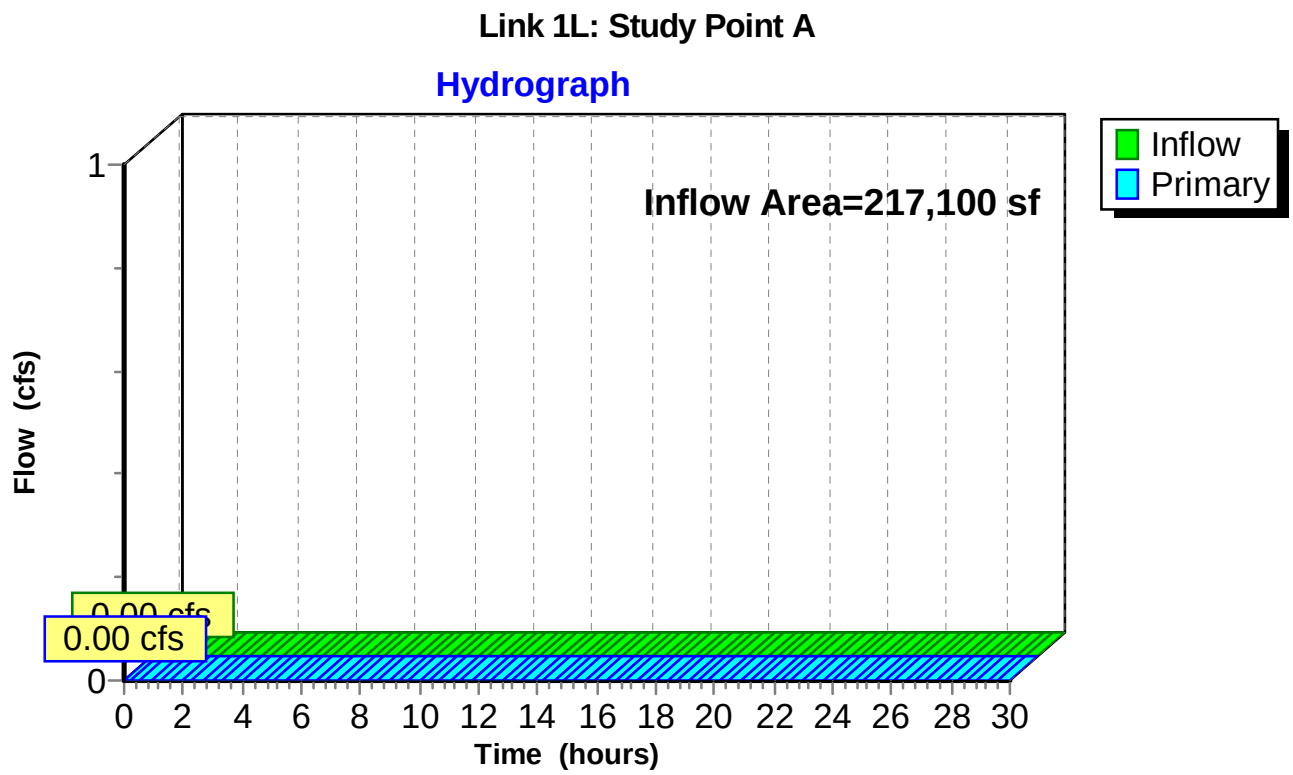
Hydrograph



Summary for Link 1L: Study Point A

Inflow Area = 217,100 sf, 3.09% Impervious, Inflow Depth = 0.00" for 2 Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs



Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Pre Development Runoff Area=217,100 sf 3.09% Impervious Runoff Depth=0.13"
Flow Length=760' Tc=20.3 min CN=38 Runoff=0.09 cfs 2,394 cf

Pond 1P: On SIte Depression Peak Elev=134.05' Storage=20 cf Inflow=0.09 cfs 2,394 cf
Outflow=0.09 cfs 2,394 cf

Link 1L: Study Point A Inflow=0.09 cfs 2,394 cf
Primary=0.09 cfs 2,394 cf

Total Runoff Area = 217,100 sf Runoff Volume = 2,394 cf Average Runoff Depth = 0.13"
96.91% Pervious = 210,400 sf 3.09% Impervious = 6,700 sf

Summary for Subcatchment 1S: Pre Development Subcatchment

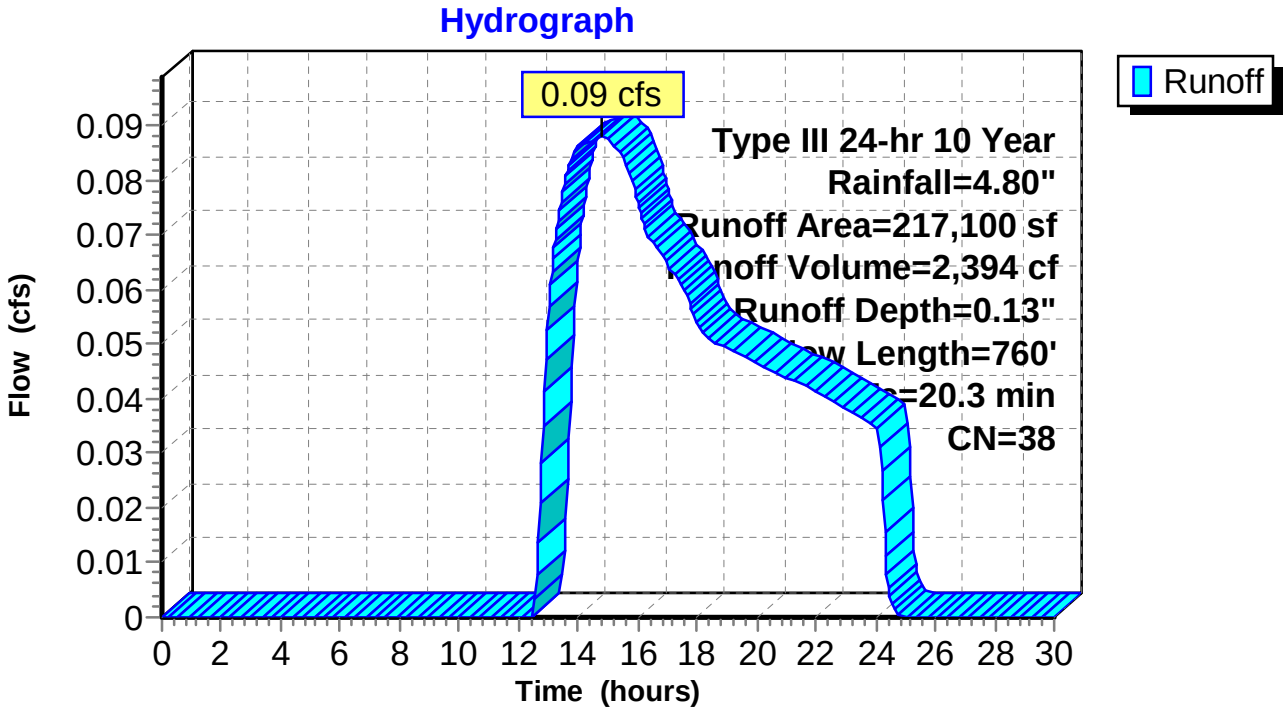
Runoff = 0.09 cfs @ 14.79 hrs, Volume= 2,394 cf, Depth= 0.13"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=4.80"

Area (sf)	CN	Description
98,000	36	Woods, Fair, HSG A
28,000	51	1 acre lots, 20% imp, HSG A
90,000	36	Woods, Fair, HSG A
1,100	98	Paved roads w/curbs & sewers
217,100	38	Weighted Average
210,400		Pervious Area
6,700		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	100	0.1000	0.15		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
9.0	660	0.0600	1.22		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
20.3	760	Total			

Subcatchment 1S: Pre Development Subcatchment



Summary for Pond 1P: On SIte Depression

Inflow Area = 217,100 sf, 3.09% Impervious, Inflow Depth = 0.13" for 10 Year event
Inflow = 0.09 cfs @ 14.79 hrs, Volume= 2,394 cf
Outflow = 0.09 cfs @ 14.97 hrs, Volume= 2,394 cf, Atten= 0%, Lag= 11.2 min
Primary = 0.09 cfs @ 14.97 hrs, Volume= 2,394 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 134.05' @ 14.97 hrs Surf.Area= 460 sf Storage= 20 cf

Plug-Flow detention time= 3.2 min calculated for 2,394 cf (100% of inflow)
Center-of-Mass det. time= 3.2 min (1,059.8 - 1,056.7)

Volume	Invert	Avail.Storage	Storage Description
#1	134.00'	29,000 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

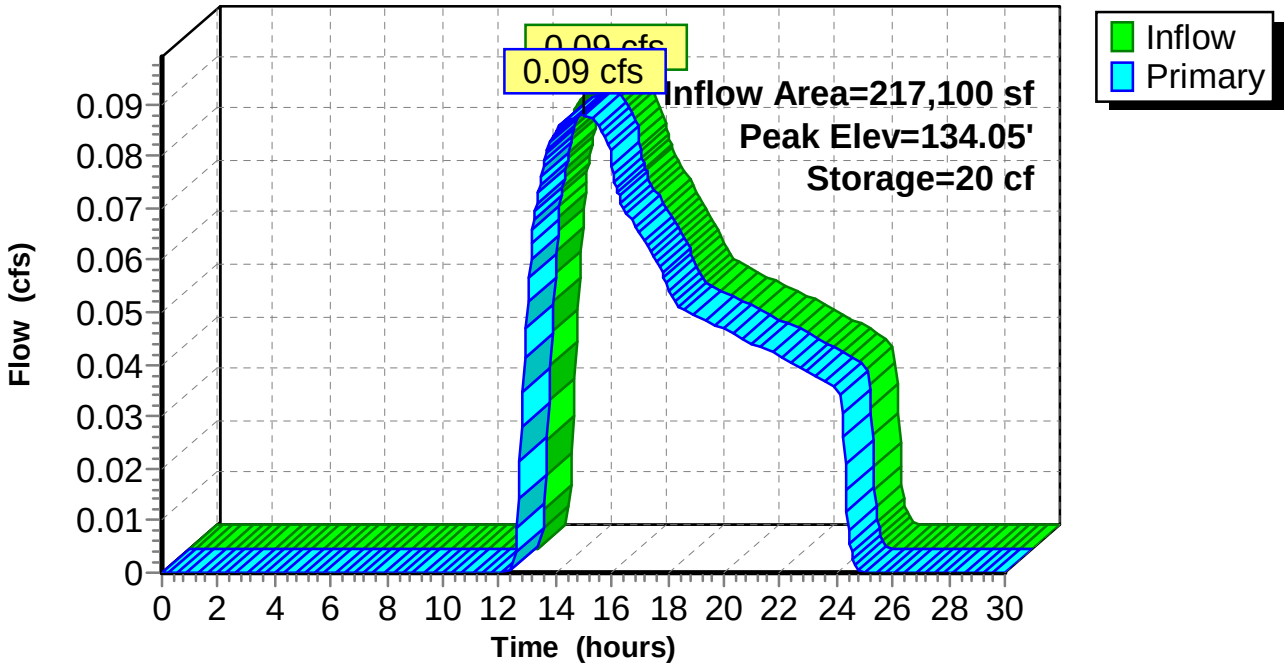
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
134.00	300	0	0
136.00	6,350	6,650	6,650
138.00	16,000	22,350	29,000

Device	Routing	Invert	Outlet Devices
#1	Primary	134.00'	**8.270 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.09 cfs @ 14.97 hrs HW=134.05' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.09 cfs)

Pond 1P: On SIte Depression

Hydrograph

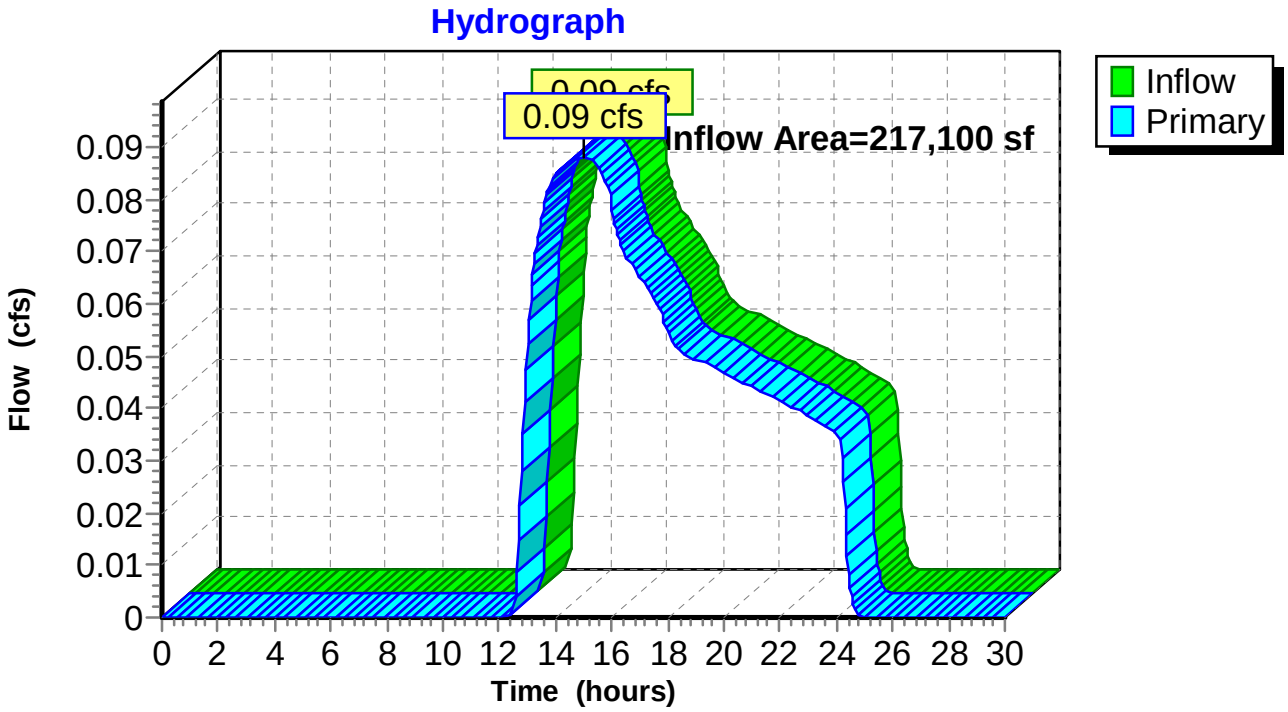


Summary for Link 1L: Study Point A

Inflow Area = 217,100 sf, 3.09% Impervious, Inflow Depth = 0.13" for 10 Year event
Inflow = 0.09 cfs @ 14.97 hrs, Volume= 2,394 cf
Primary = 0.09 cfs @ 14.97 hrs, Volume= 2,394 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Link 1L: Study Point A



Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Pre Development Runoff Area=217,100 sf 3.09% Impervious Runoff Depth=0.27"
Flow Length=760' Tc=20.3 min CN=38 Runoff=0.28 cfs 4,879 cf

Pond 1P: On SIte Depression Peak Elev=134.27' Storage=187 cf Inflow=0.28 cfs 4,879 cf
Outflow=0.21 cfs 4,879 cf

Link 1L: Study Point A Inflow=0.21 cfs 4,879 cf
Primary=0.21 cfs 4,879 cf

Total Runoff Area = 217,100 sf Runoff Volume = 4,879 cf Average Runoff Depth = 0.27"
96.91% Pervious = 210,400 sf 3.09% Impervious = 6,700 sf

Summary for Subcatchment 1S: Pre Development Subcatchment

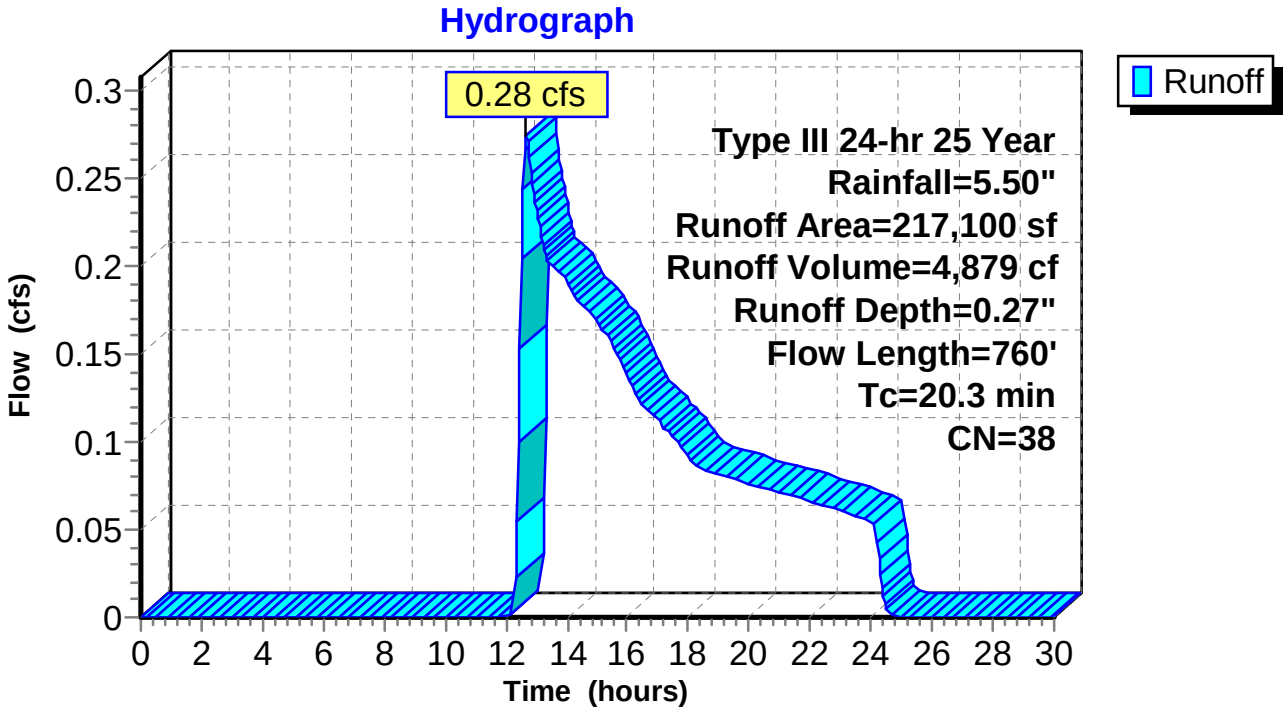
Runoff = 0.28 cfs @ 12.66 hrs, Volume= 4,879 cf, Depth= 0.27"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Rainfall=5.50"

Area (sf)	CN	Description
98,000	36	Woods, Fair, HSG A
28,000	51	1 acre lots, 20% imp, HSG A
90,000	36	Woods, Fair, HSG A
1,100	98	Paved roads w/curbs & sewers
217,100	38	Weighted Average
210,400		Pervious Area
6,700		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	100	0.1000	0.15		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
9.0	660	0.0600	1.22		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
20.3	760	Total			

Subcatchment 1S: Pre Development Subcatchment



Summary for Pond 1P: On SIte Depression

Inflow Area = 217,100 sf, 3.09% Impervious, Inflow Depth = 0.27" for 25 Year event
Inflow = 0.28 cfs @ 12.66 hrs, Volume= 4,879 cf
Outflow = 0.21 cfs @ 13.22 hrs, Volume= 4,879 cf, Atten= 23%, Lag= 33.7 min
Primary = 0.21 cfs @ 13.22 hrs, Volume= 4,879 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 134.27' @ 13.22 hrs Surf.Area= 1,106 sf Storage= 187 cf

Plug-Flow detention time= 8.5 min calculated for 4,871 cf (100% of inflow)
Center-of-Mass det. time= 8.5 min (1,014.8 - 1,006.2)

Volume	Invert	Avail.Storage	Storage Description
#1	134.00'	29,000 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

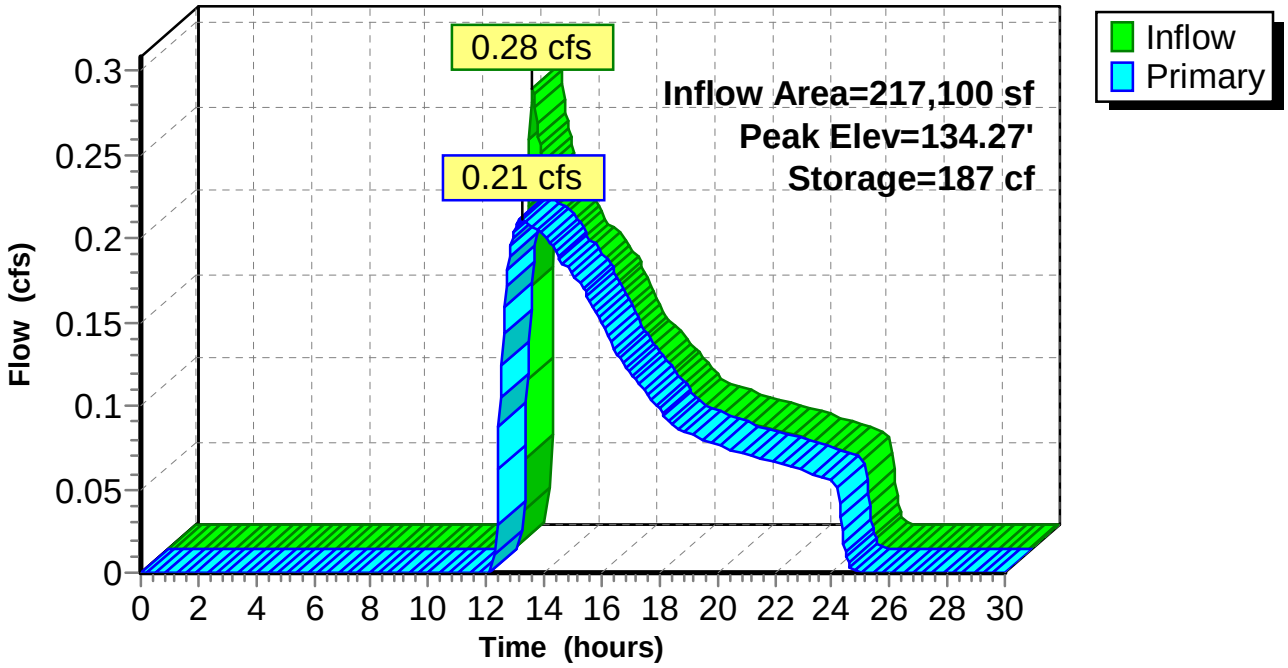
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
134.00	300	0	0
136.00	6,350	6,650	6,650
138.00	16,000	22,350	29,000

Device	Routing	Invert	Outlet Devices
#1	Primary	134.00'	**8.270 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.21 cfs @ 13.22 hrs HW=134.27' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.21 cfs)

Pond 1P: On SIte Depression

Hydrograph

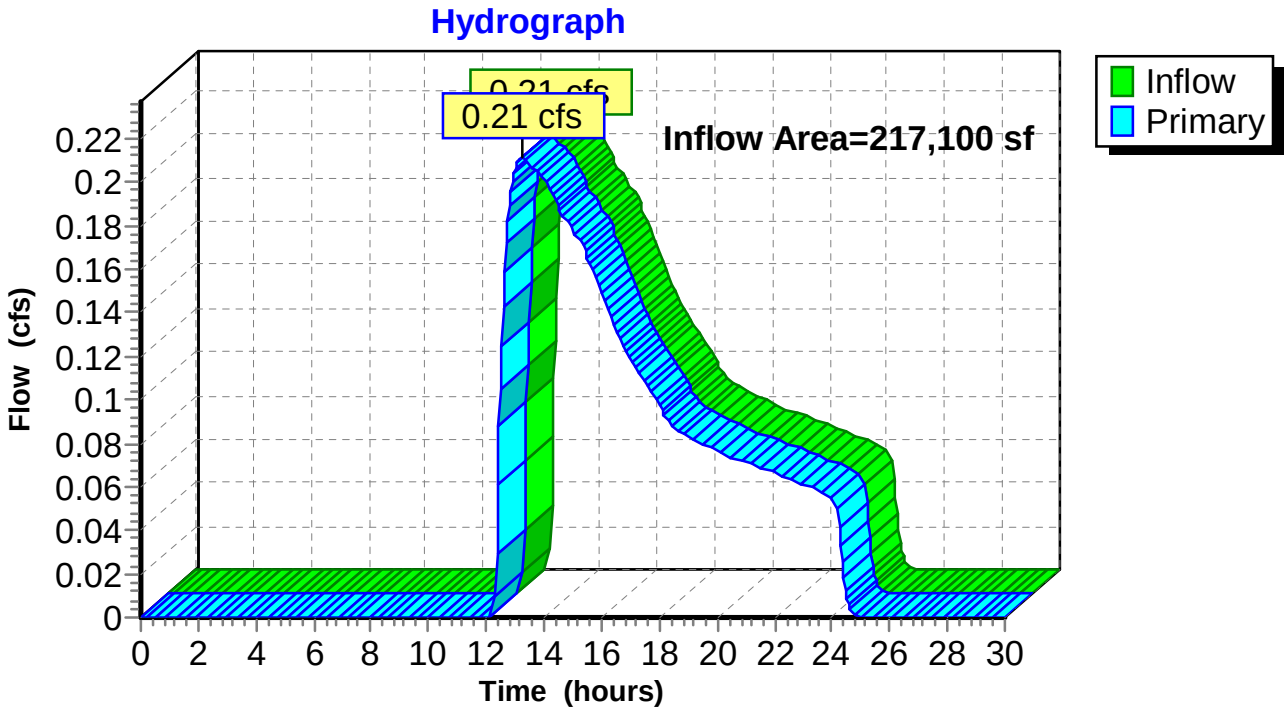


Summary for Link 1L: Study Point A

Inflow Area = 217,100 sf, 3.09% Impervious, Inflow Depth = 0.27" for 25 Year event
Inflow = 0.21 cfs @ 13.22 hrs, Volume= 4,879 cf
Primary = 0.21 cfs @ 13.22 hrs, Volume= 4,879 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Link 1L: Study Point A



Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Pre Development Runoff Area=217,100 sf 3.09% Impervious Runoff Depth=0.60"
Flow Length=760' Tc=20.3 min CN=38 Runoff=1.14 cfs 10,819 cf

Pond 1P: On SIte Depression Peak Elev=134.84' Storage=1,333 cf Inflow=1.14 cfs 10,819 cf
Outflow=0.55 cfs 10,819 cf

Link 1L: Study Point A Inflow=0.55 cfs 10,819 cf
Primary=0.55 cfs 10,819 cf

Total Runoff Area = 217,100 sf Runoff Volume = 10,819 cf Average Runoff Depth = 0.60"
96.91% Pervious = 210,400 sf 3.09% Impervious = 6,700 sf

Summary for Subcatchment 1S: Pre Development Subcatchment

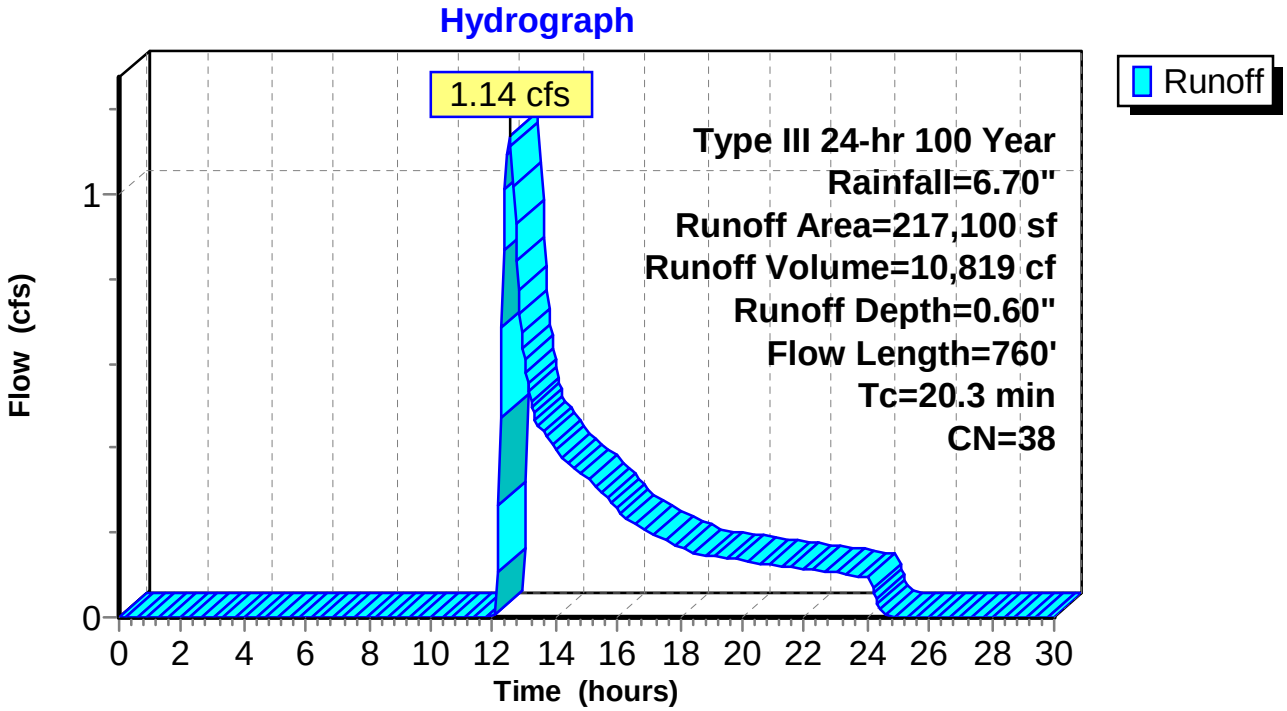
Runoff = 1.14 cfs @ 12.52 hrs, Volume= 10,819 cf, Depth= 0.60"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=6.70"

Area (sf)	CN	Description
98,000	36	Woods, Fair, HSG A
28,000	51	1 acre lots, 20% imp, HSG A
90,000	36	Woods, Fair, HSG A
1,100	98	Paved roads w/curbs & sewers
217,100	38	Weighted Average
210,400		Pervious Area
6,700		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	100	0.1000	0.15		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
9.0	660	0.0600	1.22		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
20.3	760	Total			

Subcatchment 1S: Pre Development Subcatchment



Summary for Pond 1P: On SIte Depression

Inflow Area = 217,100 sf, 3.09% Impervious, Inflow Depth = 0.60" for 100 Year event
Inflow = 1.14 cfs @ 12.52 hrs, Volume= 10,819 cf
Outflow = 0.55 cfs @ 13.12 hrs, Volume= 10,819 cf, Atten= 52%, Lag= 36.1 min
Primary = 0.55 cfs @ 13.12 hrs, Volume= 10,819 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 134.84' @ 13.12 hrs Surf.Area= 2,855 sf Storage= 1,333 cf

Plug-Flow detention time= 24.3 min calculated for 10,801 cf (100% of inflow)
Center-of-Mass det. time= 24.2 min (983.2 - 958.9)

Volume	Invert	Avail.Storage	Storage Description
#1	134.00'	29,000 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

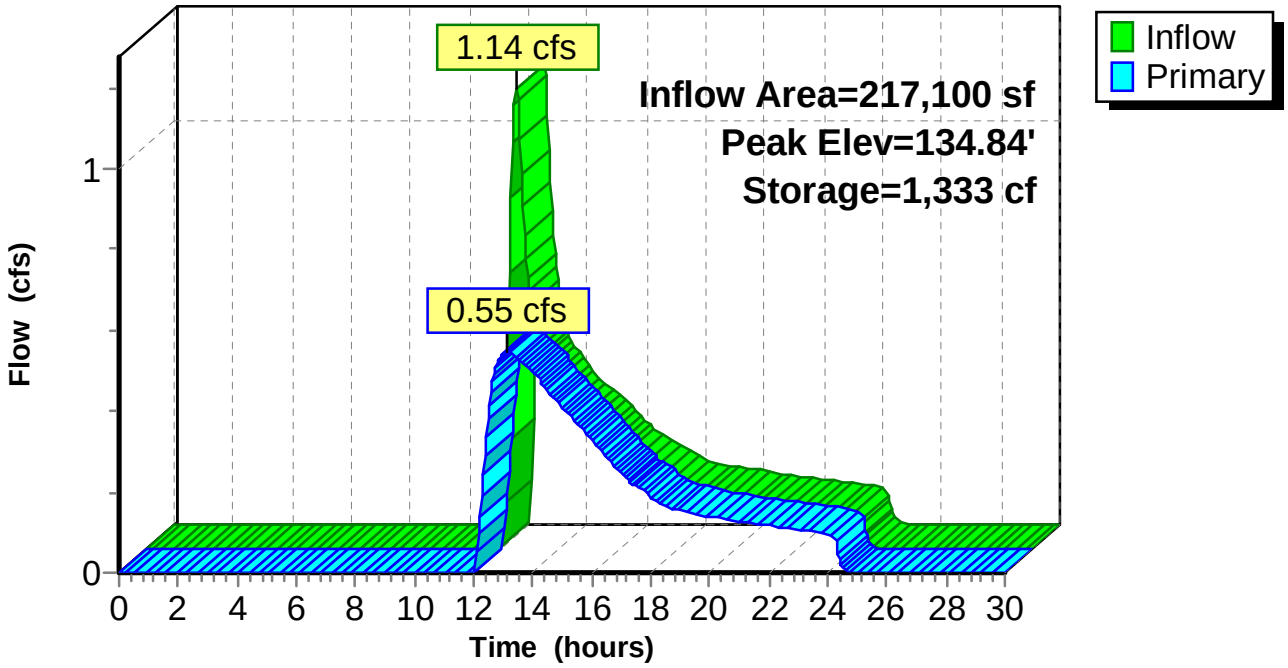
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
134.00	300	0	0
136.00	6,350	6,650	6,650
138.00	16,000	22,350	29,000

Device	Routing	Invert	Outlet Devices
#1	Primary	134.00'	**8.270 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.55 cfs @ 13.12 hrs HW=134.84' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.55 cfs)

Pond 1P: On SIte Depression

Hydrograph

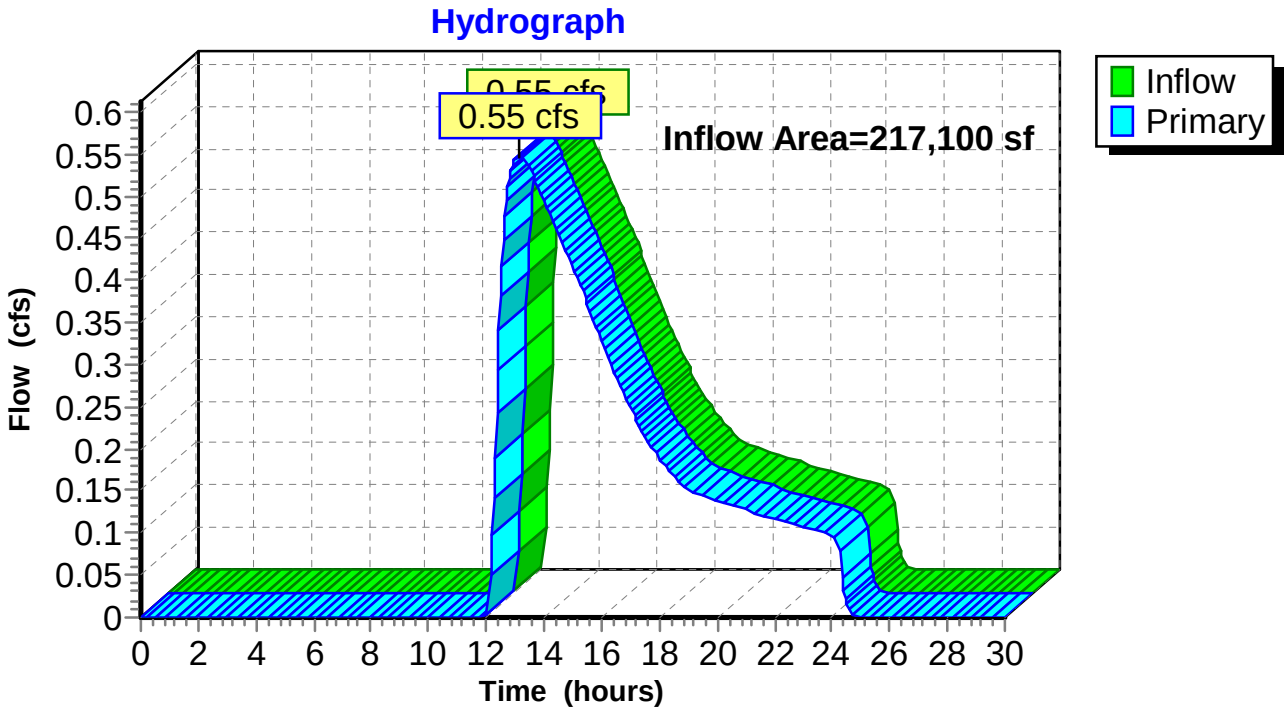


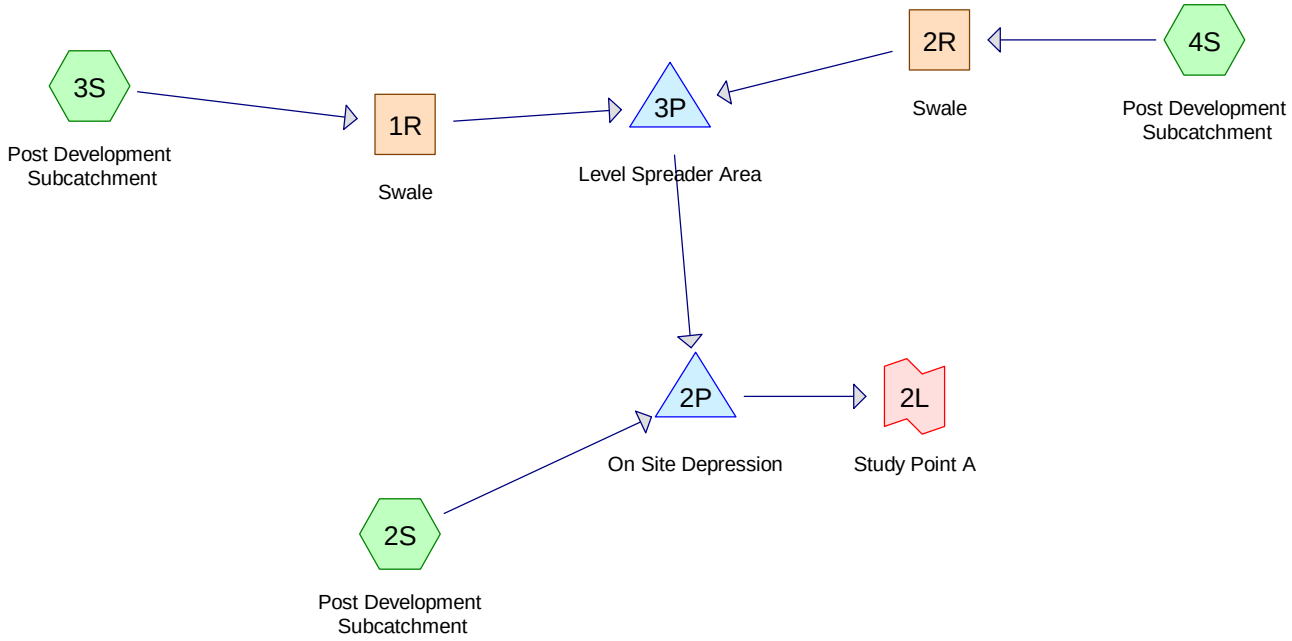
Summary for Link 1L: Study Point A

Inflow Area = 217,100 sf, 3.09% Impervious, Inflow Depth = 0.60" for 100 Year event
Inflow = 0.55 cfs @ 13.12 hrs, Volume= 10,819 cf
Primary = 0.55 cfs @ 13.12 hrs, Volume= 10,819 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Link 1L: Study Point A





Subcat Reach Pond Link

Drainage Diagram for Medway Proposed w swale model
Prepared by L.A.L. Engineering Group

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
78,000	30	Woods, Good, HSG A (2S)
16,400	39	>75% Grass cover, Good, HSG A (2S)
104,500	46	2 acre lots, 12% imp, HSG A (2S,3S)
11,900	51	1 acre lots, 20% imp, HSG A (4S)
5,200	83	Paved roads w/open ditches, 50% imp, HSG A (3S,4S)
1,100	98	Populatic St (4S)
217,100		**TOTAL AREA**

Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 2S: Post Development Runoff Area=143,400 sf 4.10% Impervious Runoff Depth=0.00"
Flow Length=760' Tc=20.3 min CN=36 Runoff=0.00 cfs 0 cf

Subcatchment 3S: Post Development Runoff Area=58,200 sf 13.76% Impervious Runoff Depth=0.09"
Flow Length=760' Tc=20.3 min CN=48 Runoff=0.02 cfs 436 cf

Subcatchment 4S: Post Development Runoff Area=15,500 sf 30.52% Impervious Runoff Depth=0.37"
Tc=6.0 min CN=59 Runoff=0.08 cfs 483 cf

Reach 1R: Swale Avg. Depth=0.01' Max Vel=0.55 fps Inflow=0.02 cfs 436 cf
n=0.030 L=85.0' S=0.0235 '/' Capacity=112.94 cfs Outflow=0.02 cfs 436 cf

Reach 2R: Swale Avg. Depth=0.04' Max Vel=1.07 fps Inflow=0.08 cfs 483 cf
n=0.030 L=120.0' S=0.0417 '/' Capacity=150.29 cfs Outflow=0.08 cfs 483 cf

Pond 2P: On Site Depression Peak Elev=134.02' Storage=8 cf Inflow=0.05 cfs 500 cf
Outflow=0.05 cfs 500 cf

Pond 3P: Level Spreader Area Peak Elev=135.50' Storage=55 cf Inflow=0.08 cfs 920 cf
Discarded=0.01 cfs 418 cf Primary=0.05 cfs 500 cf Outflow=0.06 cfs 918 cf

Link 2L: Study Point A Inflow=0.05 cfs 500 cf
Primary=0.05 cfs 500 cf

Total Runoff Area = 217,100 sf Runoff Volume = 920 cf Average Runoff Depth = 0.05"
91.42% Pervious = 198,480 sf 8.58% Impervious = 18,620 sf

Summary for Subcatchment 2S: Post Development Subcatchment

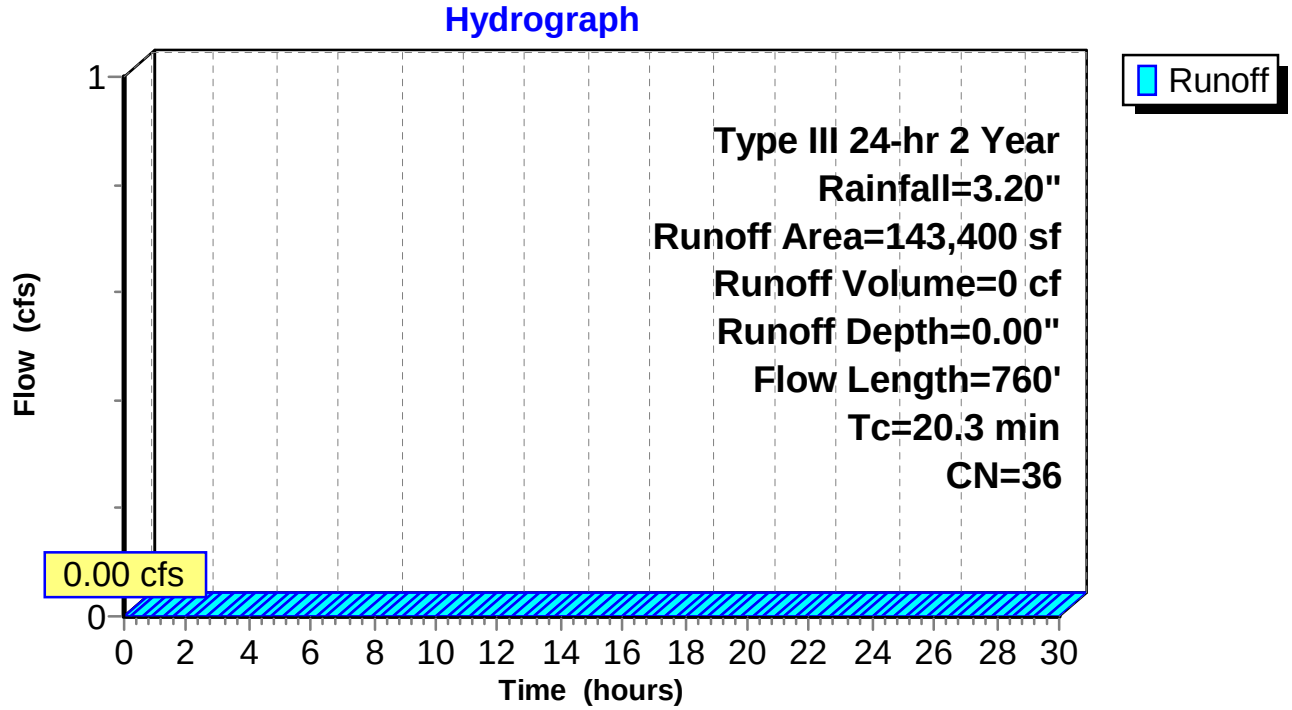
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.20"

Area (sf)	CN	Description
16,400	39	>75% Grass cover, Good, HSG A
49,000	46	2 acre lots, 12% imp, HSG A
78,000	30	Woods, Good, HSG A
143,400	36	Weighted Average
137,520		Pervious Area
5,880		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	100	0.1000	0.15		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
9.0	660	0.0600	1.22		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
20.3	760	Total			

Subcatchment 2S: Post Development Subcatchment



Summary for Subcatchment 3S: Post Development Subcatchment

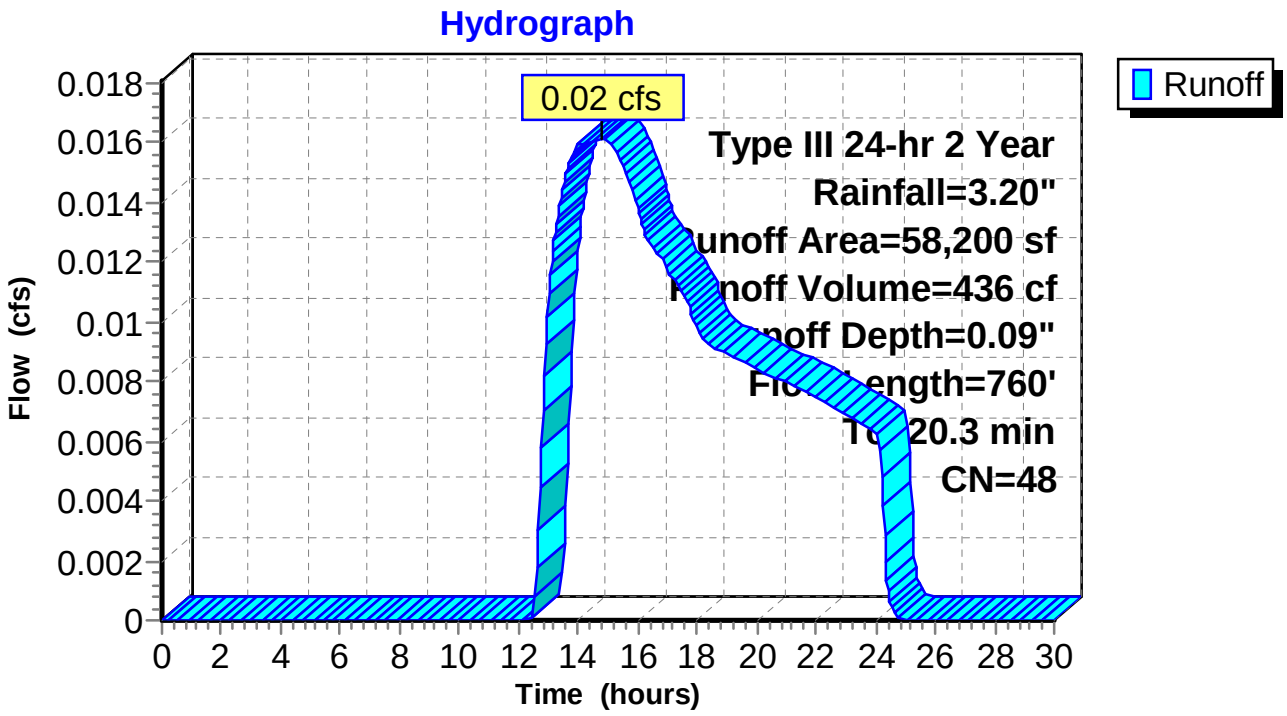
Runoff = 0.02 cfs @ 14.76 hrs, Volume= 436 cf, Depth= 0.09"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.20"

Area (sf)	CN	Description
55,500	46	2 acre lots, 12% imp, HSG A
2,700	83	Paved roads w/open ditches, 50% imp, HSG A
58,200	48	Weighted Average
50,190		Pervious Area
8,010		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	100	0.1000	0.15		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
9.0	660	0.0600	1.22		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
20.3	760	Total			

Subcatchment 3S: Post Development Subcatchment



Summary for Subcatchment 4S: Post Development Subcatchment

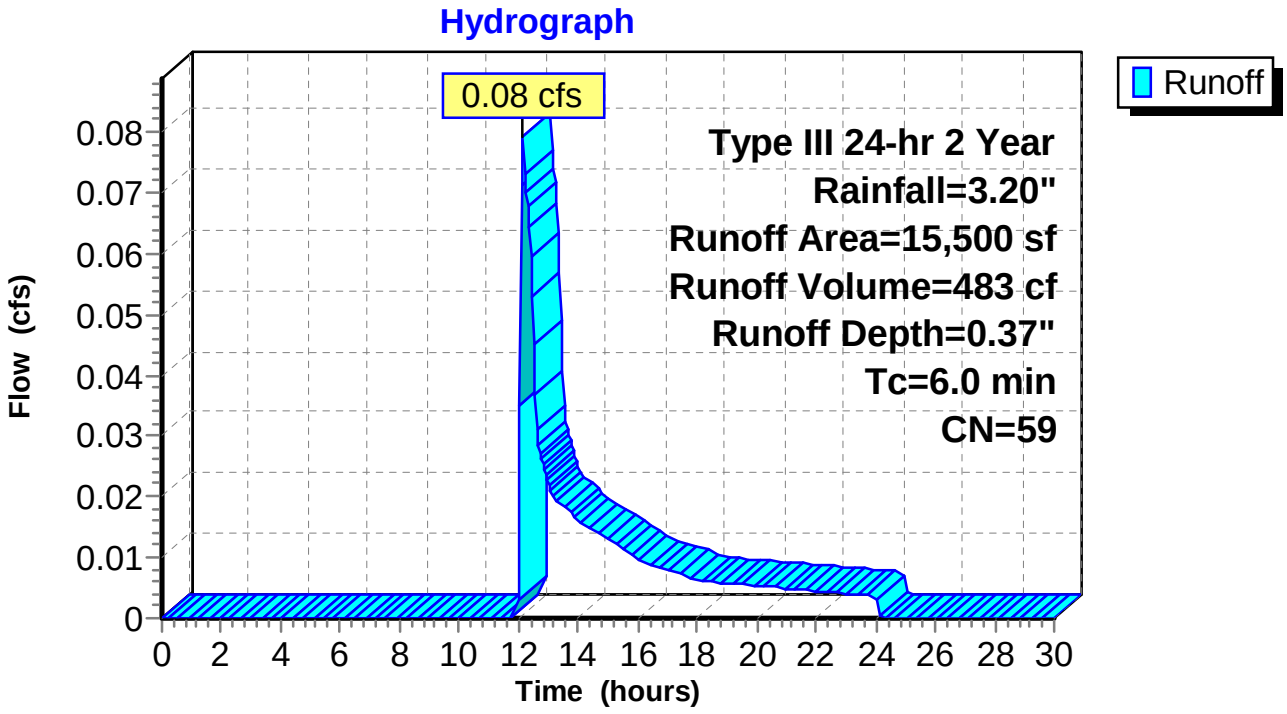
Runoff = 0.08 cfs @ 12.15 hrs, Volume= 483 cf, Depth= 0.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.20"

	Area (sf)	CN	Description
	11,900	51	1 acre lots, 20% imp, HSG A
*	1,100	98	Populatic St
	2,500	83	Paved roads w/open ditches, 50% imp, HSG A
	15,500	59	Weighted Average
	10,770		Pervious Area
	4,730		Impervious Area

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

Subcatchment 4S: Post Development Subcatchment



Summary for Reach 1R: Swale

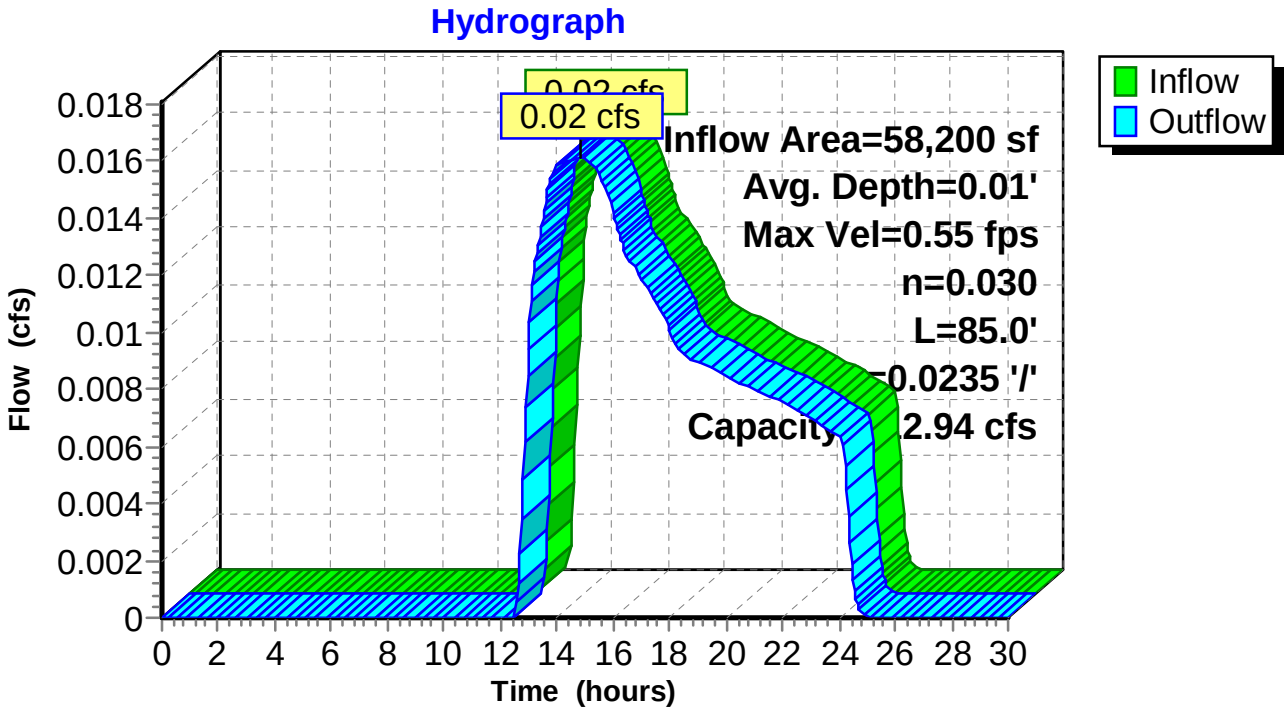
Inflow Area = 58,200 sf, 13.76% Impervious, Inflow Depth = 0.09" for 2 Year event
Inflow = 0.02 cfs @ 14.76 hrs, Volume= 436 cf
Outflow = 0.02 cfs @ 14.85 hrs, Volume= 436 cf, Atten= 0%, Lag= 5.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.55 fps, Min. Travel Time= 2.6 min
Avg. Velocity = 0.55 fps, Avg. Travel Time= 2.6 min

Peak Storage= 2 cf @ 14.80 hrs, Average Depth at Peak Storage= 0.01'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 112.94 cfs

2.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.0 3.0 '/' Top Width= 12.00'
Length= 85.0' Slope= 0.0235 '/'
Inlet Invert= 137.00', Outlet Invert= 135.00'

Reach 1R: Swale



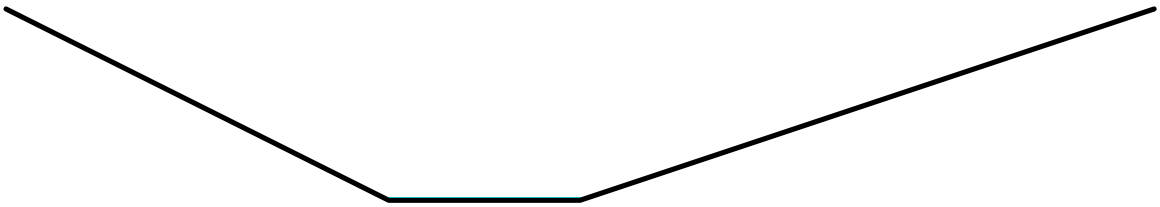
Summary for Reach 2R: Swale

Inflow Area = 15,500 sf, 30.52% Impervious, Inflow Depth = 0.37" for 2 Year event
Inflow = 0.08 cfs @ 12.15 hrs, Volume= 483 cf
Outflow = 0.08 cfs @ 12.22 hrs, Volume= 483 cf, Atten= 1%, Lag= 3.9 min

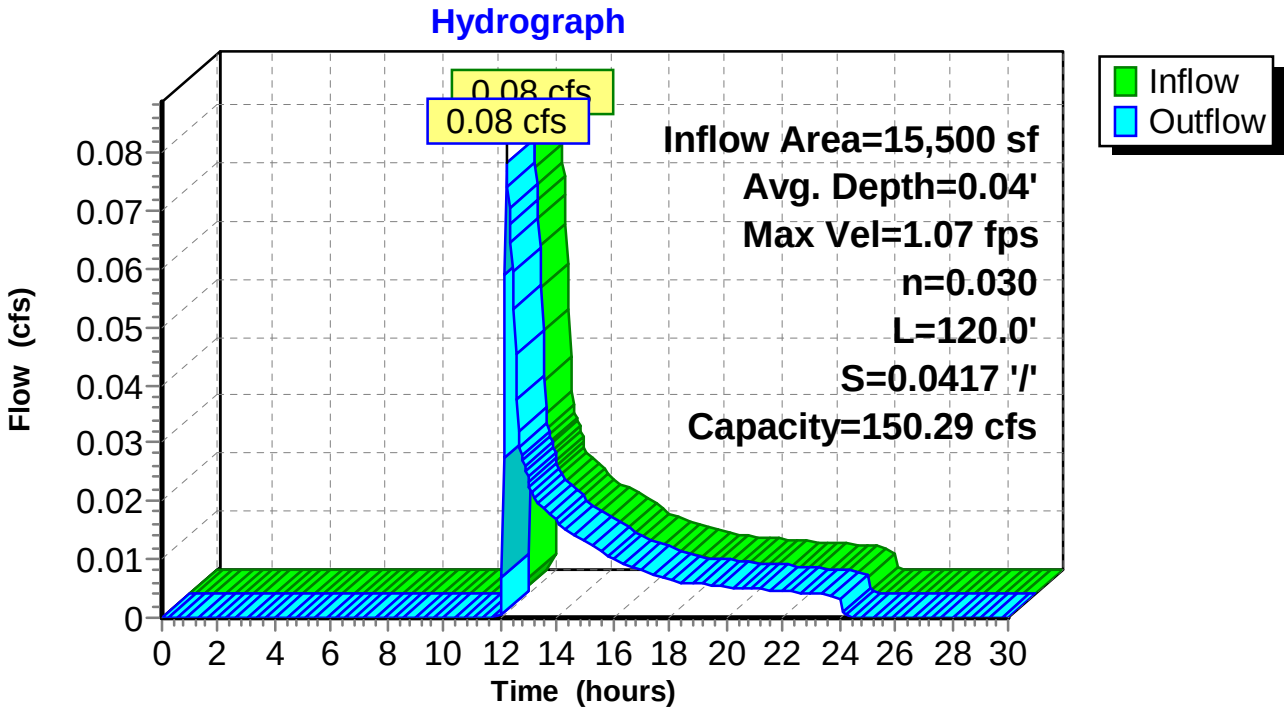
Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.07 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 0.74 fps, Avg. Travel Time= 2.7 min

Peak Storage= 9 cf @ 12.17 hrs, Average Depth at Peak Storage= 0.04'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 150.29 cfs

2.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.0 3.0 '/' Top Width= 12.00'
Length= 120.0' Slope= 0.0417 '/'
Inlet Invert= 140.00', Outlet Invert= 135.00'



Reach 2R: Swale



Summary for Pond 2P: On Site Depression

Inflow Area = 217,100 sf, 8.58% Impervious, Inflow Depth = 0.03" for 2 Year event
Inflow = 0.05 cfs @ 12.42 hrs, Volume= 500 cf
Outflow = 0.05 cfs @ 12.49 hrs, Volume= 500 cf, Atten= 9%, Lag= 4.1 min
Primary = 0.05 cfs @ 12.49 hrs, Volume= 500 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 134.02' @ 12.49 hrs Surf.Area= 385 sf Storage= 8 cf

Plug-Flow detention time= 3.0 min calculated for 499 cf (100% of inflow)
Center-of-Mass det. time= 3.0 min (949.8 - 946.8)

Volume	Invert	Avail.Storage	Storage Description
#1	134.00'	29,020 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

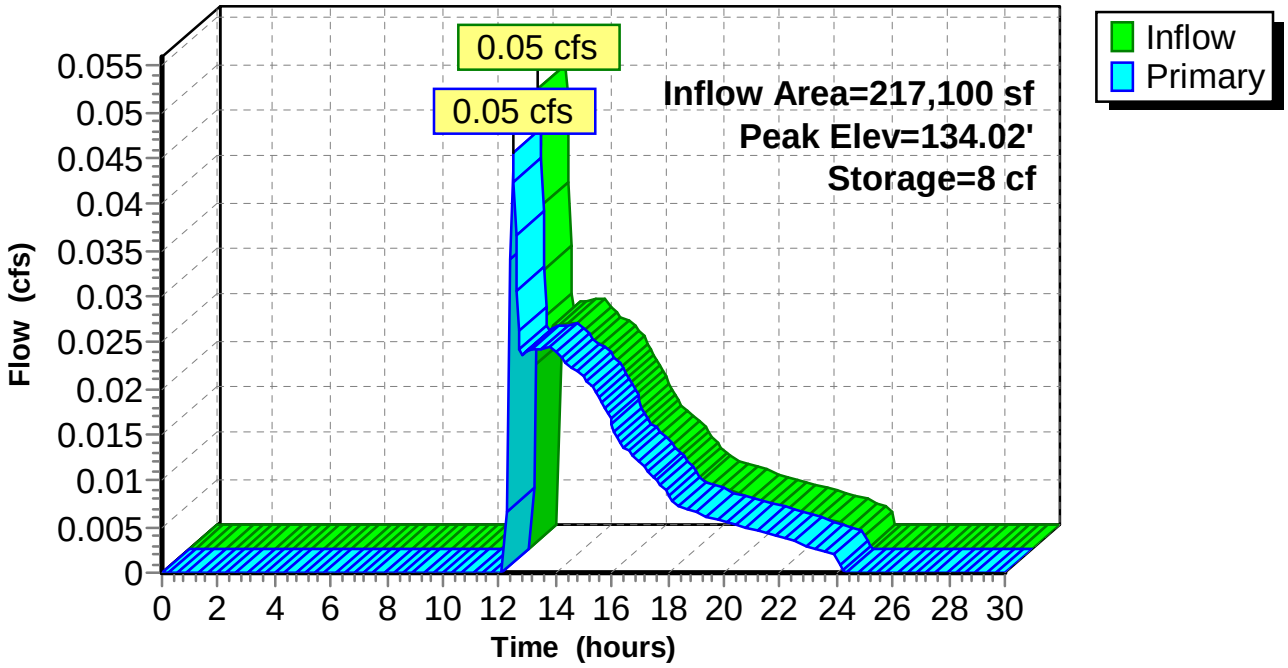
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
134.00	320	0	0
136.00	6,350	6,670	6,670
138.00	16,000	22,350	29,020

Device	Routing	Invert	Outlet Devices
#1	Primary	134.00'	**8.270 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.07 cfs @ 12.49 hrs HW=134.02' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.07 cfs)

Pond 2P: On Site Depression

Hydrograph



Summary for Pond 3P: Level Spreader Area

Inflow Area = 73,700 sf, 17.29% Impervious, Inflow Depth = 0.15" for 2 Year event
Inflow = 0.08 cfs @ 12.22 hrs, Volume= 920 cf
Outflow = 0.06 cfs @ 12.42 hrs, Volume= 918 cf, Atten= 26%, Lag= 12.3 min
Discarded = 0.01 cfs @ 12.40 hrs, Volume= 418 cf
Primary = 0.05 cfs @ 12.42 hrs, Volume= 500 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 135.50' @ 12.40 hrs Surf.Area= 149 sf Storage= 55 cf

Plug-Flow detention time= 48.3 min calculated for 916 cf (100% of inflow)
Center-of-Mass det. time= 47.5 min (1,039.6 - 992.1)

Volume	Invert	Avail.Storage	Storage Description
#1	135.00'	479 cf	**2.00'W x 35.00'L x 2.00'H Prismatoid Z=2.0**

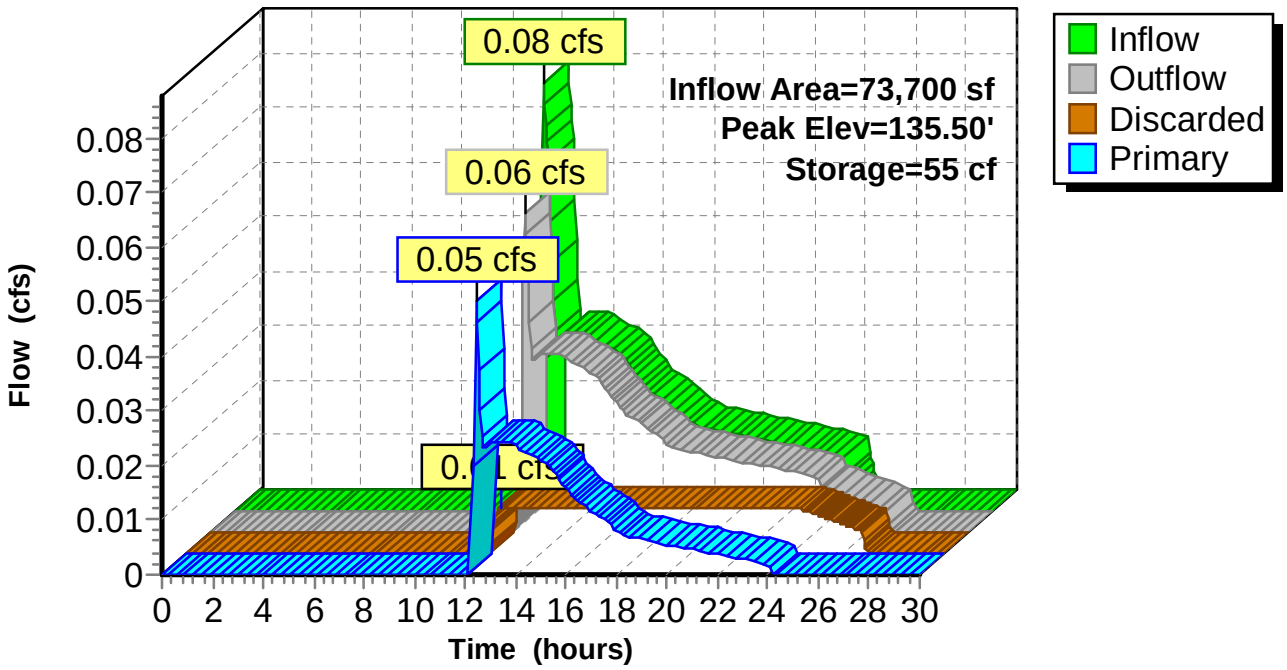
Device	Routing	Invert	Outlet Devices
#1	Primary	135.50'	**38.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#2	Discarded	135.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.40 hrs HW=135.50' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.02 cfs @ 12.42 hrs HW=135.50' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.02 cfs @ 0.15 fps)

Pond 3P: Level Spreader Area

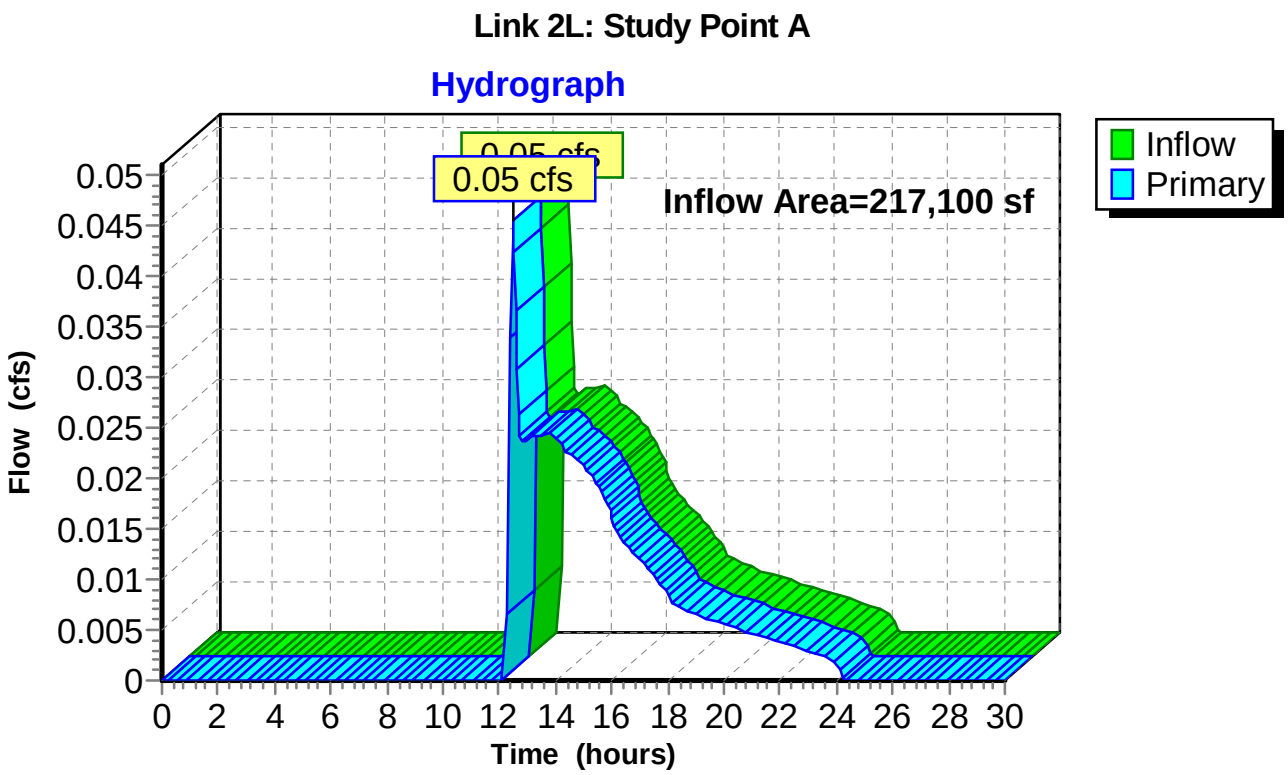
Hydrograph



Summary for Link 2L: Study Point A

Inflow Area = 217,100 sf, 8.58% Impervious, Inflow Depth = 0.03" for 2 Year event
Inflow = 0.05 cfs @ 12.49 hrs, Volume= 500 cf
Primary = 0.05 cfs @ 12.49 hrs, Volume= 500 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs



Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 2S: Post Development Runoff Area=143,400 sf 4.10% Impervious Runoff Depth=0.08"
Flow Length=760' Tc=20.3 min CN=36 Runoff=0.03 cfs 973 cf

Subcatchment 3S: Post Development Runoff Area=58,200 sf 13.76% Impervious Runoff Depth=0.51"
Flow Length=760' Tc=20.3 min CN=48 Runoff=0.30 cfs 2,497 cf

Subcatchment 4S: Post Development Runoff Area=15,500 sf 30.52% Impervious Runoff Depth=1.12"
Tc=6.0 min CN=59 Runoff=0.40 cfs 1,450 cf

Reach 1R: Swale Avg. Depth=0.09' Max Vel=1.45 fps Inflow=0.30 cfs 2,497 cf
n=0.030 L=85.0' S=0.0235 '/' Capacity=112.94 cfs Outflow=0.30 cfs 2,497 cf

Reach 2R: Swale Avg. Depth=0.09' Max Vel=1.91 fps Inflow=0.40 cfs 1,450 cf
n=0.030 L=120.0' S=0.0417 '/' Capacity=150.29 cfs Outflow=0.38 cfs 1,450 cf

Pond 2P: On Site Depression Peak Elev=134.42' Storage=404 cf Inflow=0.46 cfs 4,495 cf
Outflow=0.31 cfs 4,495 cf

Pond 3P: Level Spreader Area Peak Elev=135.53' Storage=58 cf Inflow=0.47 cfs 3,947 cf
Discarded=0.01 cfs 435 cf Primary=0.46 cfs 3,522 cf Outflow=0.47 cfs 3,957 cf

Link 2L: Study Point A Inflow=0.31 cfs 4,495 cf
Primary=0.31 cfs 4,495 cf

Total Runoff Area = 217,100 sf Runoff Volume = 4,920 cf Average Runoff Depth = 0.27"
91.42% Pervious = 198,480 sf 8.58% Impervious = 18,620 sf

Summary for Subcatchment 2S: Post Development Subcatchment

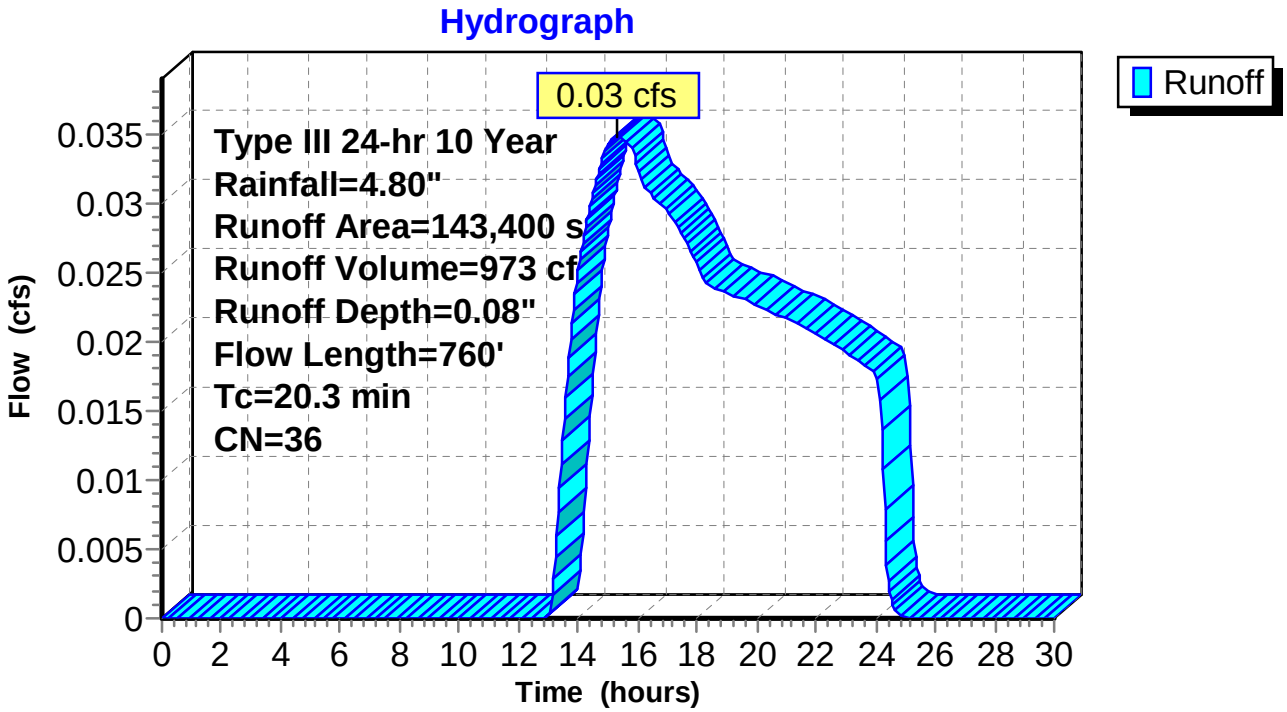
Runoff = 0.03 cfs @ 15.35 hrs, Volume= 973 cf, Depth= 0.08"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=4.80"

Area (sf)	CN	Description
16,400	39	>75% Grass cover, Good, HSG A
49,000	46	2 acre lots, 12% imp, HSG A
78,000	30	Woods, Good, HSG A
143,400	36	Weighted Average
137,520		Pervious Area
5,880		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	100	0.1000	0.15		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
9.0	660	0.0600	1.22		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
20.3	760	Total			

Subcatchment 2S: Post Development Subcatchment



Summary for Subcatchment 3S: Post Development Subcatchment

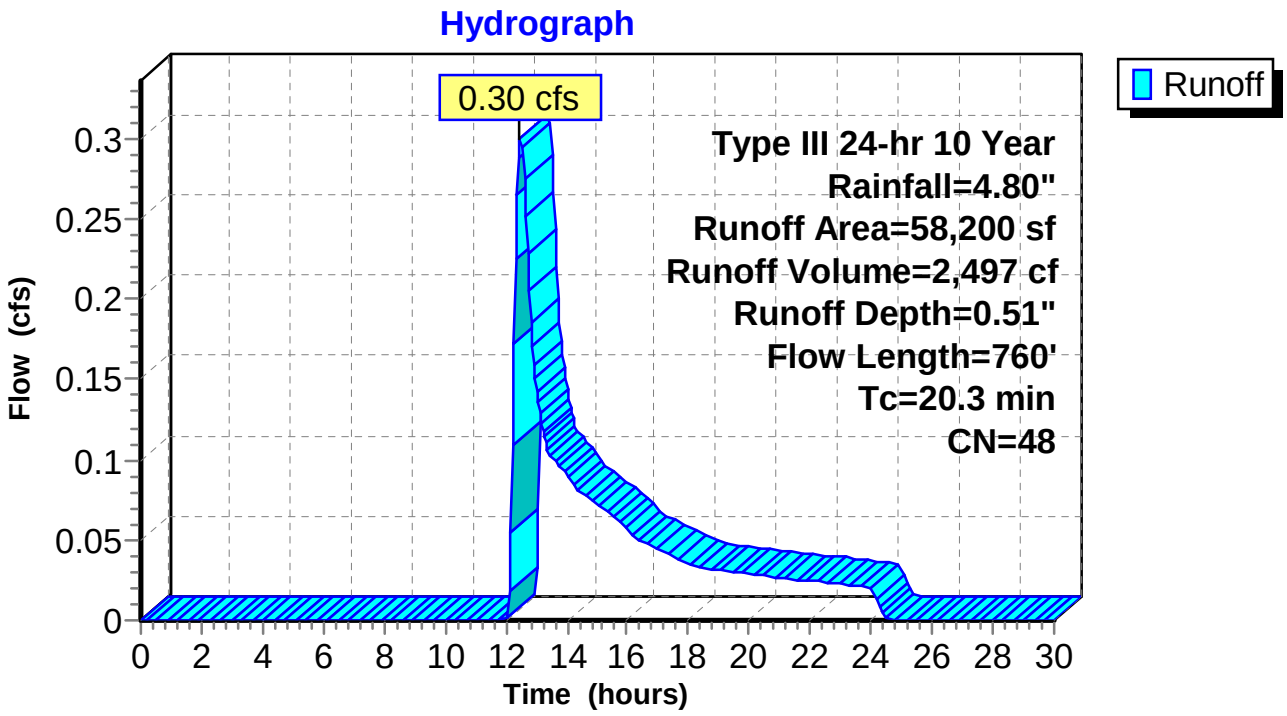
Runoff = 0.30 cfs @ 12.48 hrs, Volume= 2,497 cf, Depth= 0.51"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=4.80"

Area (sf)	CN	Description
55,500	46	2 acre lots, 12% imp, HSG A
2,700	83	Paved roads w/open ditches, 50% imp, HSG A
58,200	48	Weighted Average
50,190		Pervious Area
8,010		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	100	0.1000	0.15		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
9.0	660	0.0600	1.22		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
20.3	760	Total			

Subcatchment 3S: Post Development Subcatchment



Summary for Subcatchment 4S: Post Development Subcatchment

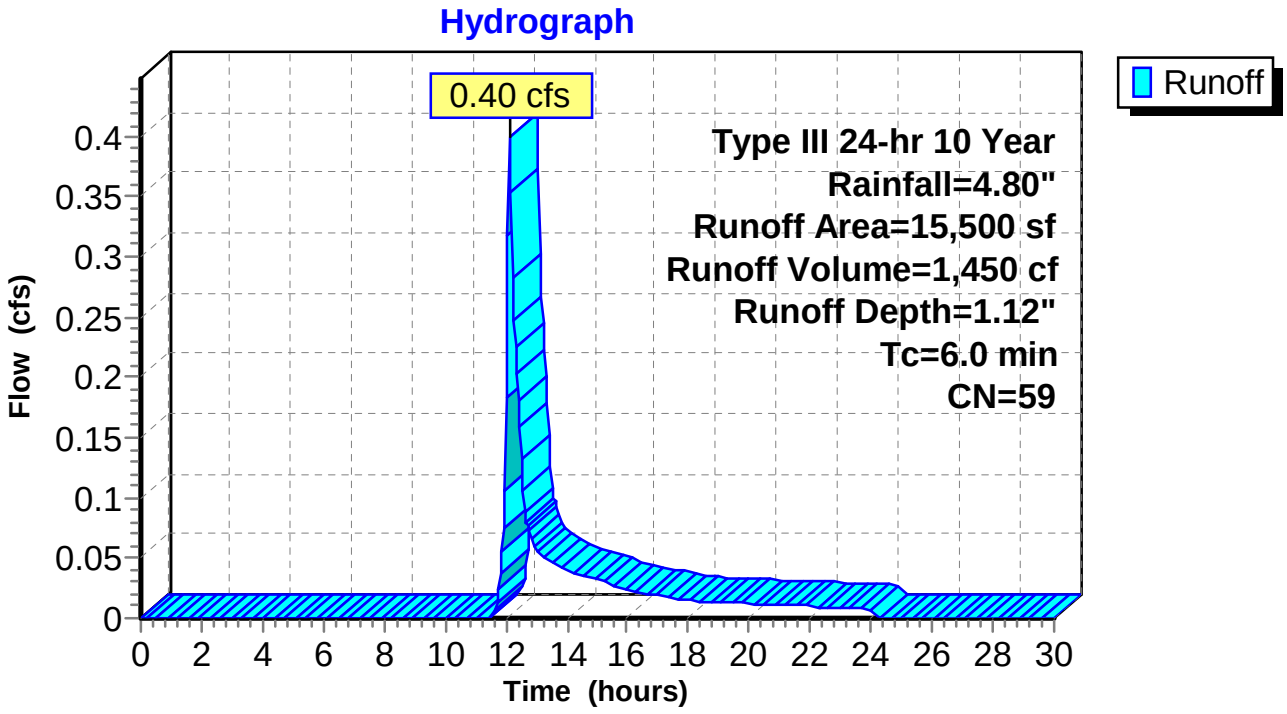
Runoff = 0.40 cfs @ 12.11 hrs, Volume= 1,450 cf, Depth= 1.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=4.80"

	Area (sf)	CN	Description
	11,900	51	1 acre lots, 20% imp, HSG A
*	1,100	98	Populatic St
	2,500	83	Paved roads w/open ditches, 50% imp, HSG A
	15,500	59	Weighted Average
	10,770		Pervious Area
	4,730		Impervious Area

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

Subcatchment 4S: Post Development Subcatchment



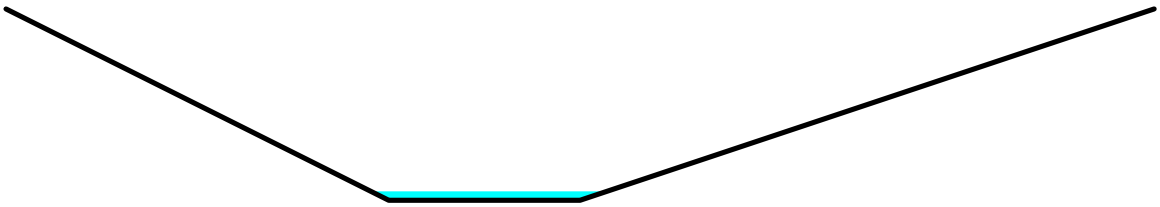
Summary for Reach 1R: Swale

Inflow Area = 58,200 sf, 13.76% Impervious, Inflow Depth = 0.51" for 10 Year event
Inflow = 0.30 cfs @ 12.48 hrs, Volume= 2,497 cf
Outflow = 0.30 cfs @ 12.51 hrs, Volume= 2,497 cf, Atten= 0%, Lag= 1.7 min

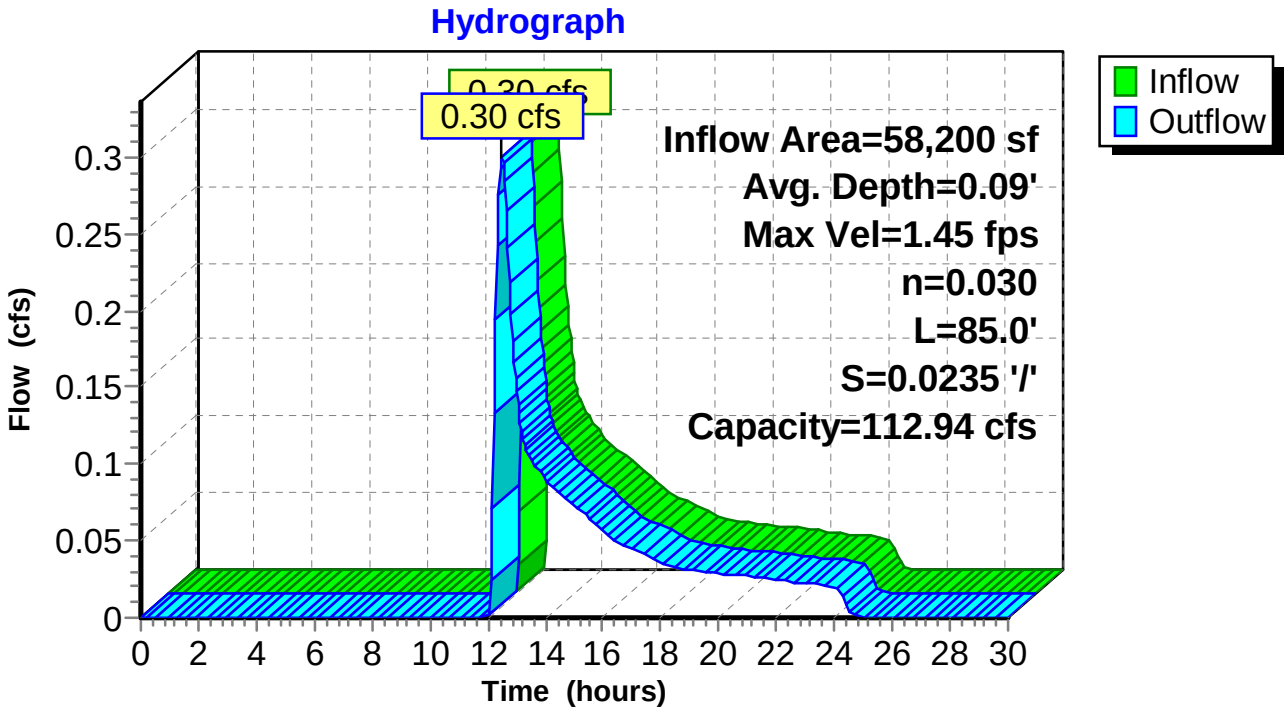
Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.45 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 0.73 fps, Avg. Travel Time= 1.9 min

Peak Storage= 18 cf @ 12.49 hrs, Average Depth at Peak Storage= 0.09'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 112.94 cfs

2.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.0 3.0 '/' Top Width= 12.00'
Length= 85.0' Slope= 0.0235 '/'
Inlet Invert= 137.00', Outlet Invert= 135.00'



Reach 1R: Swale



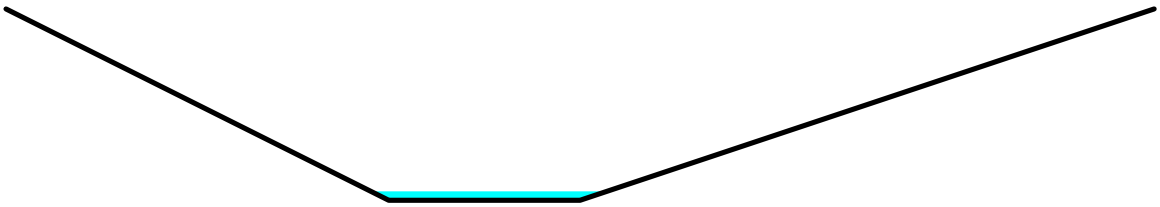
Summary for Reach 2R: Swale

Inflow Area = 15,500 sf, 30.52% Impervious, Inflow Depth = 1.12" for 10 Year event
Inflow = 0.40 cfs @ 12.11 hrs, Volume= 1,450 cf
Outflow = 0.38 cfs @ 12.14 hrs, Volume= 1,450 cf, Atten= 6%, Lag= 2.1 min

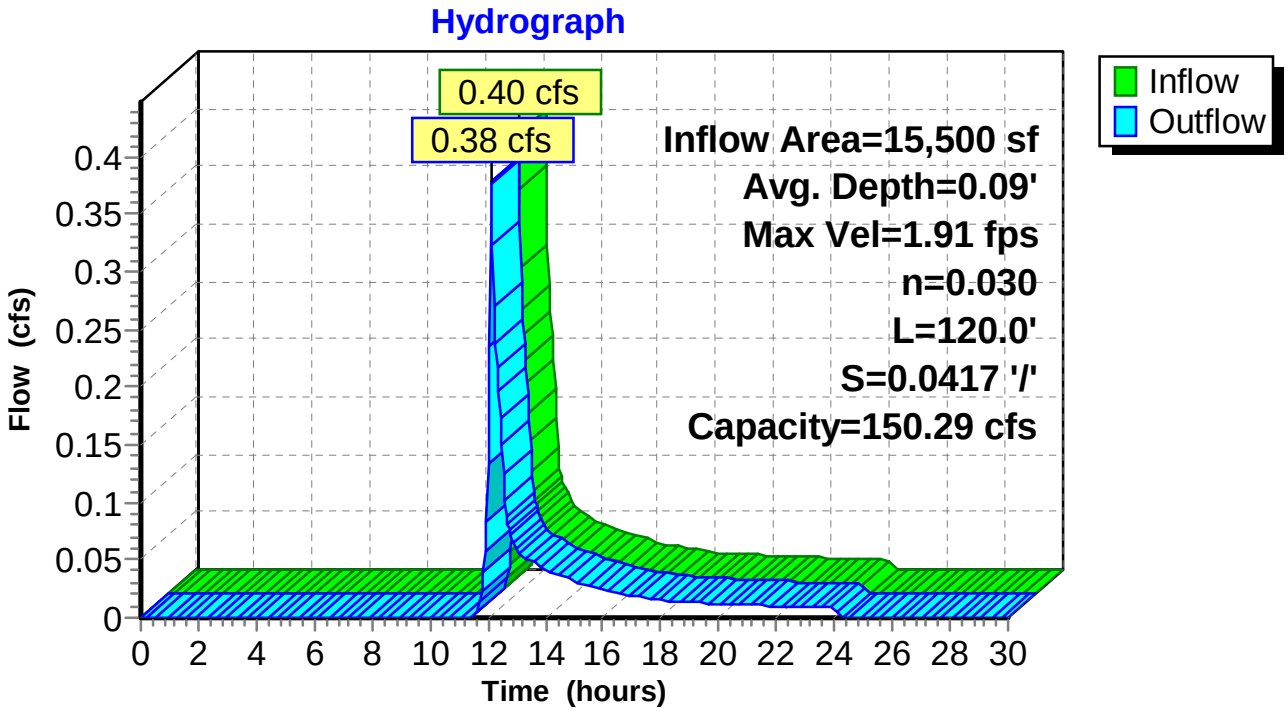
Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.91 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 0.80 fps, Avg. Travel Time= 2.5 min

Peak Storage= 25 cf @ 12.12 hrs, Average Depth at Peak Storage= 0.09'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 150.29 cfs

2.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.0 3.0 '/' Top Width= 12.00'
Length= 120.0' Slope= 0.0417 '/'
Inlet Invert= 140.00', Outlet Invert= 135.00'



Reach 2R: Swale



Summary for Pond 2P: On Site Depression

Inflow Area = 217,100 sf, 8.58% Impervious, Inflow Depth = 0.25" for 10 Year event
Inflow = 0.46 cfs @ 12.41 hrs, Volume= 4,495 cf
Outflow = 0.31 cfs @ 12.72 hrs, Volume= 4,495 cf, Atten= 34%, Lag= 18.3 min
Primary = 0.31 cfs @ 12.72 hrs, Volume= 4,495 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 134.42' @ 12.72 hrs Surf.Area= 1,593 sf Storage= 404 cf

Plug-Flow detention time= 9.9 min calculated for 4,495 cf (100% of inflow)
Center-of-Mass det. time= 9.9 min (961.5 - 951.6)

Volume	Invert	Avail.Storage	Storage Description
#1	134.00'	29,020 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

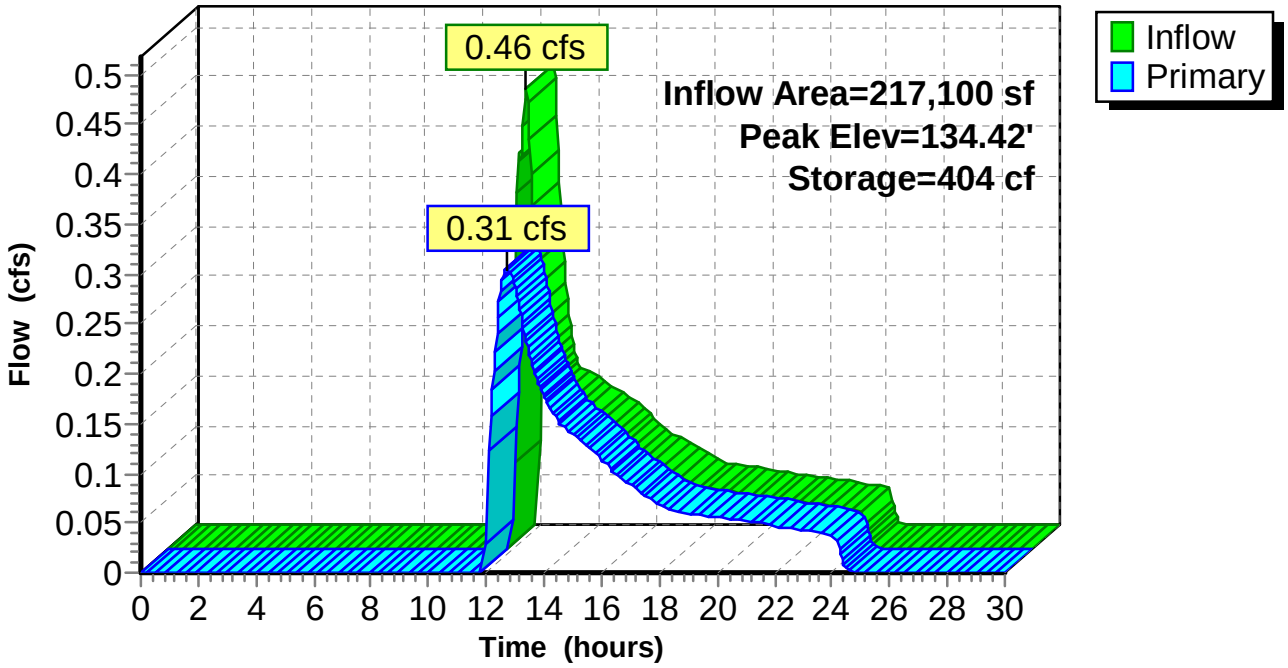
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
134.00	320	0	0
136.00	6,350	6,670	6,670
138.00	16,000	22,350	29,020

Device	Routing	Invert	Outlet Devices
#1	Primary	134.00'	**8.270 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.30 cfs @ 12.72 hrs HW=134.42' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.30 cfs)

Pond 2P: On Site Depression

Hydrograph



Summary for Pond 3P: Level Spreader Area

Inflow Area = 73,700 sf, 17.29% Impervious, Inflow Depth = 0.64" for 10 Year event
Inflow = 0.47 cfs @ 12.41 hrs, Volume= 3,947 cf
Outflow = 0.47 cfs @ 12.41 hrs, Volume= 3,957 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.01 cfs @ 12.41 hrs, Volume= 435 cf
Primary = 0.46 cfs @ 12.41 hrs, Volume= 3,522 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 135.53' @ 12.41 hrs Surf.Area= 153 sf Storage= 58 cf

Plug-Flow detention time= 9.3 min calculated for 3,943 cf (100% of inflow)
Center-of-Mass det. time= 11.0 min (936.0 - 925.0)

Volume	Invert	Avail.Storage	Storage Description
#1	135.00'	479 cf	**2.00'W x 35.00'L x 2.00'H Prismatoid Z=2.0**

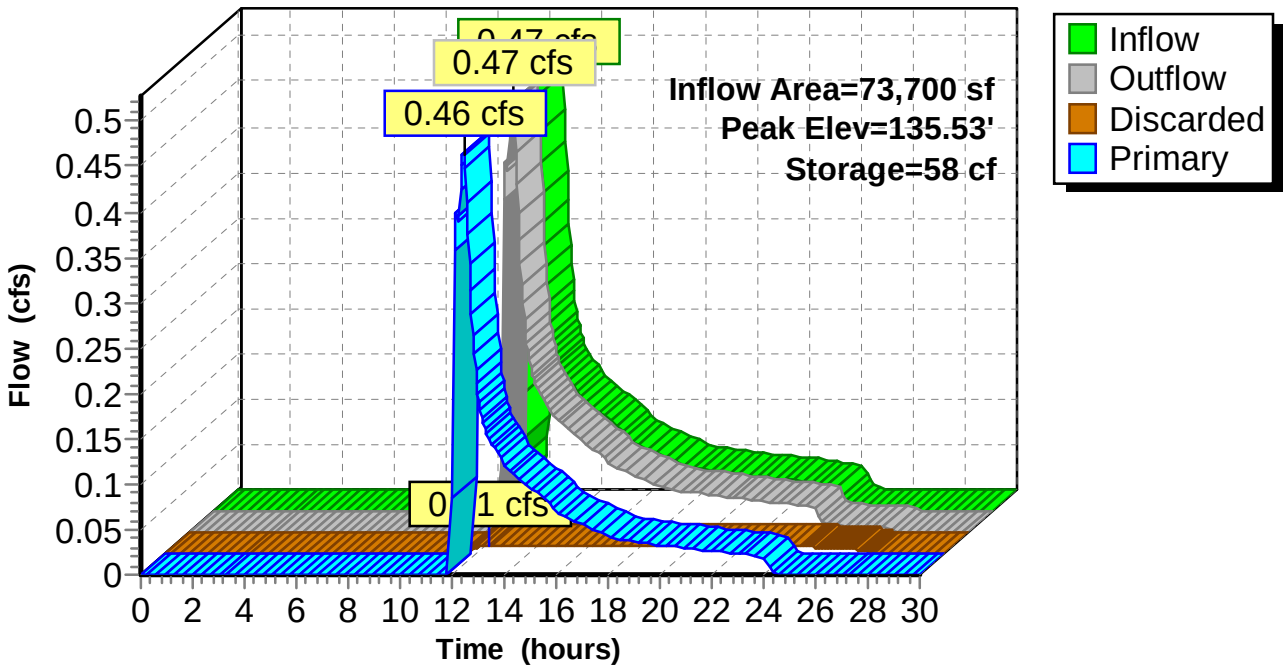
Device	Routing	Invert	Outlet Devices
#1	Primary	135.50'	**38.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#2	Discarded	135.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.41 hrs HW=135.53' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.44 cfs @ 12.41 hrs HW=135.53' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.44 cfs @ 0.42 fps)

Pond 3P: Level Spreader Area

Hydrograph

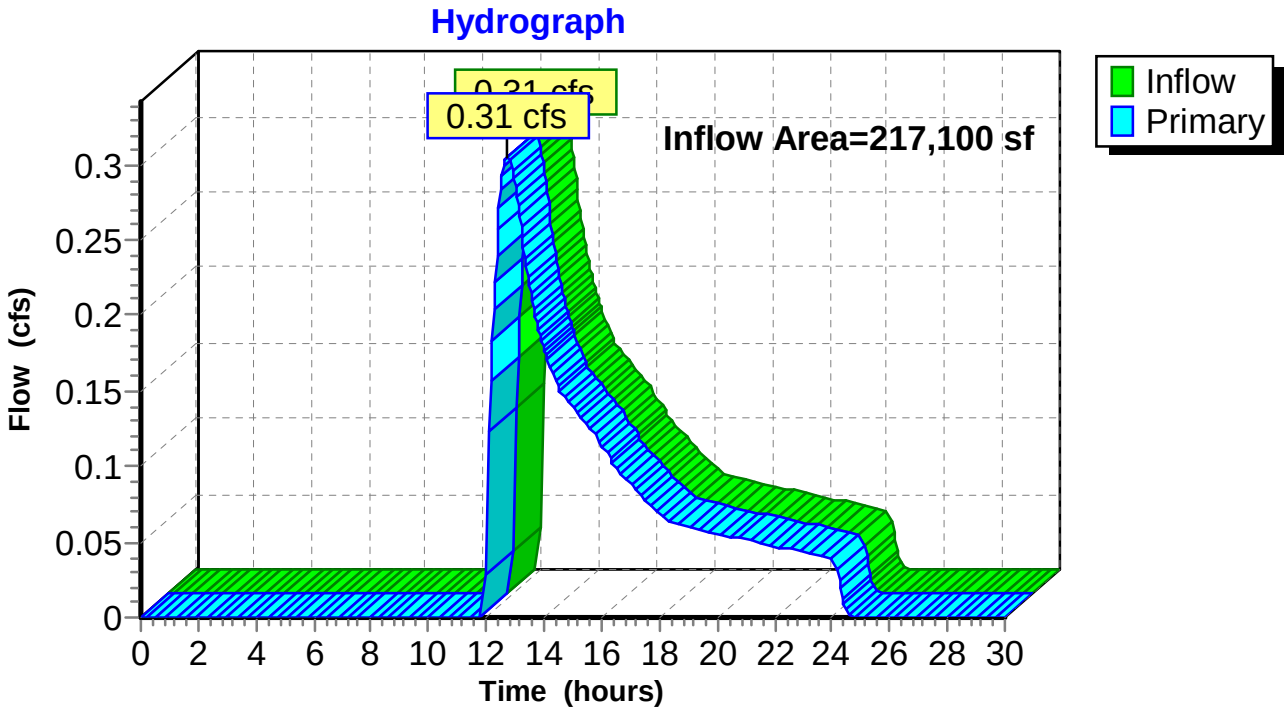


Summary for Link 2L: Study Point A

Inflow Area = 217,100 sf, 8.58% Impervious, Inflow Depth = 0.25" for 10 Year event
Inflow = 0.31 cfs @ 12.72 hrs, Volume= 4,495 cf
Primary = 0.31 cfs @ 12.72 hrs, Volume= 4,495 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Link 2L: Study Point A



Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 2S: Post Development Runoff Area=143,400 sf 4.10% Impervious Runoff Depth=0.19"
Flow Length=760' Tc=20.3 min CN=36 Runoff=0.09 cfs 2,291 cf

Subcatchment 3S: Post Development Runoff Area=58,200 sf 13.76% Impervious Runoff Depth=0.78"
Flow Length=760' Tc=20.3 min CN=48 Runoff=0.55 cfs 3,804 cf

Subcatchment 4S: Post Development Runoff Area=15,500 sf 30.52% Impervious Runoff Depth=1.53"
Tc=6.0 min CN=59 Runoff=0.57 cfs 1,973 cf

Reach 1R: Swale Avg. Depth=0.13' Max Vel=1.78 fps Inflow=0.55 cfs 3,804 cf
n=0.030 L=85.0' S=0.0235 '/' Capacity=112.94 cfs Outflow=0.55 cfs 3,804 cf

Reach 2R: Swale Avg. Depth=0.11' Max Vel=2.17 fps Inflow=0.57 cfs 1,973 cf
n=0.030 L=120.0' S=0.0417 '/' Capacity=150.29 cfs Outflow=0.54 cfs 1,973 cf

Pond 2P: On Site Depression Peak Elev=134.68' Storage=905 cf Inflow=0.81 cfs 7,609 cf
Outflow=0.45 cfs 7,609 cf

Pond 3P: Level Spreader Area Peak Elev=135.54' Storage=60 cf Inflow=0.81 cfs 5,777 cf
Discarded=0.01 cfs 444 cf Primary=0.80 cfs 5,318 cf Outflow=0.81 cfs 5,762 cf

Link 2L: Study Point A Inflow=0.45 cfs 7,609 cf
Primary=0.45 cfs 7,609 cf

Total Runoff Area = 217,100 sf Runoff Volume = 8,068 cf Average Runoff Depth = 0.45"
91.42% Pervious = 198,480 sf 8.58% Impervious = 18,620 sf

Summary for Subcatchment 2S: Post Development Subcatchment

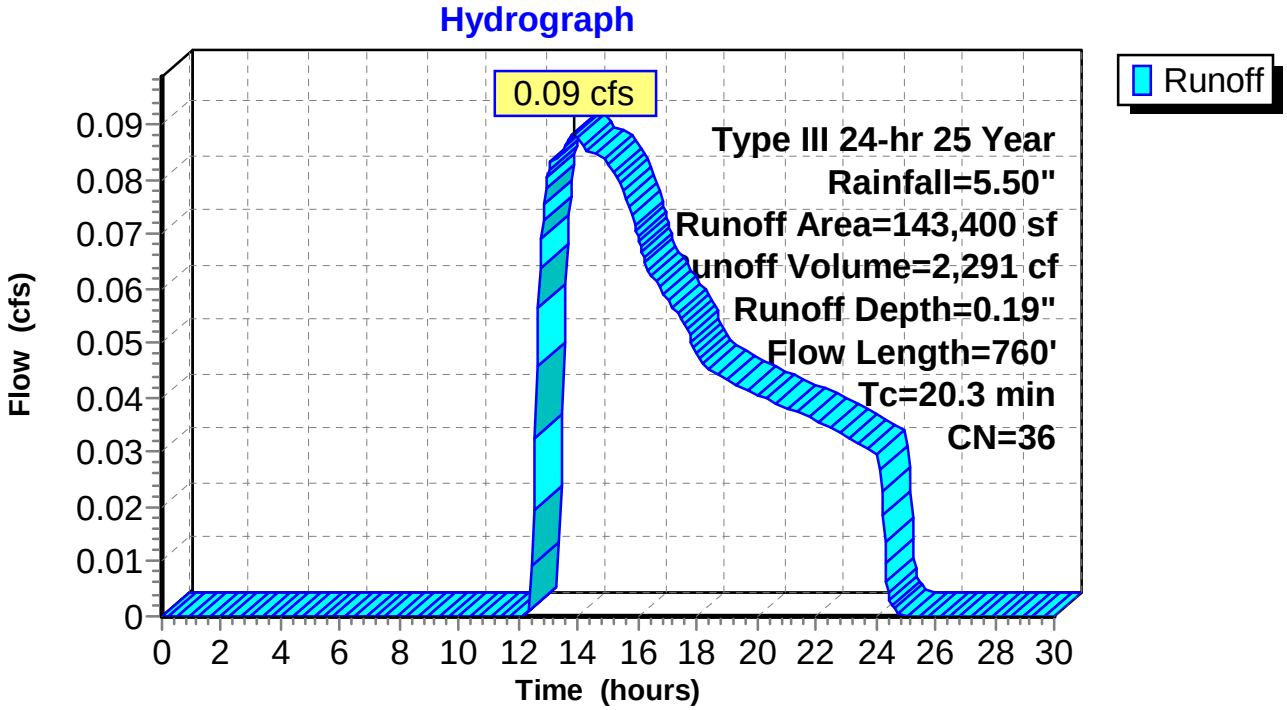
Runoff = 0.09 cfs @ 13.86 hrs, Volume= 2,291 cf, Depth= 0.19"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Rainfall=5.50"

Area (sf)	CN	Description
16,400	39	>75% Grass cover, Good, HSG A
49,000	46	2 acre lots, 12% imp, HSG A
78,000	30	Woods, Good, HSG A
143,400	36	Weighted Average
137,520		Pervious Area
5,880		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	100	0.1000	0.15		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
9.0	660	0.0600	1.22		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
20.3	760	Total			

Subcatchment 2S: Post Development Subcatchment



Summary for Subcatchment 3S: Post Development Subcatchment

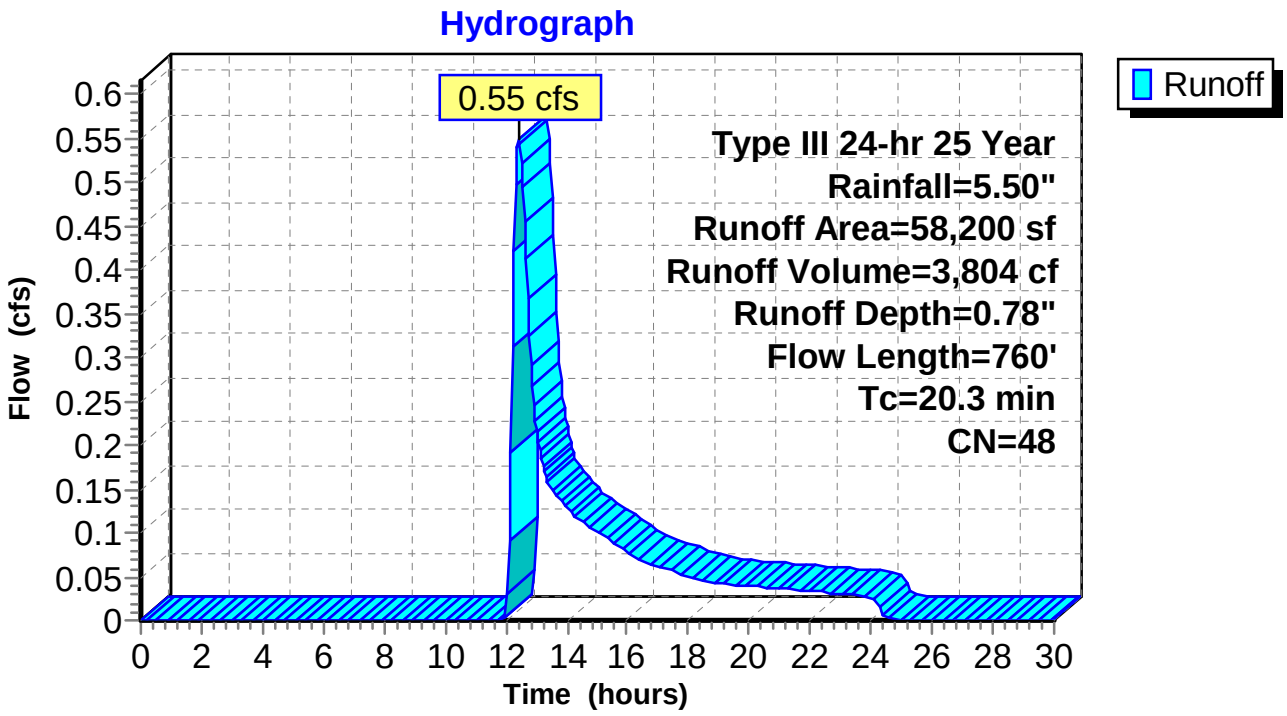
Runoff = 0.55 cfs @ 12.40 hrs, Volume= 3,804 cf, Depth= 0.78"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Rainfall=5.50"

Area (sf)	CN	Description
55,500	46	2 acre lots, 12% imp, HSG A
2,700	83	Paved roads w/open ditches, 50% imp, HSG A
58,200	48	Weighted Average
50,190		Pervious Area
8,010		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	100	0.1000	0.15		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
9.0	660	0.0600	1.22		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
20.3	760	Total			

Subcatchment 3S: Post Development Subcatchment



Summary for Subcatchment 4S: Post Development Subcatchment

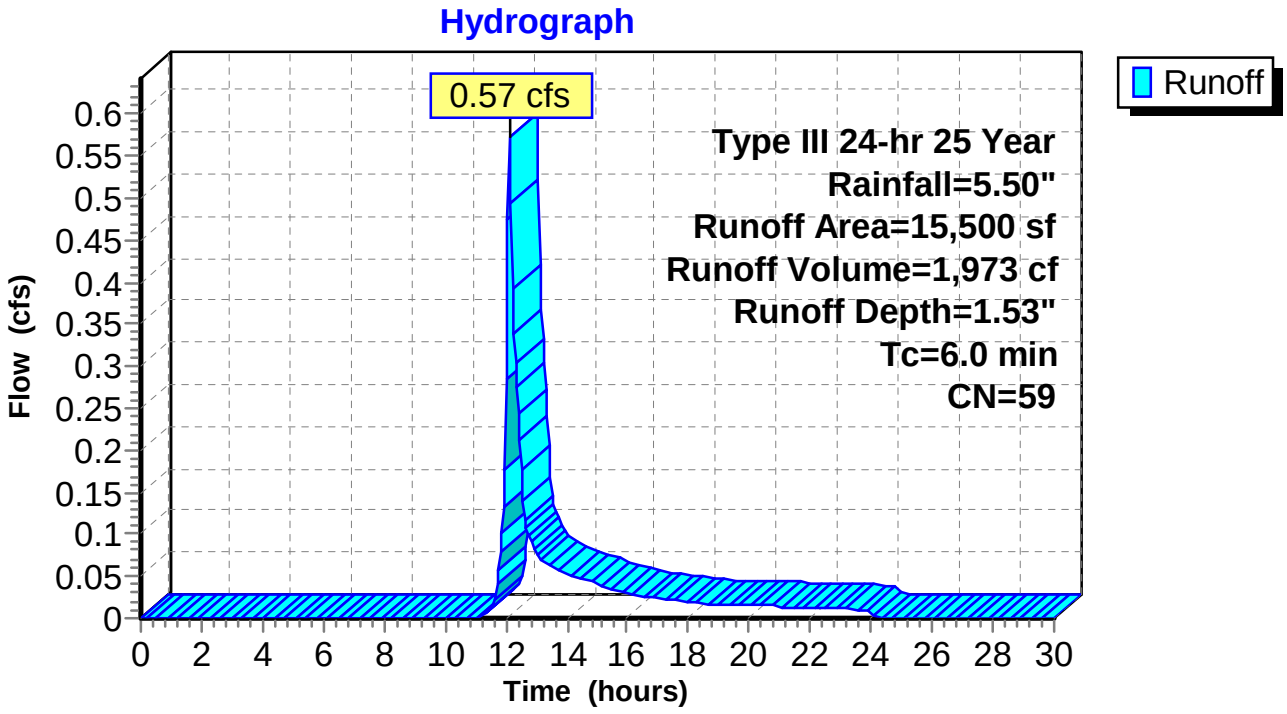
Runoff = 0.57 cfs @ 12.10 hrs, Volume= 1,973 cf, Depth= 1.53"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Rainfall=5.50"

	Area (sf)	CN	Description
	11,900	51	1 acre lots, 20% imp, HSG A
*	1,100	98	Populatic St
	2,500	83	Paved roads w/open ditches, 50% imp, HSG A
	15,500	59	Weighted Average
	10,770		Pervious Area
	4,730		Impervious Area

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

Subcatchment 4S: Post Development Subcatchment



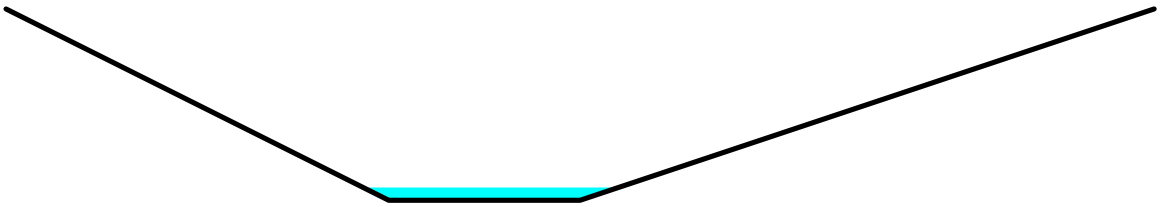
Summary for Reach 1R: Swale

Inflow Area = 58,200 sf, 13.76% Impervious, Inflow Depth = 0.78" for 25 Year event
Inflow = 0.55 cfs @ 12.40 hrs, Volume= 3,804 cf
Outflow = 0.55 cfs @ 12.42 hrs, Volume= 3,804 cf, Atten= 0%, Lag= 1.3 min

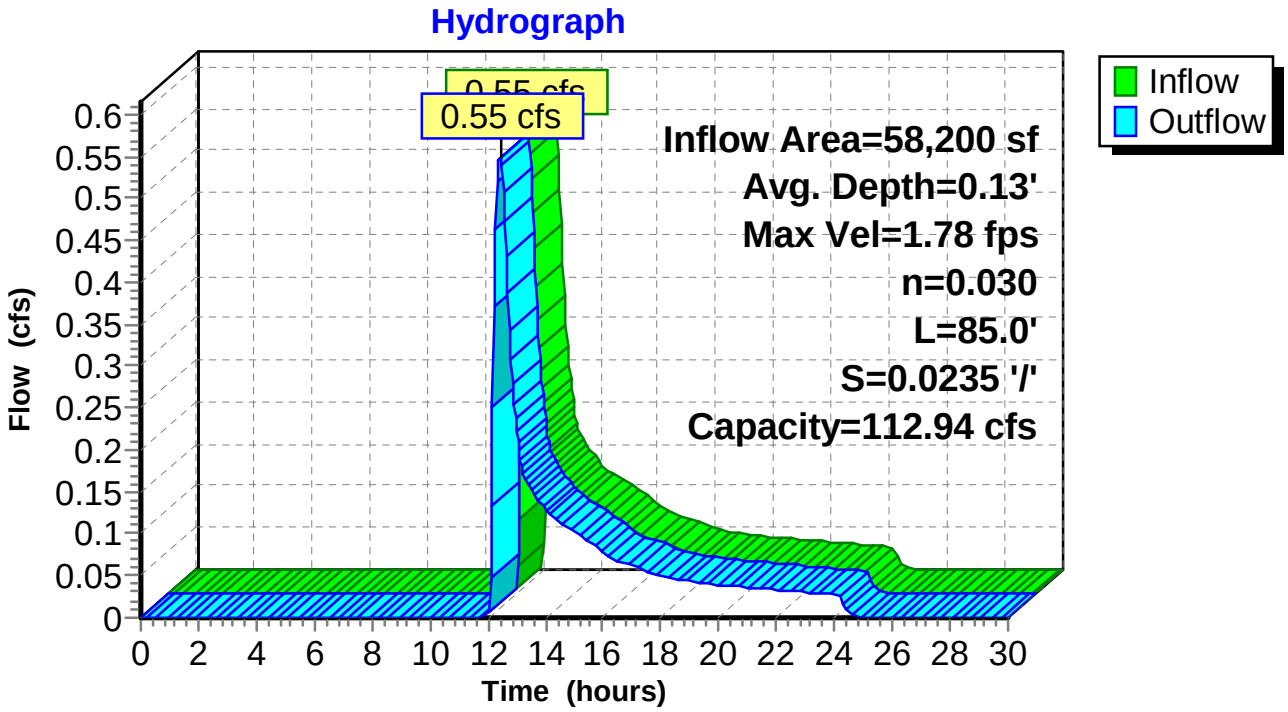
Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.78 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 0.83 fps, Avg. Travel Time= 1.7 min

Peak Storage= 26 cf @ 12.41 hrs, Average Depth at Peak Storage= 0.13'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 112.94 cfs

2.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.0 3.0 '/' Top Width= 12.00'
Length= 85.0' Slope= 0.0235 '/'
Inlet Invert= 137.00', Outlet Invert= 135.00'



Reach 1R: Swale



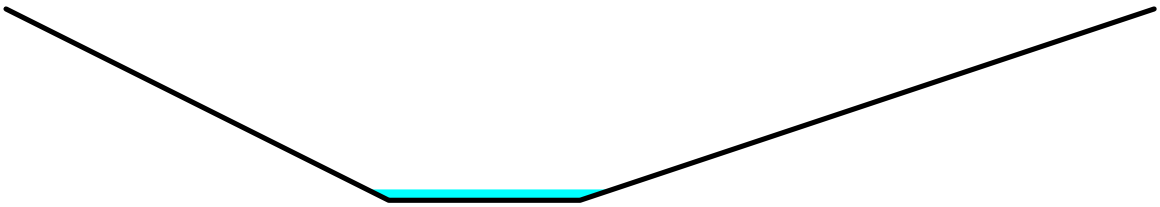
Summary for Reach 2R: Swale

Inflow Area = 15,500 sf, 30.52% Impervious, Inflow Depth = 1.53" for 25 Year event
Inflow = 0.57 cfs @ 12.10 hrs, Volume= 1,973 cf
Outflow = 0.54 cfs @ 12.13 hrs, Volume= 1,973 cf, Atten= 6%, Lag= 1.7 min

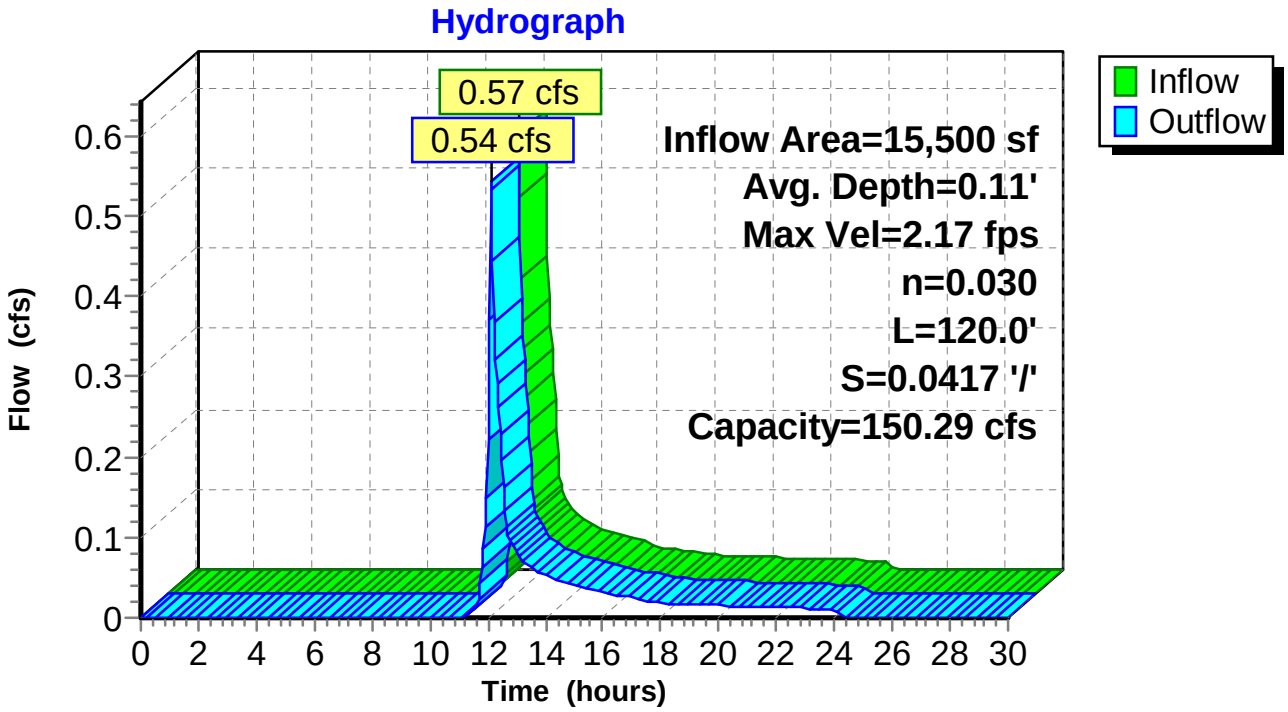
Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.17 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 0.84 fps, Avg. Travel Time= 2.4 min

Peak Storage= 31 cf @ 12.11 hrs, Average Depth at Peak Storage= 0.11'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 150.29 cfs

2.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.0 3.0 '/' Top Width= 12.00'
Length= 120.0' Slope= 0.0417 '/'
Inlet Invert= 140.00', Outlet Invert= 135.00'



Reach 2R: Swale



Summary for Pond 2P: On Site Depression

Inflow Area = 217,100 sf, 8.58% Impervious, Inflow Depth = 0.42" for 25 Year event
Inflow = 0.81 cfs @ 12.37 hrs, Volume= 7,609 cf
Outflow = 0.45 cfs @ 12.83 hrs, Volume= 7,609 cf, Atten= 44%, Lag= 27.6 min
Primary = 0.45 cfs @ 12.83 hrs, Volume= 7,609 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 134.68' @ 12.83 hrs Surf.Area= 2,357 sf Storage= 905 cf

Plug-Flow detention time= 17.7 min calculated for 7,609 cf (100% of inflow)
Center-of-Mass det. time= 17.7 min (958.6 - 940.9)

Volume	Invert	Avail.Storage	Storage Description
#1	134.00'	29,020 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

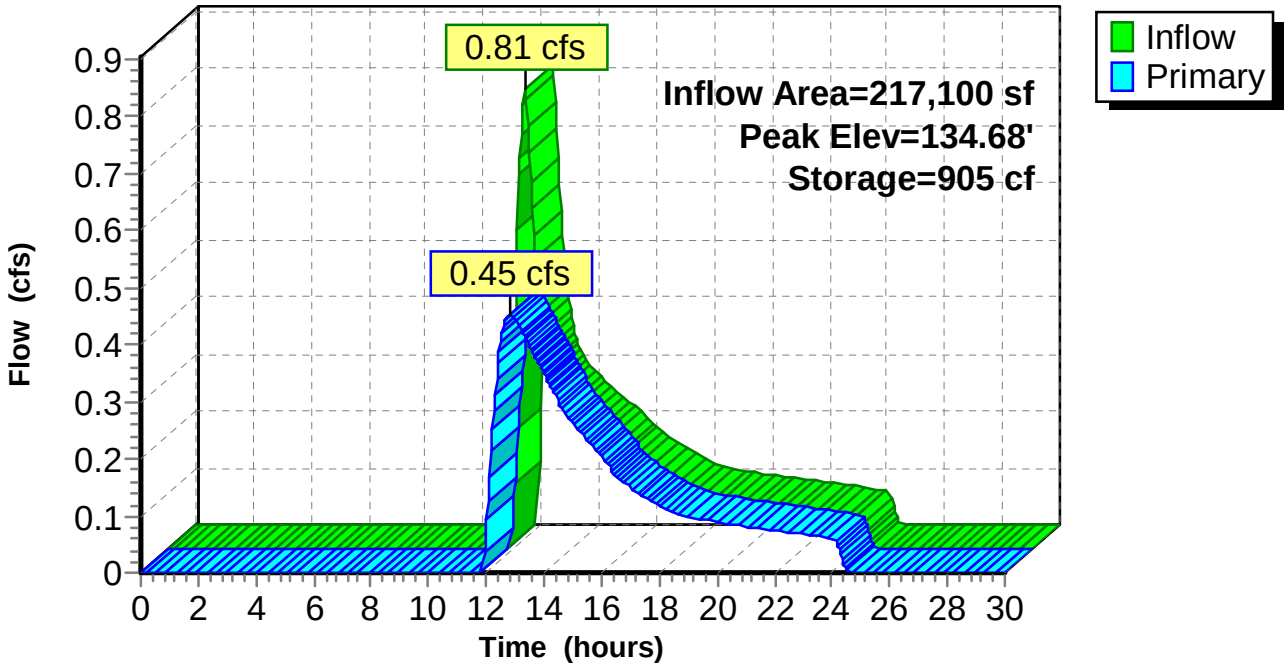
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
134.00	320	0	0
136.00	6,350	6,670	6,670
138.00	16,000	22,350	29,020

Device	Routing	Invert	Outlet Devices
#1	Primary	134.00'	**8.270 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.45 cfs @ 12.83 hrs HW=134.68' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.45 cfs)

Pond 2P: On Site Depression

Hydrograph



Summary for Pond 3P: Level Spreader Area

Inflow Area = 73,700 sf, 17.29% Impervious, Inflow Depth = 0.94" for 25 Year event
Inflow = 0.81 cfs @ 12.36 hrs, Volume= 5,777 cf
Outflow = 0.81 cfs @ 12.37 hrs, Volume= 5,762 cf, Atten= 0%, Lag= 0.1 min
Discarded = 0.01 cfs @ 12.37 hrs, Volume= 444 cf
Primary = 0.80 cfs @ 12.37 hrs, Volume= 5,318 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 135.54' @ 12.37 hrs Surf.Area= 155 sf Storage= 60 cf

Plug-Flow detention time= 9.7 min calculated for 5,753 cf (100% of inflow)
Center-of-Mass det. time= 8.5 min (918.4 - 909.9)

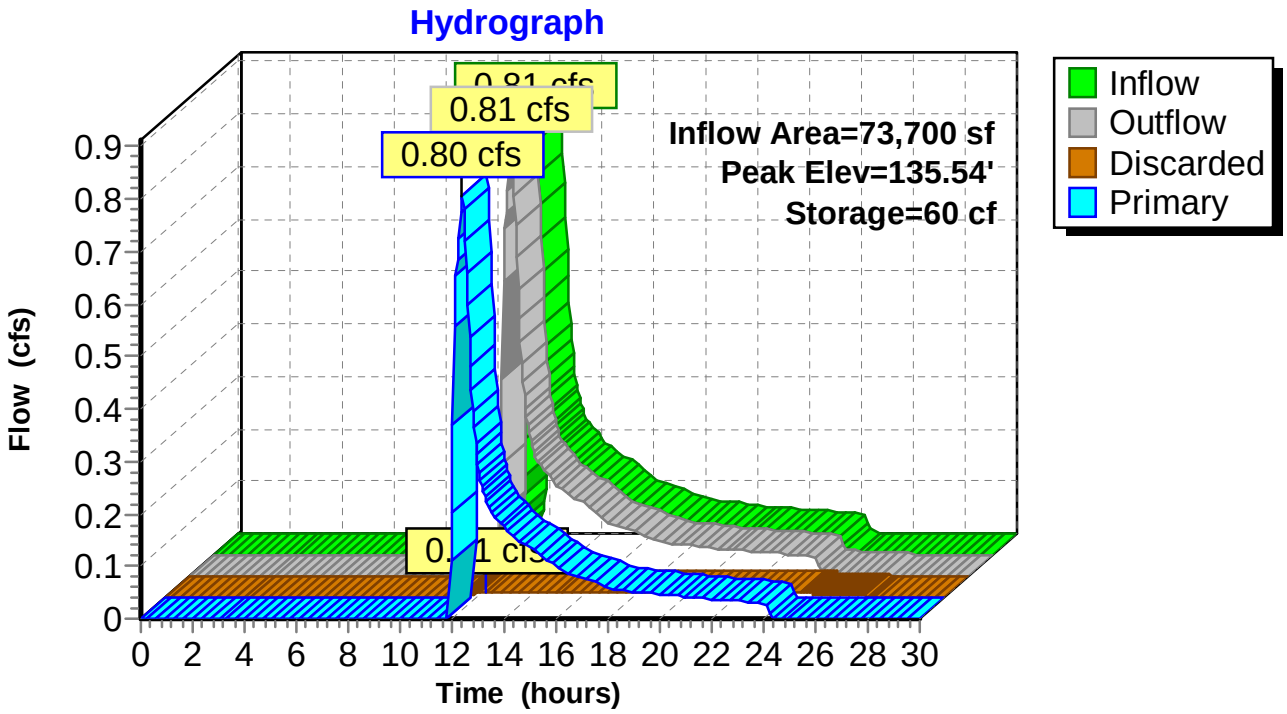
Volume	Invert	Avail.Storage	Storage Description
#1	135.00'	479 cf	**2.00'W x 35.00'L x 2.00'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	135.50'	**38.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#2	Discarded	135.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.37 hrs HW=135.54' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.80 cfs @ 12.37 hrs HW=135.54' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.80 cfs @ 0.51 fps)

Pond 3P: Level Spreader Area

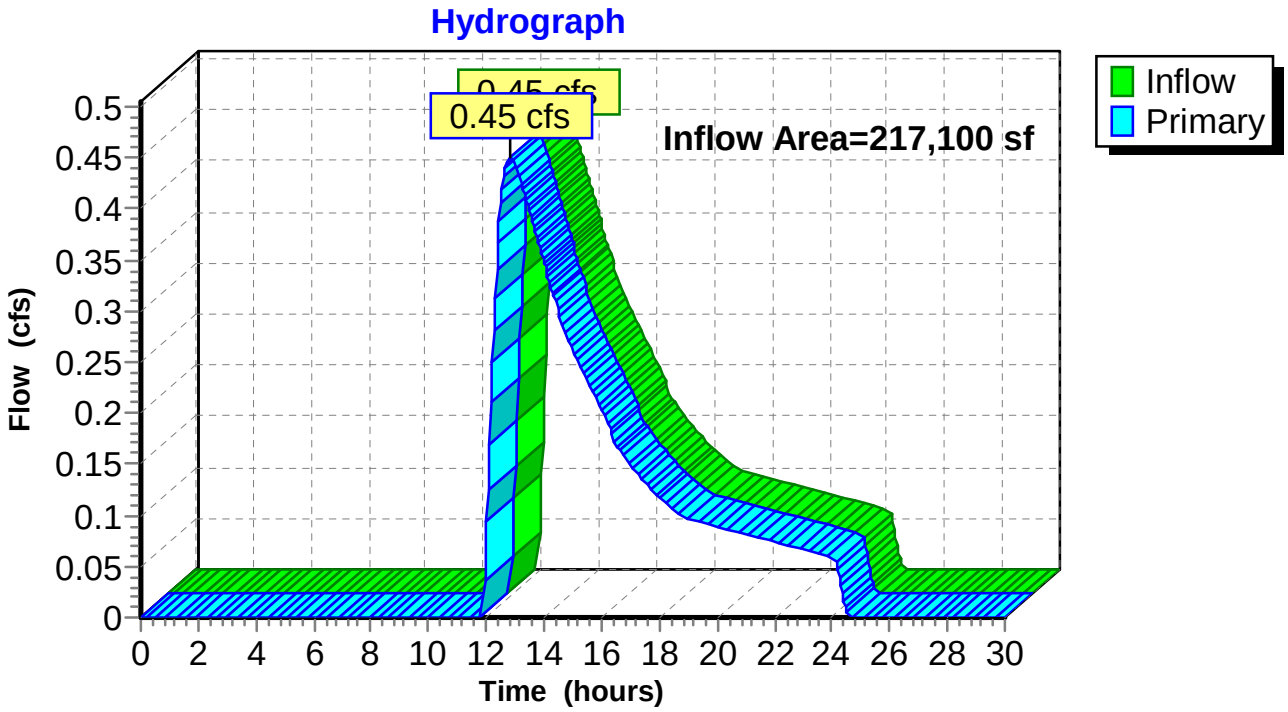


Summary for Link 2L: Study Point A

Inflow Area = 217,100 sf, 8.58% Impervious, Inflow Depth = 0.42" for 25 Year event
Inflow = 0.45 cfs @ 12.83 hrs, Volume= 7,609 cf
Primary = 0.45 cfs @ 12.83 hrs, Volume= 7,609 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Link 2L: Study Point A



Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 2S: Post Development Runoff Area=143,400 sf 4.10% Impervious Runoff Depth=0.47"
Flow Length=760' Tc=20.3 min CN=36 Runoff=0.49 cfs 5,647 cf

Subcatchment 3S: Post Development Runoff Area=58,200 sf 13.76% Impervious Runoff Depth=1.34"
Flow Length=760' Tc=20.3 min CN=48 Runoff=1.13 cfs 6,486 cf

Subcatchment 4S: Post Development Runoff Area=15,500 sf 30.52% Impervious Runoff Depth=2.30"
Tc=6.0 min CN=59 Runoff=0.90 cfs 2,971 cf

Reach 1R: Swale Avg. Depth=0.20' Max Vel=2.26 fps Inflow=1.13 cfs 6,486 cf
n=0.030 L=85.0' S=0.0235 '/' Capacity=112.94 cfs Outflow=1.12 cfs 6,486 cf

Reach 2R: Swale Avg. Depth=0.15' Max Vel=2.54 fps Inflow=0.90 cfs 2,971 cf
n=0.030 L=120.0' S=0.0417 '/' Capacity=150.29 cfs Outflow=0.87 cfs 2,971 cf

Pond 2P: On Site Depression Peak Elev=135.25' Storage=2,746 cf Inflow=1.84 cfs 14,651 cf
Outflow=0.78 cfs 14,651 cf

Pond 3P: Level Spreader Area Peak Elev=135.56' Storage=64 cf Inflow=1.56 cfs 9,457 cf
Discarded=0.01 cfs 462 cf Primary=1.54 cfs 9,003 cf Outflow=1.55 cfs 9,465 cf

Link 2L: Study Point A Inflow=0.78 cfs 14,651 cf
Primary=0.78 cfs 14,651 cf

Total Runoff Area = 217,100 sf Runoff Volume = 15,105 cf Average Runoff Depth = 0.83"
91.42% Pervious = 198,480 sf 8.58% Impervious = 18,620 sf

Summary for Subcatchment 2S: Post Development Subcatchment

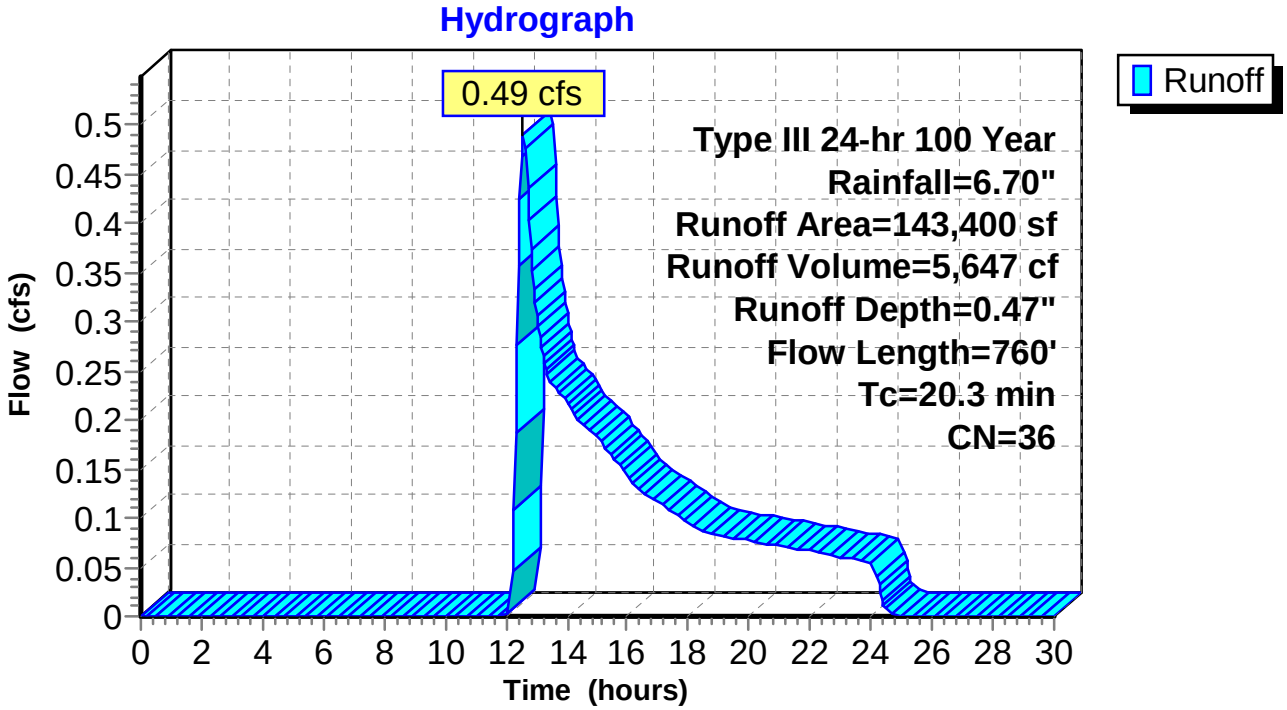
Runoff = 0.49 cfs @ 12.57 hrs, Volume= 5,647 cf, Depth= 0.47"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=6.70"

Area (sf)	CN	Description
16,400	39	>75% Grass cover, Good, HSG A
49,000	46	2 acre lots, 12% imp, HSG A
78,000	30	Woods, Good, HSG A
143,400	36	Weighted Average
137,520		Pervious Area
5,880		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	100	0.1000	0.15		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
9.0	660	0.0600	1.22		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
20.3	760	Total			

Subcatchment 2S: Post Development Subcatchment



Summary for Subcatchment 3S: Post Development Subcatchment

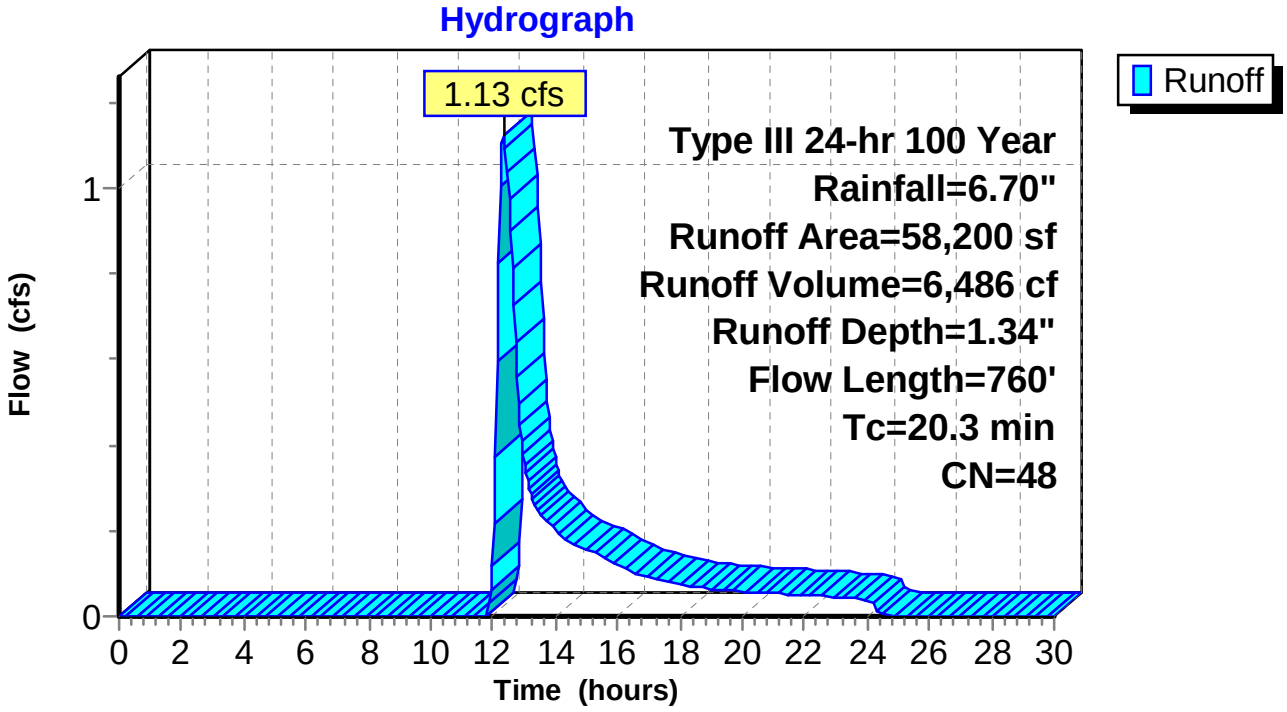
Runoff = 1.13 cfs @ 12.35 hrs, Volume= 6,486 cf, Depth= 1.34"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=6.70"

Area (sf)	CN	Description
55,500	46	2 acre lots, 12% imp, HSG A
2,700	83	Paved roads w/open ditches, 50% imp, HSG A
58,200	48	Weighted Average
50,190		Pervious Area
8,010		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	100	0.1000	0.15		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
9.0	660	0.0600	1.22		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
20.3	760	Total			

Subcatchment 3S: Post Development Subcatchment



Summary for Subcatchment 4S: Post Development Subcatchment

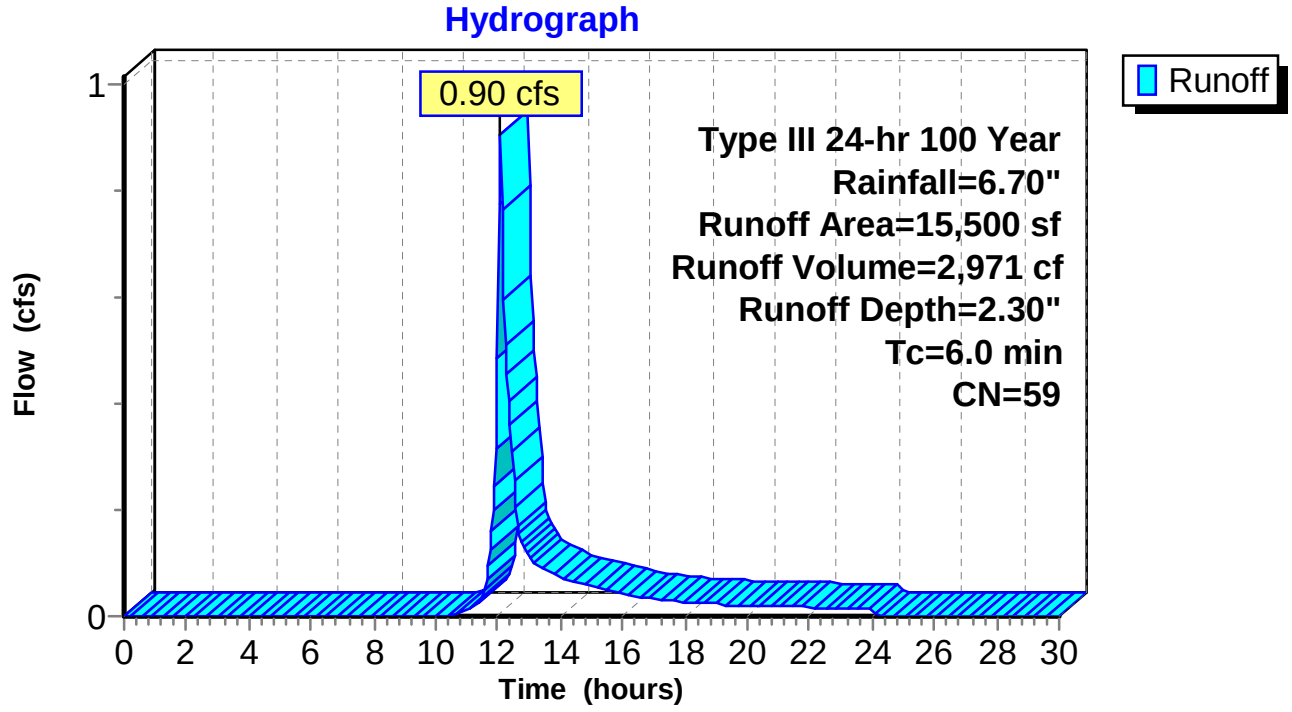
Runoff = 0.90 cfs @ 12.10 hrs, Volume= 2,971 cf, Depth= 2.30"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=6.70"

	Area (sf)	CN	Description
	11,900	51	1 acre lots, 20% imp, HSG A
*	1,100	98	Populatic St
	2,500	83	Paved roads w/open ditches, 50% imp, HSG A
	15,500	59	Weighted Average
	10,770		Pervious Area
	4,730		Impervious Area

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

Subcatchment 4S: Post Development Subcatchment



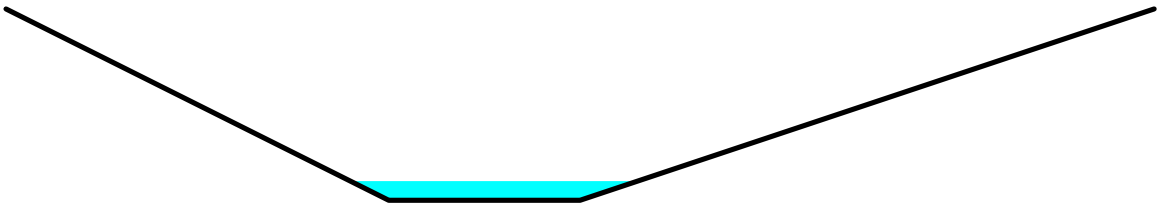
Summary for Reach 1R: Swale

Inflow Area = 58,200 sf, 13.76% Impervious, Inflow Depth = 1.34" for 100 Year event
Inflow = 1.13 cfs @ 12.35 hrs, Volume= 6,486 cf
Outflow = 1.12 cfs @ 12.36 hrs, Volume= 6,486 cf, Atten= 0%, Lag= 1.1 min

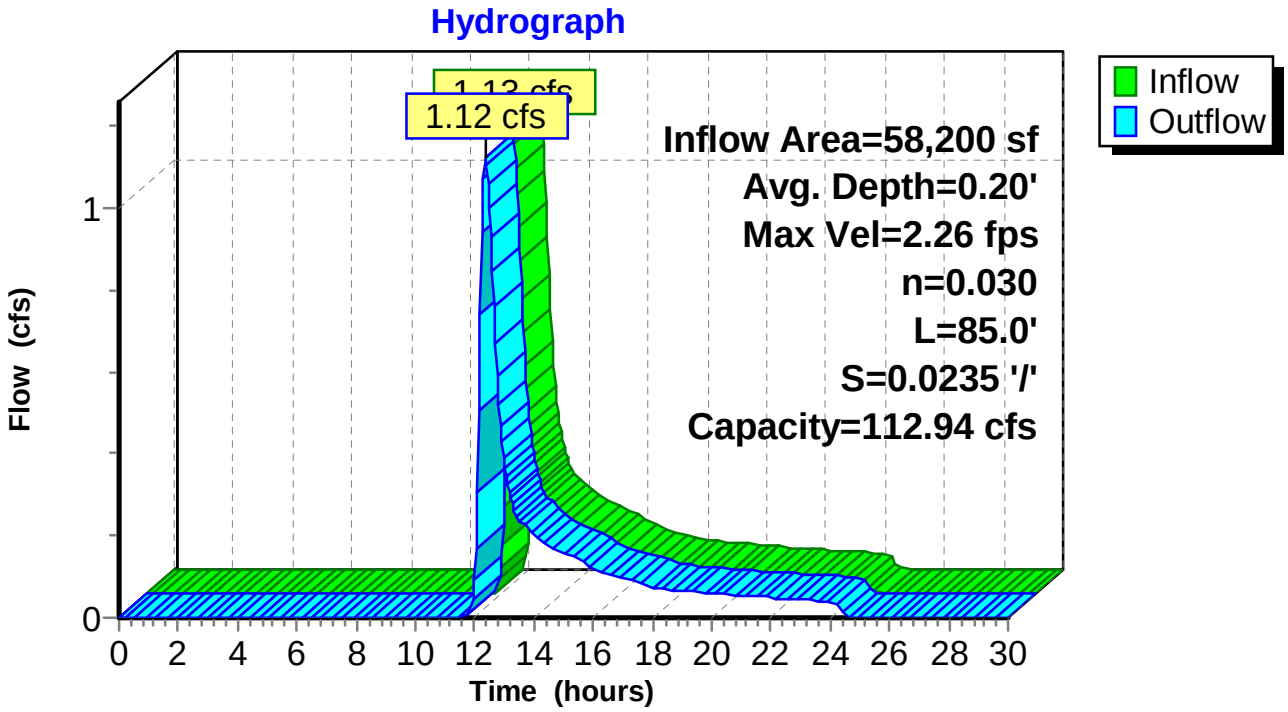
Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.26 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 0.97 fps, Avg. Travel Time= 1.5 min

Peak Storage= 42 cf @ 12.35 hrs, Average Depth at Peak Storage= 0.20'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 112.94 cfs

2.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.0 3.0 '/' Top Width= 12.00'
Length= 85.0' Slope= 0.0235 '/'
Inlet Invert= 137.00', Outlet Invert= 135.00'



Reach 1R: Swale



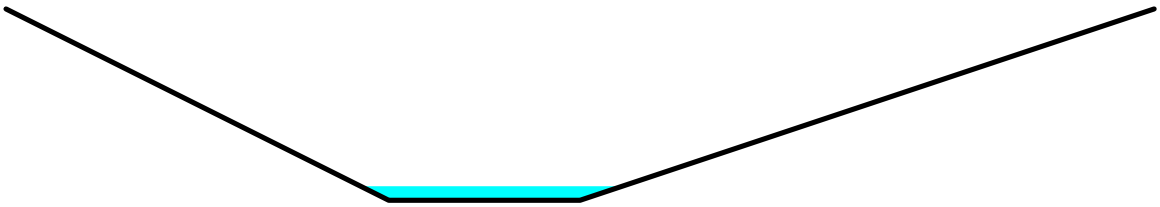
Summary for Reach 2R: Swale

Inflow Area = 15,500 sf, 30.52% Impervious, Inflow Depth = 2.30" for 100 Year event
Inflow = 0.90 cfs @ 12.10 hrs, Volume= 2,971 cf
Outflow = 0.87 cfs @ 12.12 hrs, Volume= 2,971 cf, Atten= 4%, Lag= 1.3 min

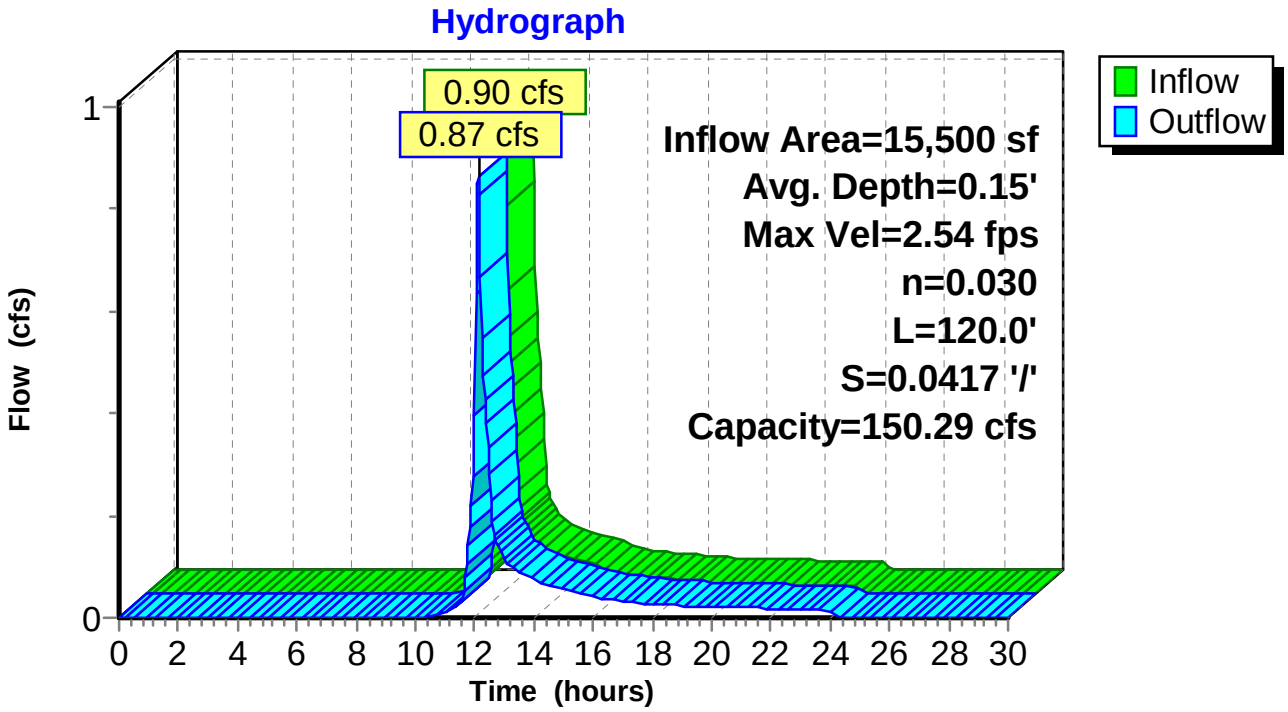
Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.54 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 0.89 fps, Avg. Travel Time= 2.2 min

Peak Storage= 42 cf @ 12.11 hrs, Average Depth at Peak Storage= 0.15'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 150.29 cfs

2.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.0 3.0 '/' Top Width= 12.00'
Length= 120.0' Slope= 0.0417 '/'
Inlet Invert= 140.00', Outlet Invert= 135.00'



Reach 2R: Swale



Summary for Pond 2P: On Site Depression

Inflow Area = 217,100 sf, 8.58% Impervious, Inflow Depth = 0.81" for 100 Year event
Inflow = 1.84 cfs @ 12.40 hrs, Volume= 14,651 cf
Outflow = 0.78 cfs @ 13.00 hrs, Volume= 14,651 cf, Atten= 57%, Lag= 36.1 min
Primary = 0.78 cfs @ 13.00 hrs, Volume= 14,651 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 135.25' @ 13.00 hrs Surf.Area= 4,082 sf Storage= 2,746 cf

Plug-Flow detention time= 35.5 min calculated for 14,626 cf (100% of inflow)
Center-of-Mass det. time= 35.4 min (956.1 - 920.7)

Volume	Invert	Avail.Storage	Storage Description
#1	134.00'	29,020 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

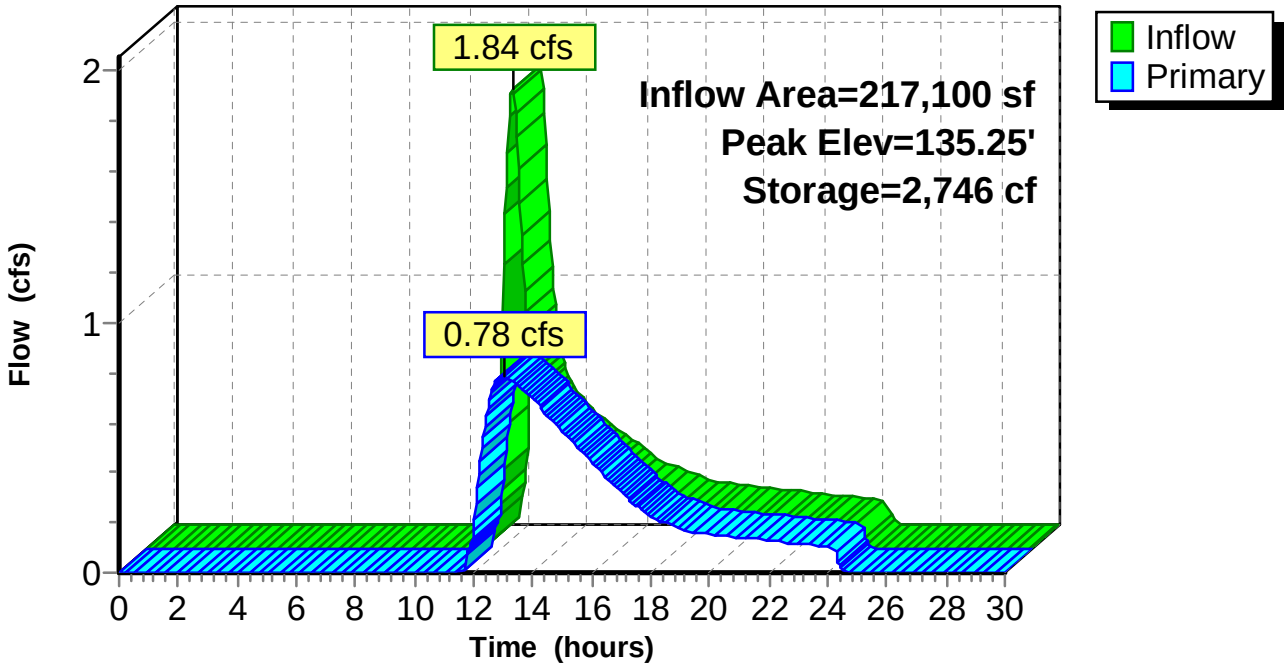
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
134.00	320	0	0
136.00	6,350	6,670	6,670
138.00	16,000	22,350	29,020

Device	Routing	Invert	Outlet Devices
#1	Primary	134.00'	**8.270 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.78 cfs @ 13.00 hrs HW=135.25' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.78 cfs)

Pond 2P: On Site Depression

Hydrograph



Summary for Pond 3P: Level Spreader Area

Inflow Area = 73,700 sf, 17.29% Impervious, Inflow Depth = 1.54" for 100 Year event
Inflow = 1.56 cfs @ 12.32 hrs, Volume= 9,457 cf
Outflow = 1.55 cfs @ 12.32 hrs, Volume= 9,465 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.01 cfs @ 12.32 hrs, Volume= 462 cf
Primary = 1.54 cfs @ 12.32 hrs, Volume= 9,003 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 135.56' @ 12.32 hrs Surf.Area= 158 sf Storage= 64 cf

Plug-Flow detention time= 4.2 min calculated for 9,450 cf (100% of inflow)
Center-of-Mass det. time= 4.9 min (897.1 - 892.2)

Volume	Invert	Avail.Storage	Storage Description
#1	135.00'	479 cf	**2.00'W x 35.00'L x 2.00'H Prismatoid Z=2.0**

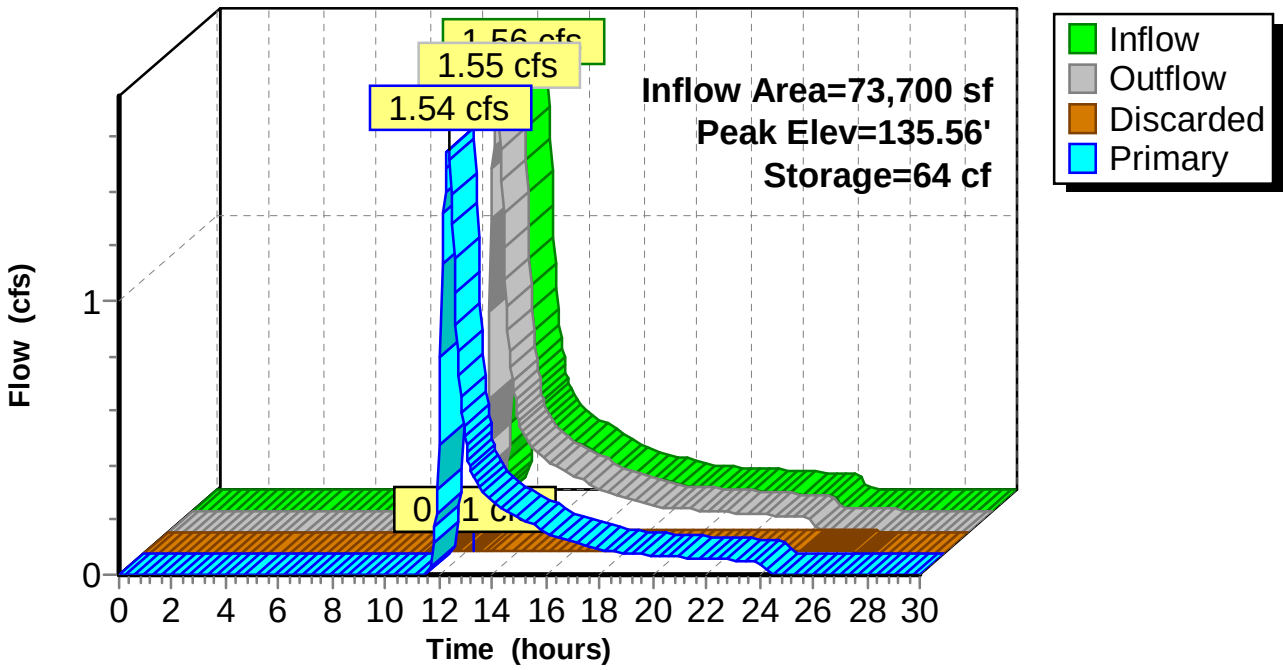
Device	Routing	Invert	Outlet Devices
#1	Primary	135.50'	**38.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#2	Discarded	135.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.32 hrs HW=135.56' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.53 cfs @ 12.32 hrs HW=135.56' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 1.53 cfs @ 0.64 fps)

Pond 3P: Level Spreader Area

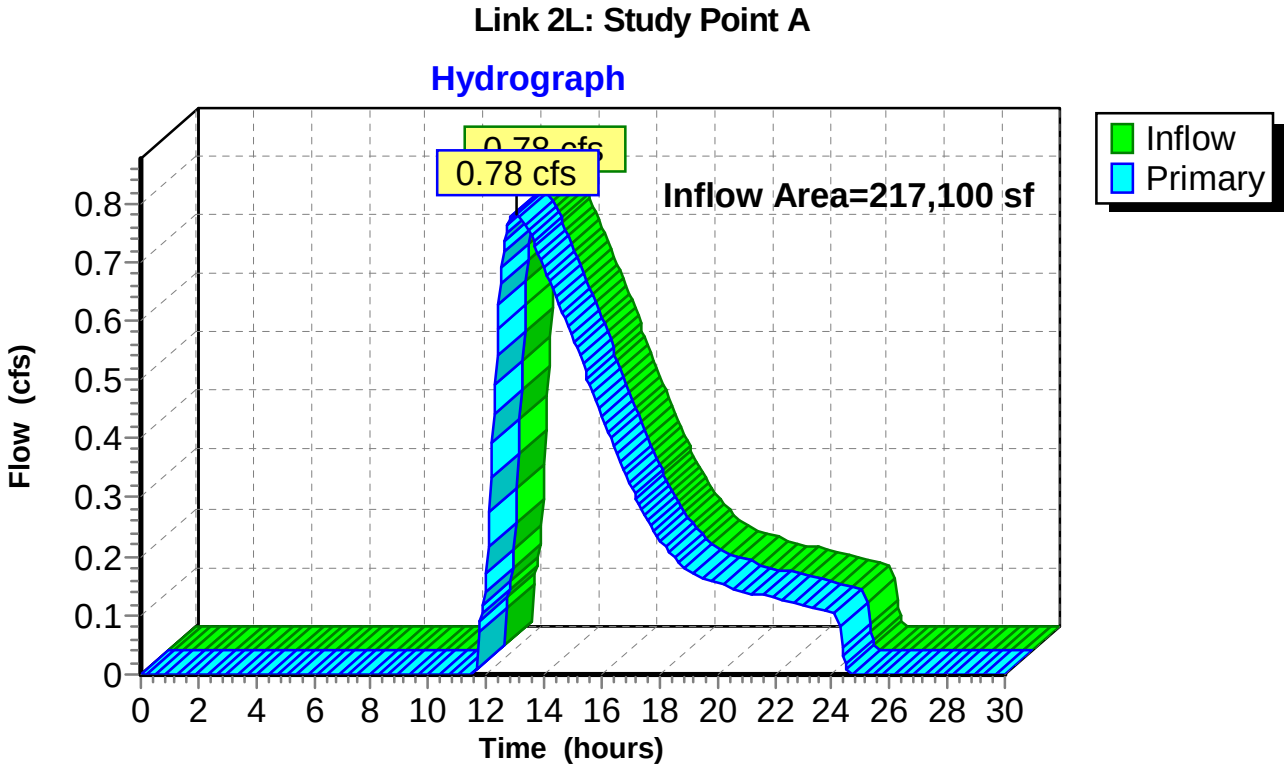
Hydrograph



Summary for Link 2L: Study Point A

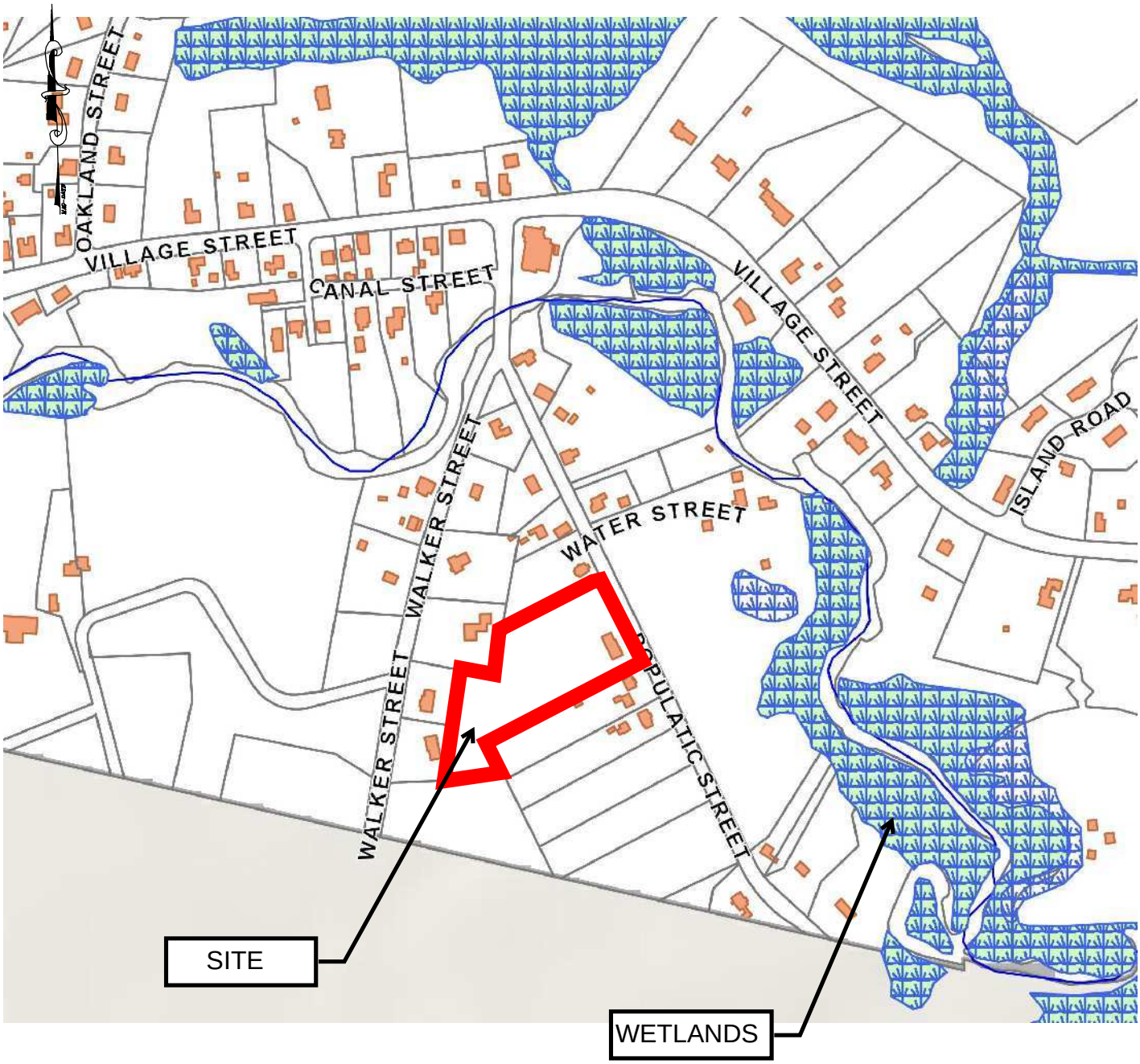
Inflow Area = 217,100 sf, 8.58% Impervious, Inflow Depth = 0.81" for 100 Year event
Inflow = 0.78 cfs @ 13.00 hrs, Volume= 14,651 cf
Primary = 0.78 cfs @ 13.00 hrs, Volume= 14,651 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs



Attachment A

Locus Map



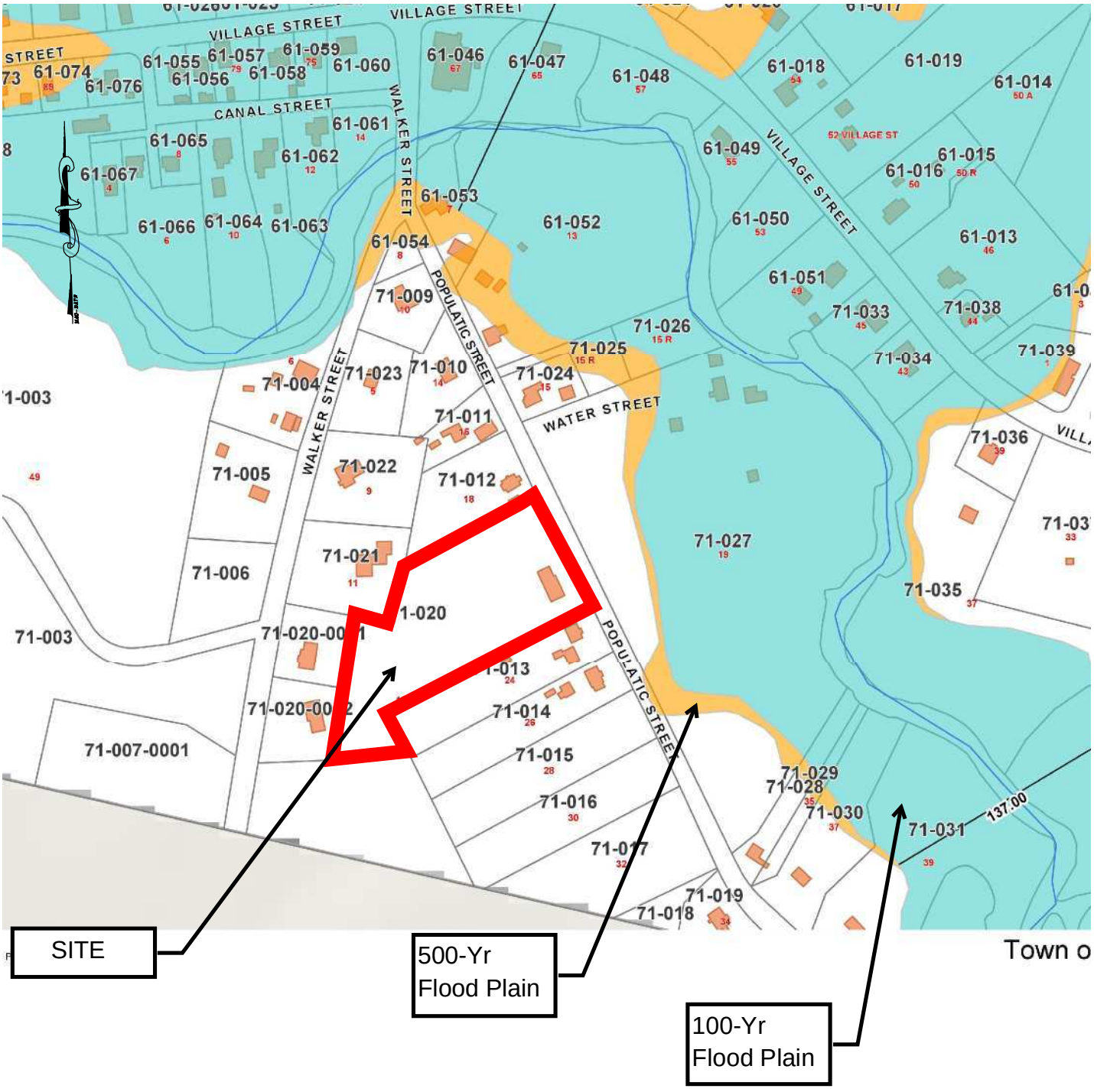
Sheet Title 22 Populatic St. Medway, Ma	Project Name LOCUS PLAN	Prepared for Robert and Lisa Lapinski

ENGINEER/DBA:
L.A.L Engineering Group
730 Main Street, Suite 1F
Millis MA 02054
Tel (781) 248-1133
Fax (508) 376-8440

Scale	Date	Fig. No.
1:1,000	October, 2017	1
	File No.	

Attachment B

Flood Zone Map



Sheet Title 22 Populatic St. Medway, Ma	Project Name FLOOD ZONE MAP	Prepared for Robert and Lisa Lapinski
ENGINEER/DBA: L.A.L Engineering Group 730 Main Street, Suite 1F Millis MA 02054 Tel (781) 248-1133 Fax (508) 376-8440	Scale 1:1,000 Date October, 2017 File No.	Fig. No. 2

Attachment C

TSS Removal Worksheet

INSTRUCTIONS:

Version 1, Automated: Mar. 4, 2008

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Location: Pre-Infiltration Area (At Level Spreader)

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Street Sweeping - 1%	**0.01**	**1.00**	**0.01**	**0.99**
Grass Channel	**0.50**	**0.99**	**0.50**	**0.50**
	0.00	**0.50**	**0.00**	**0.50**
	0.00	**0.50**	**0.00**	**0.50**
	0.00	**0.50**	**0.00**	**0.50**

Total TSS Removal = **51%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: **Town Line Estate**

Prepared By: **JMK**

Date: **Oct-17**

*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:

Version 1, Automated: Mar. 4, 2008

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Location: Infiltration Area Study Point A

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Street Sweeping - 1%	**0.01**	**1.00**	**0.01**	**0.99**
Grass Channel	**0.50**	**0.99**	**0.50**	**0.50**
Infiltration Basin	**0.80**	**0.50**	**0.40**	**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

Project: Town Line Estate

Prepared By: JMK

Date: Oct-17

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

Attachment D

Long Term Operation & Maintenance Plan

Drainage Operations and Maintenance (O&M) Plan

Town Line Estate
Medway, Ma

This long-term Drainage Operations and Maintenance (O&M) Plan shall be implemented at Tannery Way to ensure that the Stormwater management system functions as designed and in accordance with DEP Stormwater Management Standard No. 9. This Operations and Maintenance Plan is intended to cover all on-site drainage structures, conveyances and outfalls. The Property Owner of Lot # 2 possesses the primary responsibility for overseeing and implementing the O&M Plan and designating a person who will be responsible for the proper operation and maintenance of the Stormwater structures. In case of transfer of property ownership, future property owners shall be notified of the presence of the Stormwater management system and the requirements for proper implementation of the O&M Plan.

O&M Plan Implementation Manager Contact Information:

Robert Lapinsky
62 Allston Ave.
Worcester, Ma 01604

Components of the Operations and Maintenance Plan include:

- Removal of all trash and litter debris from entire site, particularly roadway gutters, wooded areas, Water Quality Swales, sediment forebays and Raingardens.
- Pavement sweeping of paved roadway.
- Removal of sediment and pollutants trapped in swales, water quality treatment units, Raingardens and forebays.
- Snow Management Plan-Winter Roadway Maintenance and snow storage.

Stormwater Runoff Quality

The Stormwater management system protects and enhances the Stormwater runoff water quality through the removal of sediment and pollutants, and source control significantly reduces the amount of pollutants entering the system. Preventive maintenance of the system will include a comprehensive source reduction program of regular sweeping and litter removal, and maintenance of the roadway area. These measures are described below.

Drainage System

Stormwater runoff is collected, via roadside grass swales and is discharged over a level spreader into an existing forested infiltration area. Maintenance and cleaning of swales and level spreader area will assure adequate performance.

Maintenance Program

The Property Owner of Lot #2 will conduct the operation and maintenance program set forth in this document. The Owner will ensure that inspections and record keeping are timely and accurate and that cleaning and maintenance are performed at least on a bi-annual basis. Inspection & Maintenance Log Forms (attached) shall include the date and the amount of the last significant storm event in excess of 1" of rain in a 24-hour period, physical conditions of the structures, depth of sediment in structures, evidence of overtopping or debris blockage and maintenance required of each structure. *Records of maintenance will be kept on file at the Property Manager's office and copies of Inspection & Maintenance Log sheets indicating all work and inspections will be available to the Town upon request.*

All Stormwater management structures will be inspected two times per year, with cleaning typically occurring in April and October and possibly more often, as site conditions warrant. Concurrent with inspection and cleaning, all litter shall be picked up and removed from the roadway areas, grass, landscaped and wooded areas within the Right-of-Way and drainage easements.

Quarterly Inspections

1. Inspect roadside swales, level spreader and Infiltration Area; remove wind-blown trash and debris to ensure that the items are working in their intended fashion and that they are free of debris.

Bi-Annual Inspections (performed in April and October)

1. Inspect for sediment near level spreader once per year or more frequently if sediment is found to be present Accumulated sediment must be removed. Excessive sediment shall be removed and properly disposed of.
2. Inspect Swales. Accumulated sediment must be removed if depth of sediment exceeds 15% of the unit's storage capacity during either of the bi-annual inspections and at least once per year;
3. Inspect roadside swales, level spreader and Infiltration Area; remove wind-blown trash and debris. Inspect vegetation twice per year during both the growing and non-growing seasons. Remove accumulated sediment once every ten years or more often as necessary;
4. Inspect Swales / Infiltration Area for standing water. If standing water is observed for longer than 72 hours, a pump should be placed in the structure and

discharged through the outlet pipe. After a system is dewatered, it should be observed by a Professional Engineer. A Professional Engineer should provide an opinion as to why the structure is not draining and provide recommendations to restore the capacity to the system. **Note: When the swale systems are first constructed, this inspection should occur after every major storm for the first 3 months. A major storm shall be any storm that produces 1" or more of rain.** Thereafter, inspect based on the Maintenance Plan frequency and as necessary to ensure that the swales are functioning properly. Clean and reseed as required and remove accumulated sediment if it exceeds a depth of 2 inches;

5. Inspect all vegetated areas and remove litter and debris as necessary. Inspect slopes and embankments early in the growing season to identify active or potential erosion problems. Replant bare areas or areas with sparse growth. Where rill erosion is evident, armor the area with an appropriate lining or divert the erosive flows to on-site areas able to withstand the concentrated flows.

Pavement Sweeping Program

Pavement sweeping is a highly effective source control measure for reducing pollutant loading in Stormwater. Hand sweeping and/or Mechanical air blowers may be utilized to facilitate collecting and removing sediment. All sweepings will be disposed of in a legal manner.

Long-term management practices include monthly sweeping of the roadway areas during Spring-Fall months. The sweeping program will remove sand and contaminants directly from paved surfaces before they become mobilized during rain events and transported to the drainage system.

Snow Management Plan

1. Snow shall be managed in accordance with MA DEP *Snow Disposal Guidance* No. BWR G2015-01**.**
2. No deicing materials shall be stored within the Right-of-way.
3. Every effort should be made to plow and store snow on vegetated pervious surfaces to allow the snowmelt to filter through the soil, leaving behind sand and debris that can be collected and removed in the springtime.
4. Snow shall not be stored in swale/infiltration areas.
5. Plowed snow should not block drainage collection areas, and conveyance channels, as this may cause flooding.
6. The Owner of Lot #2 is responsible for all snow clearing on Tannery Way. It is the responsibility of the Owner to notify contractors as to permissible areas for the storage of snow, according to the restrictions described.

Maintenance Schedule

The following is a general maintenance schedule that can be used as a reference by the Property Owner. This schedule includes the maintenance action to be taken and when the action is to occur.

Site Component	Action to be Taken	Timeline for Completion
Swales, Level Spreader Area	Removal of wind-blown trash and litter from entire property	April October
Infiltration Area	Removal of trash and sediment from inside of Infiltration Area	April October
Roadway	Sweeping	Quarterly

Illicit Discharge Compliance Statement

Per Standard No. 10 of the MassDEP Stormwater Management Standards, there shall be no illicit discharges to the Stormwater management system. The Property Owner of Lot #2 is responsible for implementing the Operation and Maintenance Plan and overseeing activities at the facility to prevent illicit discharges to the drainage system from occurring.

It is strictly prohibited to discharge any products or substances onto the ground surface or into any drainage structures, such as catch basin inlets, manholes, water quality units, swales or drainage outlets.

Should a spill occur, immediate action steps must be implemented to contain the spill, cordon off the area, clean it up immediately and dispose of it properly to prevent an illicit discharge to the Stormwater management system.

Drainage Operation and Maintenance Log

Maintenance Supervisor: _____ Date:_____
_____Routine_____Response to Rainfall Event _____in Other_____

BMP	Frequency	Date Performed	Comments
Landscaped & Vegetated Areas	Maintenance as necessary		
Swales, Level Spreader and Infiltration Area	Bi-Annual Inspections Clean when sediment depth reaches 2”		
	Maintenance as necessary		
	Bi-Annual Mowing		
Street Sweeping	Quarterly		

***Inspect swales, Level Spreader and Infiltration Area after each 1” rainfall for the first 3 months after construction.**

Annual Budget Estimate (2017)

The following is an estimated annual budget for the Operation and Maintenance of the drainage system:

Site Component	Rate	Annual Total
Street Sweeping	$.55/lf x 250 lf of roadway X 4 Quarters	$550
Swales, Level Spreader , Areas	4 /Year (Mow/Trash & Sediment Removal) @$120	$480
Infiltration Area	4 x $80 (Removal of trash and sediment)	$320
	Estimated Annual Total	**$1350.00**

Attachment E

Soil Evaluation Data / Percolation Tests

Parent Material Name—Norfolk and Suffolk Counties, Massachusetts
(22 Populatic - NRCS Data)

Map Scale: 1:1,680 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 20 40 80 120

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

Parent Material Name

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
245C	Hinckley loamy sand, 8 to 15 percent slopes	sandy and gravelly glaciofluvial deposits derived from gneiss and/or granite and/or schist	4.3	60.9%
255B	Windsor loamy sand, 3 to 8 percent slopes	loose sandy glaciofluvial deposits derived from granite and/or loose sandy glaciofluvial deposits derived from schist and/or loose sandy glaciofluvial deposits derived from gneiss	2.8	39.1%
Totals for Area of Interest			**7.1**	**100.0%**

Description

Parent material name is a term for the general physical, chemical, and mineralogical composition of the unconsolidated material, mineral or organic, in which the soil forms. Mode of deposition and/or weathering may be implied by the name.

The soil surveyor uses parent material to develop a model used for soil mapping. Soil scientists and specialists in other disciplines use parent material to help interpret soil boundaries and project performance of the material below the soil. Many soil properties relate to parent material. Among these properties are proportions of sand, silt, and clay; chemical content; bulk density; structure; and the kinds and amounts of rock fragments. These properties affect interpretations and may be criteria used to separate soil series. Soil properties and landscape information may imply the kind of parent material.

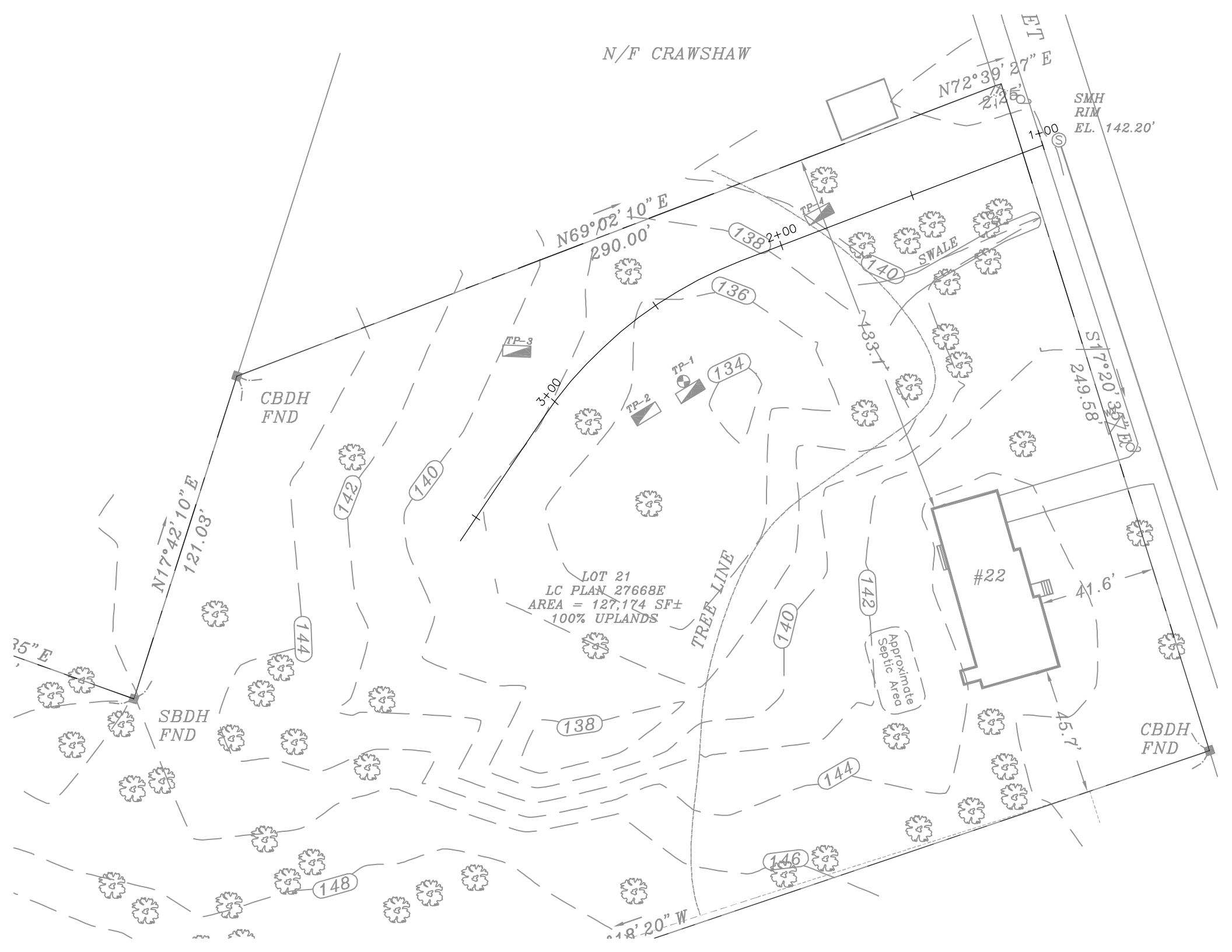
For each soil in the database, one or more parent materials may be identified. One is marked as the representative or most commonly occurring. The representative parent material name is presented here.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Lower


N/F CRAWSHAW
N72°39'27"E
212.5'
SMH
RIM
EL. 142.20'
1+00
S
TP-4
N69°02'10"E
290.00'
138
2+00
SWALE
140
136
TP-3
TP-1
134
3+00
TP-2
133.1'
S17°20'35"E
249.58'
CBDH
FND
N17°42'10"E
121.03'
142
140
144
LOT 21
LC PLAN 27668E
AREA = 127,174 SF±
100% UPLANDS
TREE LINE
#22
41.6'
Approximate
Septic Area
45.7'
SBDH
FND
CBDH
FND
138
144
148
146

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

WASNEWSKI
Owner Name

22 POPULATIC ST
Street Address

MEDWAY | MA | 02053
City | State | Zip Code

Map/Lot #

B. Site Information

1. (Check one) ☑ New Construction ☐ Upgrade ☐ Repair

2. Soil Survey Available? ☐ Yes ☐ No If yes: Source | Soil Map Unit

HINCKLEY SAND LOAM / WINDSOR LOAMY SAND | RAPID PERC
Soil Name | Soil Limitations

OUTWASH | DRUMLIN
Geologic/Parent Material | Landform

3. Surficial Geological Report Available? ☑ Yes ☐ No If yes: NRCS | 1:25000 | HAD
Year Published/Source | Publication Scale | Map Unit

4. Flood Rate Insurance Map

Above the 500-year flood boundary? ☑ Yes ☐ No Within the 100-year flood boundary? ☐ Yes ☑ No
If Yes, continue to #5.

5. Within a velocity zone? ☐ Yes ☑ No

6. Within a Mapped Wetland Area? ☐ Yes ☑ No MassGIS Wetland Data Layer: Wetland Type

7. Current Water Resource Conditions (USGS): Month/Year Range: ☐ Above Normal ☑ Normal ☐ Below Normal

8. Other references reviewed:

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 1 | 6/19/17 (Date) | 8:30 AM (Time) | CLEAR 80° (Weather)

1. Location

Ground Elevation at Surface of Hole: 134.5' feet | Latitude/Longitude: /

Description of Location: SITE LOW POINT - PROPOSED INFILTRATION

2. Land Use: WOODLAND (e.g., woodland, agricultural field, vacant lot, etc.) | NONE (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 2 (Slope (%))

Vegetation | DRUMLIN (Landform) | TS (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body ____ feet | Drainage Way ____ feet | Wetlands 500'± feet

Property Line 80'± feet | Drinking Water Well ____ feet | Other ____ feet

4. Parent Material: OUTWASH | Unsuitable Materials Present: ☐ Yes ☑ No

If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☑ No | If yes: Depth Weeping from Pit ____ | Depth Standing Water in Hole ____

Estimated Depth to High Groundwater: 31" inches | 131.9' elevation

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: 1

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-11	Ap	10YR 2/2				LOAMY SAND			GRANULAR		
11-17	Bw	10YR 6/2				SAND			MASSIVE	FRIABLE	
17-78	C	2.5Y 8/2	31	2.5Y 6/6	6	FINE SAND			MASSIVE	LOOSE	

Additional Notes:

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 2 | 6/19/17 (Date) | 8:30 AM (Time) | CLEAR (Weather)

1. Location

Ground Elevation at Surface of Hole: 135.0 ± feet | Latitude/Longitude: /

Description of Location: SITE LOW POINT - PROPOSED INFILTRATION

2. Land Use: WOODLAND (e.g., woodland, agricultural field, vacant lot, etc.) | NONE (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | Slope (%)

Vegetation | DRUMLIN (Landform) | TS (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from:

Open Water Body	feet	Drainage Way	feet	Wetlands	500' ± feet
Property Line	80 feet	Drinking Water Well	feet	Other	feet

4. Parent Material: | Unsuitable Materials Present: ☐ Yes ☑ No

If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☑ No | If yes: Depth Weeping from Pit | Depth Standing Water in Hole

Estimated Depth to High Groundwater: 36" inches | 132.0' elevation

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: 2

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-10	Ap	10YR 2/2				LOAMY SAND			GRANULAR		
10-16	Bw					SAND			MASSIVE	FRIABLE	
16-79	C	2.5Y 8/2	3e		6	FINE SAND			MASSIVE	LOOSE	

Additional Notes:

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 3 | 6/19/17 (Date) | 9:00 AM (Time) | CLEAR 80° (Weather)

1. Location

Ground Elevation at Surface of Hole: 139.5' feet | Latitude/Longitude: /

Description of Location: PROPOSED ROAD

2. Land Use: WOODLAND (e.g., woodland, agricultural field, vacant lot, etc.) | NONE (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 5 (Slope (%))

Vegetation | DRUMLIN (Landform) | TS (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body ____ feet | Drainage Way ____ feet | Wetlands 500'± feet

Property Line 25 feet | Drinking Water Well ____ feet | Other ____ feet

4. Parent Material: OUTWASH | Unsuitable Materials Present: ☐ Yes ☑ No

If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☑ No | If yes: Depth Weeping from Pit ____ | Depth Standing Water in Hole ____

Estimated Depth to High Groundwater: 67 inches | 133.9' elevation

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: 3

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-15	Ap	10YR 3/4				SANDY LOAM			GRANULAR	FRIABLE	
15-43	Bw	2.5Y 6/4				LOAMY SAND			MASSIVE	LOOSE	
43-77	C	2.5Y 6/2	67	10YR 5/8	10	MED SAND	15	5	MASSIVE	LOOSE	

Additional Notes:

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: 4 | 6/19/17 (Date) | 9:30 AM (Time) | CLEAR - 80° (Weather)

1. Location

   Ground Elevation at Surface of Hole: 140.0' feet | Latitude/Longitude: /

2. Land Use: LAWN (e.g., woodland, agricultural field, vacant lot, etc.) | NONE (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 4 (Slope (%))

   Vegetation | Landform | Position on Landscape (SU, SH, BS, FS,

3. Distances from:
   - Open Water Body: ____ feet
   - Drainage Way: ____ feet
   - Wetlands: 450'± feet
   - Property Line: 30 feet
   - Drinking Water Well: ____ feet
   - Other: ____ feet

4. Parent Material: OUTWASH | Unsuitable Materials Present: ☐ Yes ☑ No

   If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☑ No | If yes: Depth Weeping from Pit | Depth Standing Water in Hole

   Estimated Depth to High Groundwater: 7' 78" inches | <133.5' elevation

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: 4

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-18	Ap	10 YR 3/4				SANDY LOAM					
18-42	Bw	2.5 Y 4/2				LOAMY SAND	15	10	GRANULAR	LOOSE	
42-78	C	10 YR 5/3				MED SAND	20	15	GRANULAR	LOOSE	

Additional Notes:

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used:

	Obs. Hole # 1	Obs. Hole # 2
☐ Depth observed standing water in observation hole	____ inches	____ inches
☐ Depth weeping from side of observation hole	____ inches	____ inches
☑ Depth to soil redoximorphic features (mottles)	31 inches	36 inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	131.9' inches	132.0' inches

Index Well Number _____ Reading Date _____

$S_h = S_c - [S_r \times (OW_c - OW_{max})/OW_r]$

Obs. Hole # ____ S_c ____ S_r ____ OW_c ____ OW_{max} ____ OW_r ____ S_h ____

Obs. Hole # ____ S_c ____ S_r ____ OW_c ____ OW_{max} ____ OW_r ____ S_h ____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

   a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

   ☐ Yes ☐ No

   b. If yes, at what depth was it observed? Upper boundary: ____ inches Lower boundary: ____ inches

   c. If no, at what depth was impervious material observed? Upper boundary: ____ inches Lower boundary: ____ inches

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Board of Health Witness

Name of Board of Health Witness

Board of Health

G. Soil Evaluator Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Signature of Soil Evaluator

Date 6/19/17

Typed or Printed Name of Soil Evaluator / License # JEFFREY KANE #13275

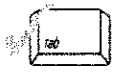
Expiration Date of License 6/30/19

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Commonwealth of Massachusetts
City/Town of
Percolation Test
Form 12

Percolation test results must be submitted with the Soil Suitability Assessment for On-site Sewage Disposal. DEP has provided this form for use by local Boards of Health. Other forms may be used, but the information must be substantially the same as that provided here. Before using this form, check with the local Board of Health to determine the form they use.

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



A. Site Information

WASLEWSKI
Owner Name

22 POPULATIC ST
Street Address or Lot #

MEDWAY | MA | 02053
City/Town | State | Zip Code

Contact Person (if different from Owner) | Telephone Number

B. Test Results

	Date	Time	Date	Time
	6/19/17		6/19/17	
Observation Hole #	1		2	
Depth of Perc	18"		19"	
Start Pre-Soak	9:50 AM		10:15 AM	
End Pre-Soak	10:05 AM		10:30 AM	
Time at 12"	*		*	
Time at 9"				
Time at 6"				
Time (9"-6")				
Rate (Min./Inch)	12 MIN/IN		12 MIN/IN	
	Test Passed: ☑ Test Failed: ☐		Test Passed: ☑ Test Failed: ☐	

JEFF KANE SE# 13275
Test Performed By:

Board of Health Witness

Comments:
* > 24 GAL ADDED W/IN 15 MIN

Attachment F

EPA NPDES Construction General Permit

No NPDES Permit Required for this project.

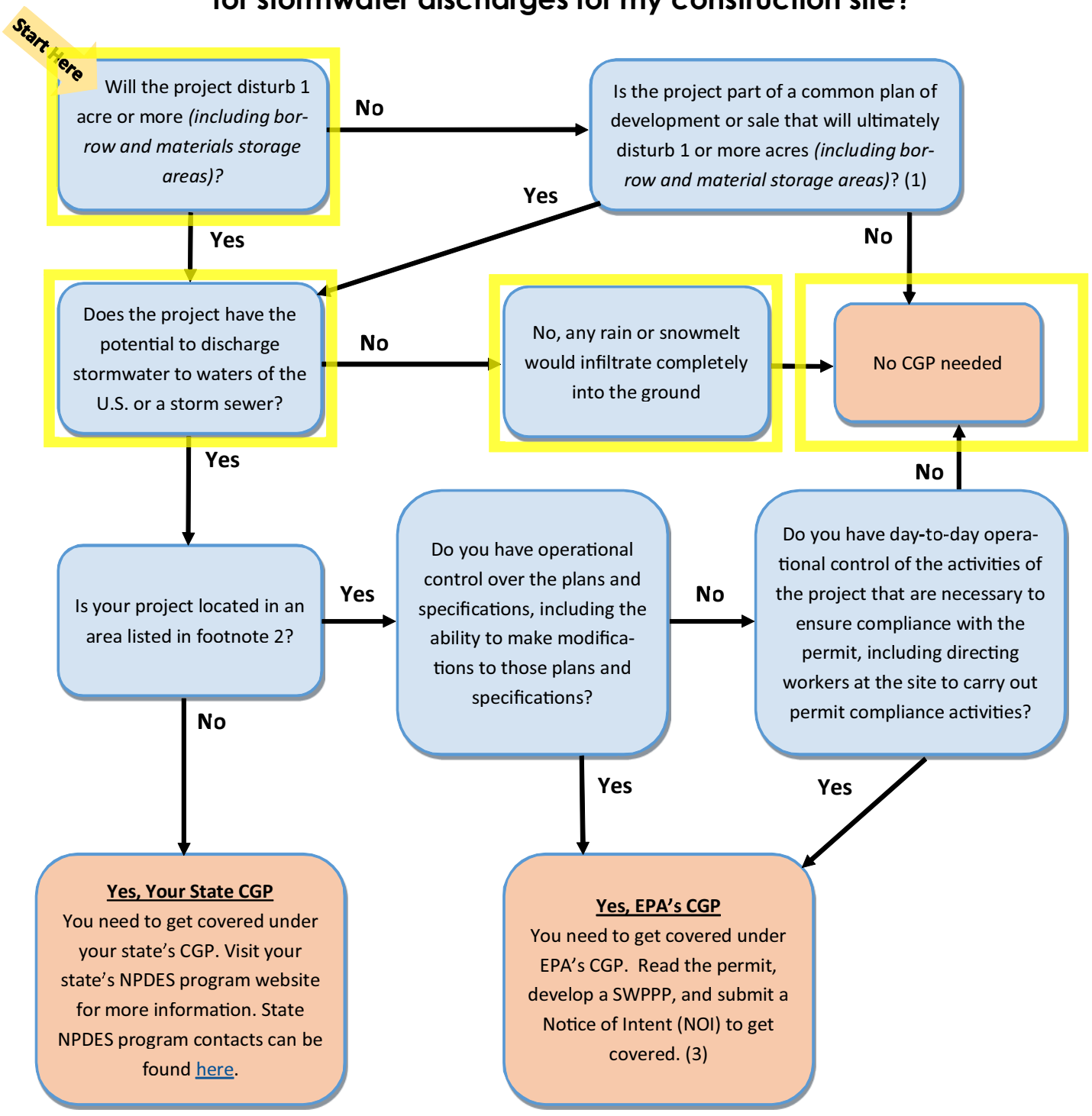
Per the 2017 EPA Construction General Permit:

1. *any "construction activity" that will disturb, or that is part of a common plan of development or sale that will disturb, one or more acres of land and discharges stormwater to waters of the U.S. must obtain NPDES permit coverage.*

2. *If all of the stormwater from the construction activity is captured on-site and allowed to evaporate, soak into the ground on-site, or is used for irrigation (i.e., not discharged to a water of the U.S.), you do not need a permit.*

The Town Line Estate project has no discharge from the site and all runoff will be captured on-site, therefor, does not meet the litmus test for the requirement of a "Construction General Permit".

Do I need to get covered under an NPDES Construction General Permit (CGP) for stormwater discharges for my construction site?



Need assistance? Contact Us - We're your partners in protecting clean water!

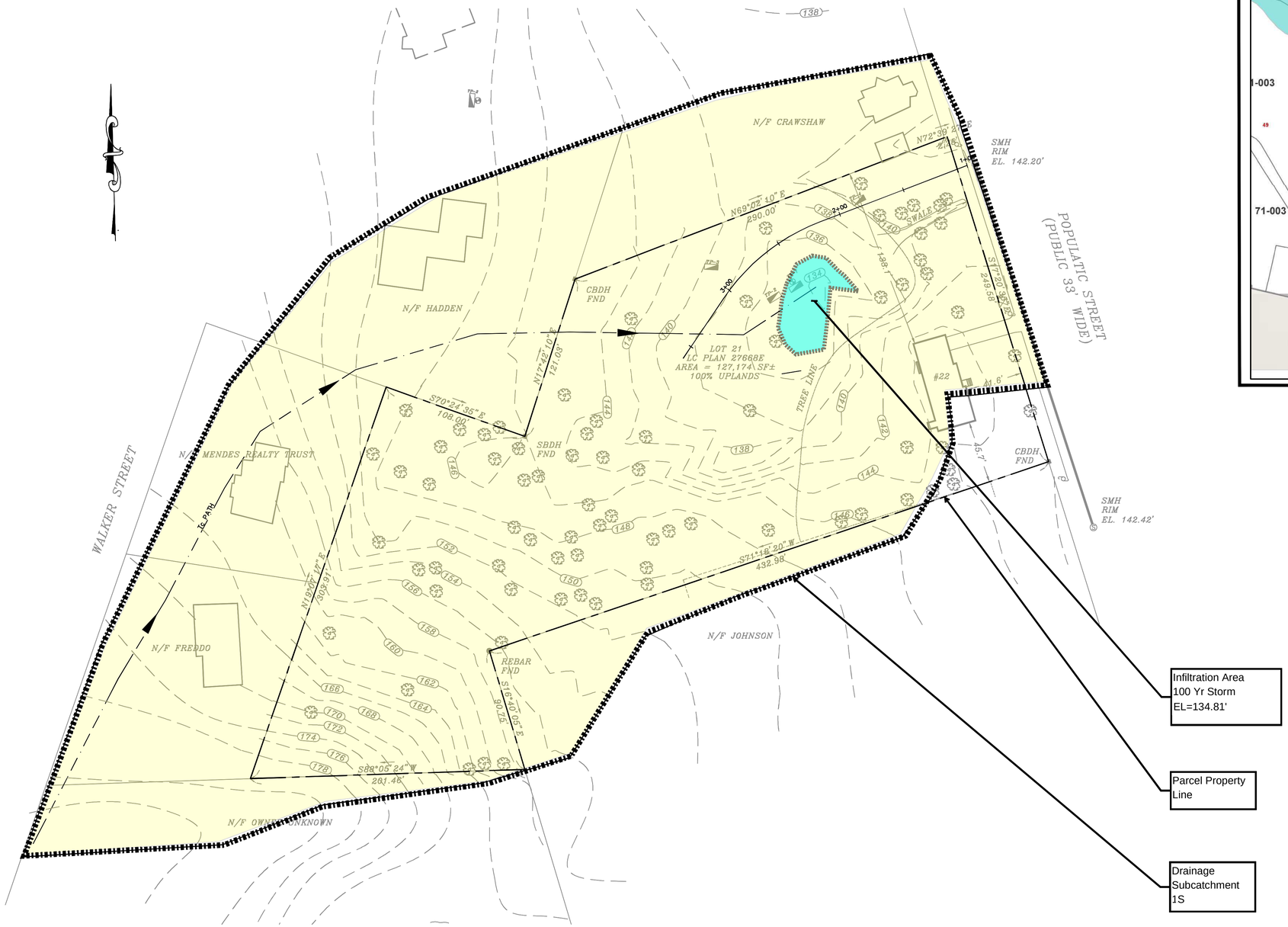
EPA Headquarters: Emily Halter (halter.emily@epa.gov) (202) 564-3324

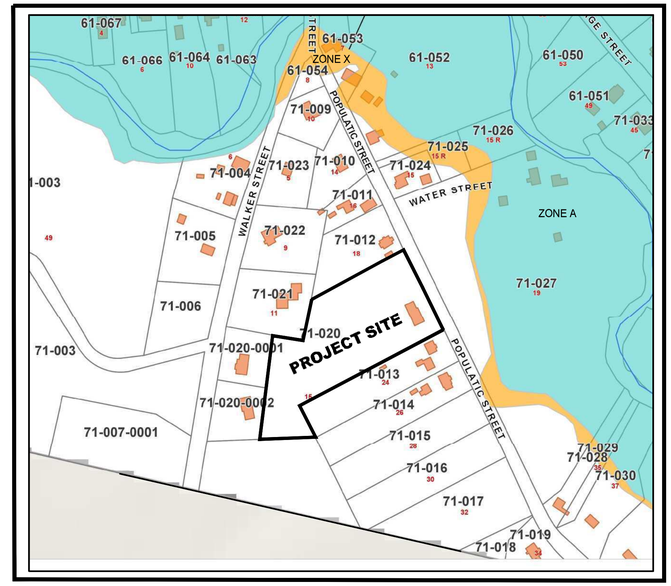
EPA Regional Offices contacts

State NPDES program contacts

Attachment G

Pre & Post Development Subcatchment Plans





SITE OVERVIEW
SCALE: 1"=200'±

"TOWN LINE ESTATE"

ASSESSORS REFERENCE
MAP 714, PARCEL 020

ZONING REFERENCE
AR-II

LEGEND

	TEL/ELEC. HAND HOLE		HYDRANT
	TEST HOLE		STONE CHECK DAM
THH	TELEPHONE HANDHOLE		STONE WALL
EHH	ELECTRIC HANDHOLE		DRILL HOLE
WSO	WATER SHUTOFF		BOUND
GG	GAS GATE		IRON PIN/PIPE
SWL	SOLID WHITE LINE		

NO.	DATE	REFERENCE
		REVISIONS

DATE: OCTOBER, 2017

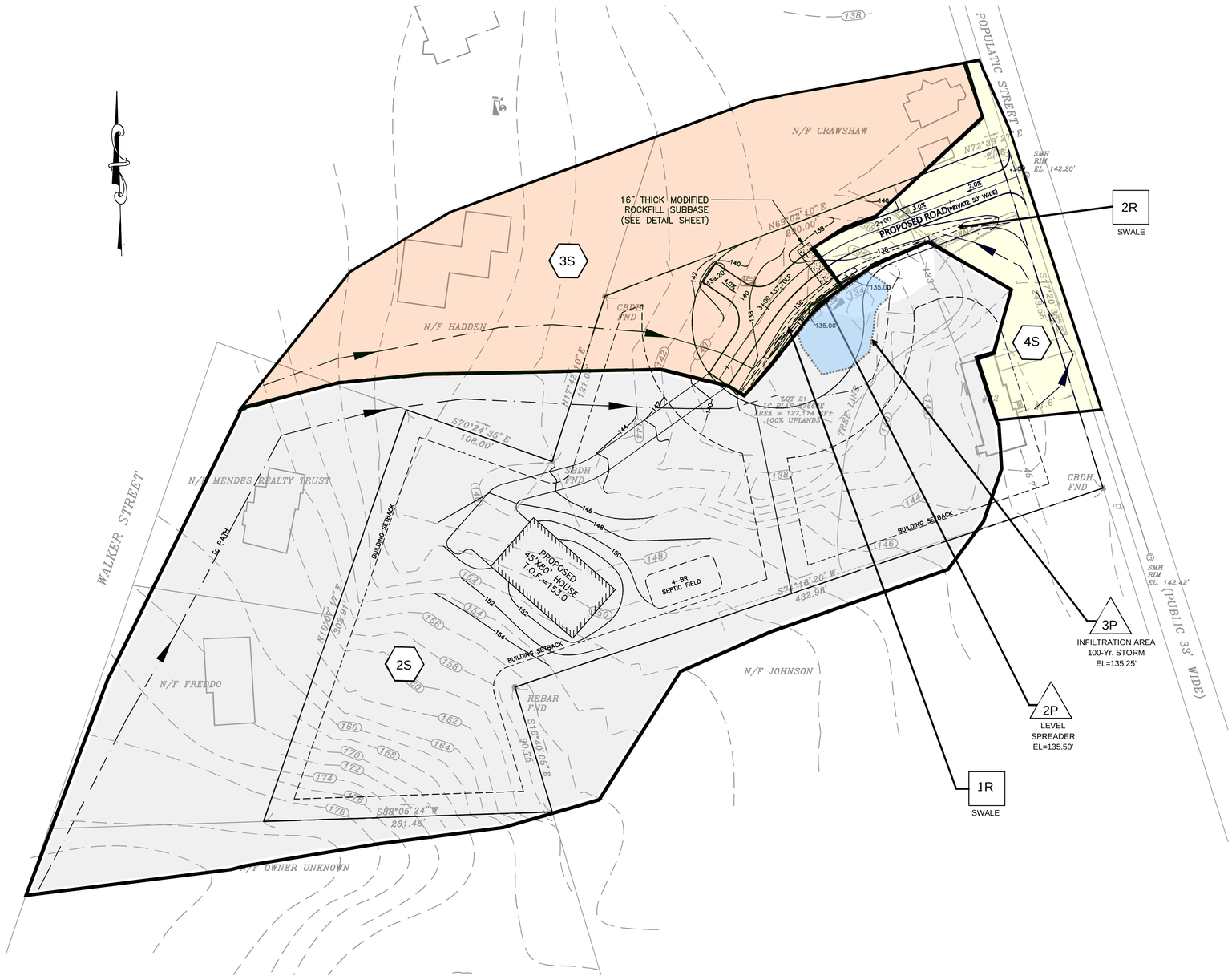
Engineer:
L.A.L. Engineering Group
DESIGN ~ PERMITTING ~ PEER REVIEW ~ LAYOUT
730 Main St, Suite 1F
Millis MA 02054
P: (781) 248-1133 F: (508) 376-8440

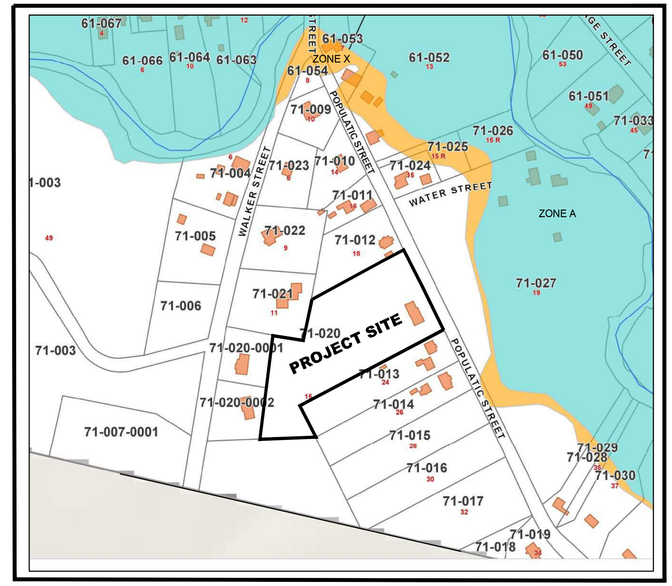
SITE LOCATION:
22 POPULATIC STREET
MEDWAY, MASSACHUSETTS

PREPARED FOR:
ROBERT & LISA LAPINSKY
62 ALLSTON AVE.
WORCESTER, MASSACHUSETTS

DRAINAGE CALCULATIONS
EXISTING SUBCATCHMENT PLAN
MEDWAY, MASSACHUSETTS

SHEET NO.	SCALE	JOB NO.
E-1	1"=40'	5332





SITE OVERVIEW

SCALE: 1"=200'±

LEGEND

- ## — SUBCATCHMENT #
- TIME OF CONCENTRATION PATH
- SUBCATCHMENT BOUNDARY
- REACH (SWALE) #
- POND #

"TOWN LINE ESTATE"

ASSESSORS REFERENCE
MAP 714, PARCEL 020

ZONING REFERENCE
AR–II

LEGEND

	TEL/ELEC. HAND HOLE		HYDRANT
TP	TEST HOLE		STONE CHECK DAM
THH	TELEPHONE HANDHOLE		STONE WALL
EHH	ELECTRIC HANDHOLE		DRILL HOLE
WSO	WATER SHUTOFF		BOUND
GG	GAS GATE		IRON PIN/PIPE
SWL	SOLID WHITE LINE		

NO.	DATE	REFERENCE
		REVISIONS

DATE: DECEMBER, 2017

Engineer:
L.A.L. Engineering Group
DESIGN ~ PERMITTING ~ PEER REVIEW ~ LAYOUT
730 Main St, Suite 1F
Millis MA 02054
P: (781) 248-1133 F: (508) 376-8440

SITE LOCATION:
22 POPULATIC STREET
MEDWAY, MASSACHUSETTS

PREPARED FOR:
ROBERT & LISA LAPINSKY
62 ALLSTON AVE.
WORCESTER, MASSACHUSETTS

DRAINAGE CALCULATIONS
PROPOSED SUBCATCHMENT PLAN
MEDWAY, MASSACHUSETTS

SHEET NO.	SCALE	JOB NO.
P-1	1"=40'	5332