

STORMWATER MANAGEMENT REPORT

**22 Waverly Street
Worcester, MA**

PREPARED BY:

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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 8²
- 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.



Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature

Signature and Date

Checklist

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

- New development
- Redevelopment
- Mix of New Development and Redevelopment



Checklist for Stormwater Report

Checklist (continued)

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

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

Standard 1: No New Untreated Discharges

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



Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

- Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
- Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.
- Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

- Soil Analysis provided.
- Required Recharge Volume calculation provided.
- Required Recharge volume reduced through use of the LID site Design Credits.
- Sizing the infiltration, BMPs is based on the following method: Check the method used.
 - Static
 - Simple Dynamic
 - Dynamic Field¹
- Runoff from all impervious areas at the site discharging to the infiltration BMP.
- Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:
 - Site is comprised solely of C and D soils and/or bedrock at the land surface
 - M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
 - Solid Waste Landfill pursuant to 310 CMR 19.000
 - Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.
- Calculations showing that the infiltration BMPs will drain in 72 hours are provided.
- Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

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



Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

- The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.
- Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

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

- Good housekeeping practices;
 - Provisions for storing materials and waste products inside or under cover;
 - Vehicle washing controls;
 - Requirements for routine inspections and maintenance of stormwater BMPs;
 - Spill prevention and response plans;
 - Provisions for maintenance of lawns, gardens, and other landscaped areas;
 - Requirements for storage and use of fertilizers, herbicides, and pesticides;
 - Pet waste management provisions;
 - Provisions for operation and management of septic systems;
 - Provisions for solid waste management;
 - Snow disposal and plowing plans relative to Wetland Resource Areas;
 - Winter Road Salt and/or Sand Use and Storage restrictions;
 - Street sweeping schedules;
 - Provisions for prevention of illicit discharges to the stormwater management system;
 - Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
 - Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
 - List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.
- A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.
 - Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:
 - is within the Zone II or Interim Wellhead Protection Area
 - is near or to other critical areas
 - is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
 - involves runoff from land uses with higher potential pollutant loads.
 - The Required Water Quality Volume is reduced through use of the LID site Design Credits.
 - Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.



Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

- The BMP is sized (and calculations provided) based on:
 - The ½" or 1" Water Quality Volume or
 - The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.
- A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

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

- The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.
- The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted **prior to** the discharge of stormwater to the post-construction stormwater BMPs.
- The NPDES Multi-Sector General Permit does **not** cover the land use.
- LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.
- All exposure has been eliminated.
- All exposure has **not** been eliminated and all BMPs selected are on MassDEP LUHPPL list.
- The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

- The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.
- Critical areas and BMPs are identified in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

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

- The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:
 - Limited Project
 - Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
 - Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
 - Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
 - Bike Path and/or Foot Path
 - Redevelopment Project
 - Redevelopment portion of mix of new and redevelopment.
- Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.
- The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

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

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

- Narrative;
 - Construction Period Operation and Maintenance Plan;
 - Names of Persons or Entity Responsible for Plan Compliance;
 - Construction Period Pollution Prevention Measures;
 - Erosion and Sedimentation Control Plan Drawings;
 - Detail drawings and specifications for erosion control BMPs, including sizing calculations;
 - Vegetation Planning;
 - Site Development Plan;
 - Construction Sequencing Plan;
 - Sequencing of Erosion and Sedimentation Controls;
 - Operation and Maintenance of Erosion and Sedimentation Controls;
 - Inspection Schedule;
 - Maintenance Schedule;
 - Inspection and Maintenance Log Form.
- A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

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

- The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has **not** been included in the Stormwater Report but will be submitted **before** land disturbance begins.
- The project is **not** covered by a NPDES Construction General Permit.
- The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.
- The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

- The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
 - Name of the stormwater management system owners;
 - Party responsible for operation and maintenance;
 - Schedule for implementation of routine and non-routine maintenance tasks;
 - Plan showing the location of all stormwater BMPs maintenance access areas;
 - Description and delineation of public safety features;
 - Estimated operation and maintenance budget; and
 - Operation and Maintenance Log Form.
- The responsible party is **not** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:
 - A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
 - A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

- The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;
- An Illicit Discharge Compliance Statement is attached;
- NO Illicit Discharge Compliance Statement is attached but will be submitted **prior to** the discharge of any stormwater to post-construction BMPs.

2- Drainage Report

INTRODUCTION

The purpose of this drainage report is to review the stormwater runoff, focusing on both quality and quantity, in relation to the existing and proposed development conditions. This report will demonstrate, through narrative, calculations, and exhibits, that appropriate best management practices have been employed to mitigate the impacts of the proposed redevelopment. It will show that the proposed site development reduces the rate of runoff at the overall site runoff point during all storm events. Furthermore, the report will illustrate that the proposed stormwater management system complies with the stormwater standards set forth in the Massachusetts Department of Environmental Protection (MA DEP) Stormwater Management Regulations.

The proposed project involves redeveloping an existing lot for condominium development. As part of the redevelopment, the project will include creating two parking lots (upper and lower lot) for a total of a 7,960-square-foot of paved parking area.

NOTE: ALL DESIGN ASSUMPTION FOR THIS REPORT SHALL BE CONFIRMED IN THE FIELD BASED ON ACTUAL SITE SOIL TEST TO CONFIRM HIGHWATER TABLE ELEVATION AND SOIL CLASSIFICATIONS AND INFILTRATION RATE AT THE SITE .

SITE LOCATION AND DESCRIPTION

The property at 22 Waverly Street, Worcester, MA, is an abandoned school building lot with an area of 31,450 square feet.

Based on the soil report obtained from the Natural Resources Conservation Service (NRCS), the majority of the site has been classified as Urban Fill Land. Due to previous development in the area, the soil cannot be accurately classified.

A copy of the NRCS Soil Map is provided in the Appendix of this report.

EXISTING DRAINAGE PATTERNS

To demonstrate compliance with stormwater regulations, the drainage patterns were analyzed at two separate design points: one for the upper parking lots at Harrison Street and another for the proposed lower parking lot.

- *Upper Parking Lot at Harrison Street*
 - Existing Conditions: The upper parking lot consists of an existing 10,455 square feet (sf) paved area, which will remain unchanged.
 - Proposed Parking Addition: A new addition to this parking lot will add 3,300 sf of paved area.
 - Drainage Plan: Runoff from the expanded upper parking lot will be collected through a catch basin and treated with a Downstream Defender system. This system will direct the runoff into an underground infiltration system. An overflow outlet pipe from this system will connect to the lower parking lot's outlet pipe system, eventually discharging into the Waverly Street drainage system.
- *Proposed Lower Parking Lot*
 - The new lower parking lot will have a paved area of 4,660 sf.
 - Drainage Plan: Similar to the upper parking lot, runoff will be collected through a catch basin

and treated with a Downstream Defender system before entering an underground infiltration system. An overflow outlet will also direct excess water into the Waverly Street drainage system.

Both systems are designed to manage stormwater effectively, ensuring that runoff is treated and infiltrated on-site, with overflow safely directed into the existing municipal drainage system. This design approach aims to meet regulatory requirements by managing water quality and reducing runoff rates to mitigate flooding and erosion.

The stormwater runoff model indicates that the proposed development will reduce the rate of runoff for the combination of design point analyzed. This reduction is achieved by incorporating subsurface infiltration systems for the proposed building roof runoff and parking lot drainage. Roof drains from proposed buildings will be connected to an on-site drainage infiltration system. This system will facilitate groundwater recharge and storage, with an overflow connected to the street drainage system

The HydroCAD worksheets and hydrographs are included in the “HydroCAD Worksheets” Section of this report.

METHODOLOGY

The peak rate of runoff was determined using techniques and data found in the following:

1. Urban Hydrology for Small Watersheds – Technical Release 55 by the United States Department of Agriculture Soils Conservation Service, June 1986. Runoff curve numbers and 24-hour precipitation values were obtained from this reference.
2. HydroCAD® Stormwater Modeling System by HydroCAD Software Solutions LLC, version 8.50, 2007. The HydroCAD program was used to generate the runoff hydrographs for the watershed areas, to determine discharge/stage/storage characteristics for the infiltration systems, to perform drainage routing and to combine the results of the runoff hydrographs.
3. Soil Survey of Norfolk County Massachusetts, by United States Department of Agriculture, Natural Resources Conservation Service. Soil types and boundaries were obtained from this reference.

STORMWATER MANAGEMENT STANDARDS

The proposed project is designed to meet or exceed all of the Stormwater Management Standards as determined by MassDEP to the maximum extent practicable. A description of each standard and if it is met is below.

Standard #1 – No New Untreated Discharges or Erosion:

Discharge points will remain unchanged from pre-construction to post-construction. No new untreated discharges are created. All discharges from the proposed building roofs for post-construction will be directed into an onsite drainage collective system with provisions provided for treatment and infiltration. .

Standard #2 – Peak Rate Attenuation:

Calculations have been provided to show that the proposed redevelopment will not cause an increase in peak discharge rates for storm events 2year, 10year and 25year, and it would help reducing it through limited storage provide in the proposed infiltration reservoir. Refer to the HydroCAD calculations provided within this report for detailed breakdowns of each study point.

Pre & Post Construction Runoff

Storm events:	2y @ 3.20"	10y @ 4.9"	25y @ 6.20"	100y @ 8.90"
Existing:	1.84 cfs	3.07 cfs	4.00 cfs	5.92 cfs
Proposed:	1.66cfs	2.57 cfs	3.35cfs	5.29cfs

Standard #3 – Recharge to Groundwater:

The project meets this standard with the “post-development site increasing the annual recharge from the pre-development conditions. All discharges from the proposed impervious surfaces post construction will be directed into an onsite drainage collective system with provisions provided for treatment and infiltration. Proposed drainage system consist of all roof runoff to be directed to an site Cultec recharge bed under the building. Under proposed conditions, recharge is provided for the impervious areas being introduced based on the table below:

Hydrologic Group Volume to Recharge (x Total Impervious Area)	
Hydrologic Group	Volume to Recharge x Total Impervious Area
A	0.60 inches of runoff
B	0.35 inches of runoff
C	0.25 inches of runoff
D	0.10 inches of runoff

Using hydrological group B (note that the majority of existing soil type has been classified as urban fill) The required recharge volume is given by the following equation:

$$R_v = F \times IA \text{ (Equation 1 Stormwater Handbook Volume 3)}$$

- Where R_v = Required Recharge Volume, ft^3
- F = Target Depth factor (Hydrologic Group C)
- IA = Impervious drainage area

For 29,282 square feet of proposed and existing impervious surface (building, Sidewalks & paved parking lot) .

$$\begin{aligned}
 R_v &= F \times IA \\
 &= (0.60 \text{ inches})(12 \text{ inches/foot})(29,282 \text{ square feet}) \\
 &= 1,464 \text{ cubic feet}
 \end{aligned}$$

3,005 X 2 = 6,010 cubic feet of available storage is provided in the underground system.

(See HydroCAD worksheet)

Infiltration system is based on the Static Method of calculation as outlined in the Stormwater Management Handbook).

The system drawdown time is defined as:

$$\text{Time}_{\text{drawdown}} = R_v / (K)(\text{bottom area})$$

where R_v = Required Recharge Volume, ft³
 K = Saturated Hydraulic Conductivity (Rawls table)
 Bottom area = bottom area of recharge structure

with a bottom area of 44x22' (A=1,100 SF x2 =2,200)

and K= 2.41 in

$$\begin{aligned}
 &= 1,464 \text{ ft}^3 / ((2.41 * \text{in/hour})(2200 \text{ s.f.})(1\text{ft}/12 \text{ in})) \\
 &= 3.30 \text{ hours } (<72 \text{ hours drain time} = \text{ok})
 \end{aligned}$$

*2.41 inches per hour is a default for HSG "B", based on soil test report.

A two feet separation is required between the bottom of the infiltration structure and the seasonal high Ground water table. Soil test indicated that there are no indication of seasonal high water at Test Hole -

A capture area adjustment is not required as all stormwater is treated through stormwater controls.

Therefore, this standard has been met.

Standard 4 – Water Quality:

The project is a redevelopment project and there are no catch basins specified in the garage parking lot. All the runoff from the project will be generated from the roof runoff which 100 % will be directed to the underground infiltration units without any requirement for pretreatment. Water Quality Depth of 0.5 inches is utilized for Water quality treatment does not apply.

Long term pollution prevention plan has been included as part of the Operation and Maintenance Plan. Structural stormwater best management practices are sized to capture the required water quality volume.

The project is not located in a critical area and therefore

The Project complies with Standard 4.

Standard 5 – Land Use with Higher Potential Pollutant Loads (LUHPPLs):

The proposed project is not a Land Use with Higher Potential Pollutant Loads and therefore Standard 5 does not apply to this project.

Standard 6 – Critical Areas

The proposed project is not located in an area defined as a Critical Area and therefore Standard 6 does not apply to this project.

Standard 7 – Redevelopments and Other Projects Subject to the Standards only to the Maximum Extent Practicable

Standards are met to the maximum extent practicable as described in this section thereby meeting this Standard.

Standard 8 – Construction Period Pollution Prevention & Erosion & Sediment Control

An Erosion Control plan has been incorporated with the design plans. Also, due to limited area of disturbance the project does not requires a Stormwater Pollution Prevention Plan under the EPA NPDES program.

Standard 9 – Operations and Maintenance Plan

Refer to the Operations and Maintenance Plan included in this report.

Standard 10 – Prohibition of Illicit Discharges

No illicit discharges exist on site. The storm water management system proposed shall not be connected to the wastewater management system and shall not be contaminated by contact with process wastes, raw materials, toxic pollutants, hazardous substances, oil, or grease per Massachusetts DEP Storm Water Standard 10. The Illicit discharge statement is included in the appendix of this report.

3- Operation & Maintenance Plan

OPERATION AND MAINTENANCE PLAN

In accordance with the standards set forth by the Stormwater Management Regulations issued by the Department of Environmental Protection (DEP), this report has prepared the following Operation and Maintenance (O&M) plan for the proposed stormwater management system at 15 Gardner Street site. This O&M plan addressed post construction pollution prevention and maintenance of stormwater systems.

This plan is broken into two major sections. The first section describes pollution prevention techniques to encourage source controls that prevent pollution. The second section is devoted to a post-development operation and maintenance plan of the stormwater management system. An operation and maintenance schedule has been included at the end of the report.

Basic Information

Owner: TBD
Address: 22 Waverly Street
City: Worcester, MA

Section 1 Pollution Prevention

As a food recycling facility, the largest potential sources of pollution includes food packaging and normal maintenance truck fluids in this facility. It is anticipated that all of these materials will be stored and maintained inside specialized containers that are only access by trained personnel. However the following pollution prevention techniques are provided in the event that there is a spill outside the facility that may enter the stormwater management system.

Good House Keeping

The following measures will be employed to control potential sources of contamination and prevent pollution at The Project property:

Deicing

To prevent increased pollutant concentrations in stormwater discharges, the amount of road salt applied will be controlled. Calibration devices for spreaders in trucks will be encouraged to contractors employed to plow the parking area. The amount of deicing materials used will be monitored with the goal of using only enough to make the roadway and parking areas safe.

Snow Storage/Disposal

Snow storage/disposal will be allowed in unused areas of the property away from storm drainage systems and wetland resource areas.

Pavement Sweeping

N/A.

Fertilizer/Pesticide/Herbicide Application

Applications of treatment materials will be used throughout the site. Their application adjacent to the stormwater systems will be limited. Slow release fertilizer will be used and applied in the minimum amounts recommended by the manufacturer. Once applied, the fertilizer will be worked into the soil to limit exposure to stormwater. Storage will be in a closed structure; and the contents of any partially used bags will be transferred to a sealable, plastic bin to avoid spills.

Materials Management/Housekeeping Practices

The following product-specific practices will be followed on-site. Recommendations are provided for petroleum products, fertilizers, solvents, paints, and other hazardous substances, and concrete.

Petroleum Products – Routine maintenance of course equipment is anticipated. No chemicals, fluids or fuels from vehicles will be drained into the stormwater system. All fluids will be collected in appropriate containers and disposed of according to State regulations. Storage of diesel and unleaded fuel will be regulated by the State Fire Marshall and will be in an approved container. No petroleum-based or asphalt substances will be stored within 100 feet of a waterway.

Solvents, Paints, and other Hazardous Substances - All containers will be tightly sealed and stored indoors when not required for use. Excess materials will not be discharged to the storm sewer system, but will be properly disposed according to manufacturer's instructions or state and local regulations. Outside storage on the property will be prohibited.

Spill Prevention and Control

The Property Manager/Groundskeeper will be responsible for training of people in the proper handling and cleanup of spilled materials. No spilled hazardous materials or hazardous wastes will be allowed to come in contact with storm water discharges. If such contact occurs, the storm water discharge will be contained on site until appropriate measures in compliance with State and Federal regulations are taken to dispose of such contaminated storm water.

In order to minimize the potential for a spill of hazardous materials to come into contact with storm water, the following steps will be implemented:

1. All materials with hazardous properties (such as pesticides, petroleum products, fertilizers, detergents, construction chemicals, acids, paints, paint solvents, cleaning solvents, additives for soil stabilization, concrete curing compounds and additives, etc.) will be stored in a secure location, with their lids on, preferably under cover, when not in use.
2. The minimum practical quantity of all such materials will be kept on the site.
3. A spill control and containment kit (containing, for example, absorbent materials, acid neutralizing powder, brooms, dust pans, mops, rags, gloves, goggles, plastic and metal trash containers, etc.) will be provided at the maintenance area of the site.
4. Manufacturers recommended methods for spill cleanup will be clearly posted and site personnel will be trained regarding these procedures and the location of the information and cleanup supplies.

In the event of a spill, the following procedures should be followed:

1. All spills will be cleaned up immediately after discovery.

2. The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with the hazardous substances.
3. The Owner and Property Manager will be notified immediately.
4. Spills of toxic or hazardous materials will be reported to the appropriate federal, state, and/or local government agency, regardless of the size of the spill.
5. If the spilt material enters the drainage system, the catch basin or other structure acting as the inlet shall be cleaned via a vac truck as soon as possible and before the next rainfall event to the extent practicable.

The Property Manager will be the spill prevention and response coordinator. He will designate the individuals who will receive spill prevention and response training. These individuals will each become responsible for a particular phase of prevention and response. The names of these personnel will be posted in the material storage area and other applicable areas onsite.

Section 2 Stormwater Management System – Operation and Maintenance

1. Paved Areas – N/A
2. Salt for de-icing during the winter months shall be limited to the minimum amount practicable. Sand containing the minimum amount of calcium chloride (or approved equivalent) needed for handling may be applied as part of the routine winter maintenance activities.
3. The Infiltration System: Inspect and maintain twice a year and after every rain event. Removal of all debris from the area and avoid storage of any material on or around the infiltration system.
4. All sediments removed from the infiltration systems shall be disposed of properly, and in accordance with applicable local and state regulations.
5. All vegetated areas on the site shall be stabilized and maintained to control erosion. Any disturbed areas shall be re-seeded as soon as practicable. Trash and debris should be removed on a regular basis.
6. Work within any drainage structures shall be performed in accordance with the latest OSHA regulations, and only by individuals with appropriate OSHA certification.

Maintenance Responsibilities - All post-construction maintenance activities shall be documented and kept on file for up to 3 years. Copies of said document shall be submitted to the Zoning Board of Appeals and the Town Engineer.

4- Exhibits

Table B-1. Requirements for Determining Field Infiltration Rates

Infiltration Design Method	NRCS Hydrologic Soil Groups			
	A	B	C	D
Static Method	Soil Textural Analysis	Soil Textural Analysis	Saturated Hydraulic Conductivity Testing	Infiltration Not Allowed
Simple Dynamic Method	Soil Textural Analysis	Soil Textural Analysis	Saturated Hydraulic Conductivity Testing	Infiltration Not Allowed
Dynamic Field Method	Saturated Hydraulic Conductivity Testing	Saturated Hydraulic Conductivity Testing	Saturated Hydraulic Conductivity Testing	Infiltration Not Allowed

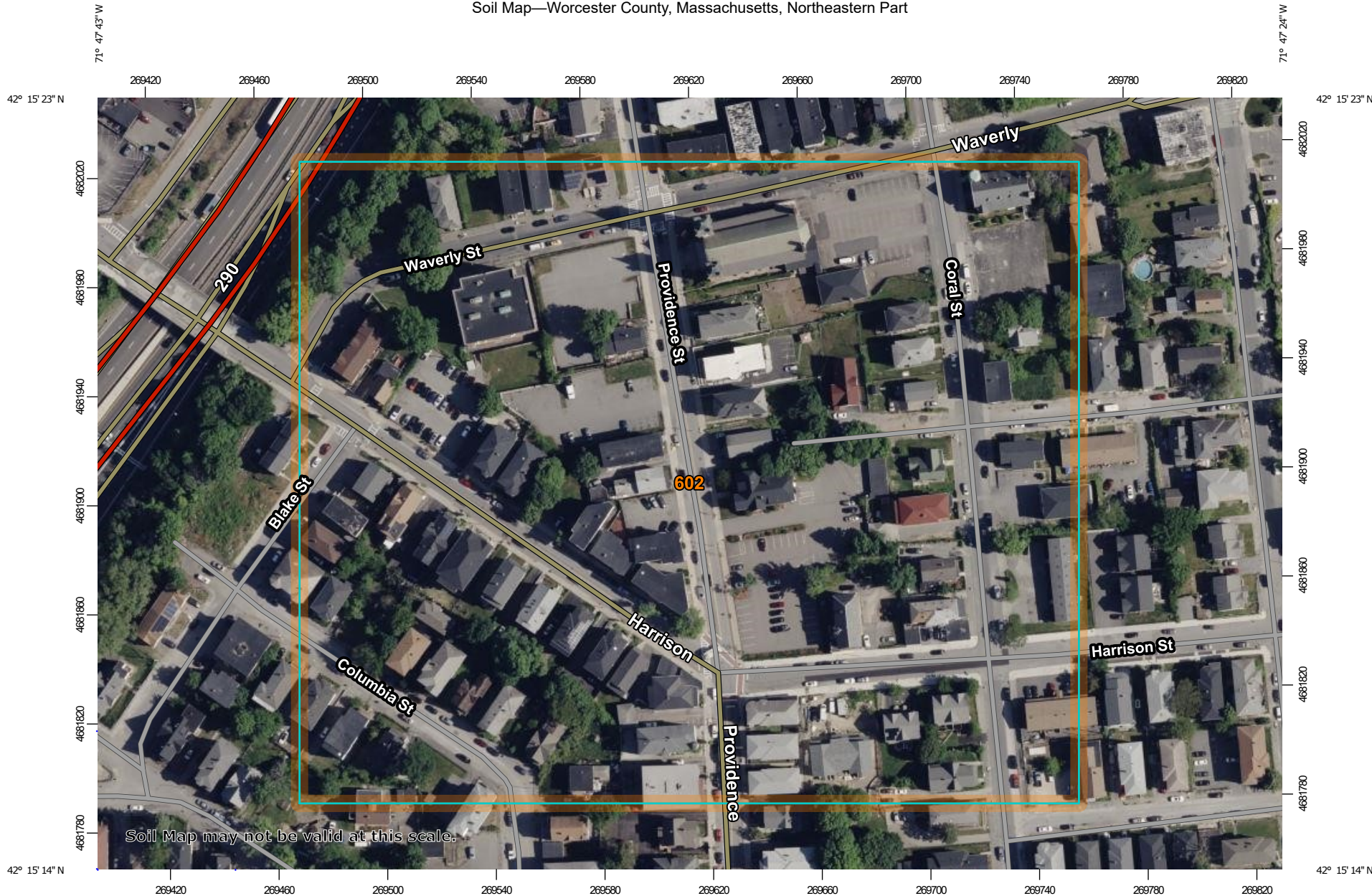
Table B-2. Default (Rawls) Infiltration Rates

Texture Class	NRCS Hydrologic Soil Group (HSG)	Infiltration Rate Inches/Hour
Sand	A	8.27
Loamy Sand	A	2.41
Sandy Loam	B	1.02
Loam	B	0.52
Silt Loam	C	0.27
Sandy Clay Loam	C	0.17
Clay Loam	D	0.09
Silty Clay Loam	D	0.06
Sandy Clay	D	0.05
Silty Clay	D	0.04
Clay	D	0.02

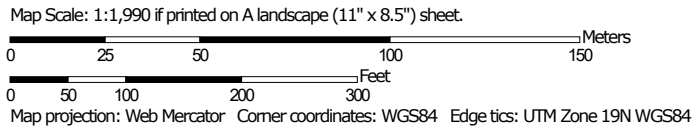
Source: Rawls, Brakensiek and Saxton, 1982.

- The slowest of the Hydrologic Soil Groups determined to exist at the point where infiltration is proposed shall be used.
 - *Example:* Two samples are taken at a proposed infiltration bioretention system in the actual soil layer where recharge is proposed. One sample indicates sandy soils. The second sample indicates a sandy loam soil. The default infiltration rate used for the design analysis must use the sandy loam rate and not the sandy soil rate. Soils must not be composited for purposes of the soil textural analysis.
- When the “Dynamic Field” method is used to size the infiltration system (regardless of Hydrologic Soil Group) or infiltration is proposed within Hydrologic Soil Group C soils

Soil Map—Worcester County, Massachusetts, Northeastern Part



Soil Map may not be valid at this scale.



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

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

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

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

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

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

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

Soil Survey Area: Worcester County, Massachusetts, Northeastern Part
 Survey Area Data: Version 18, Sep 10, 2023

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

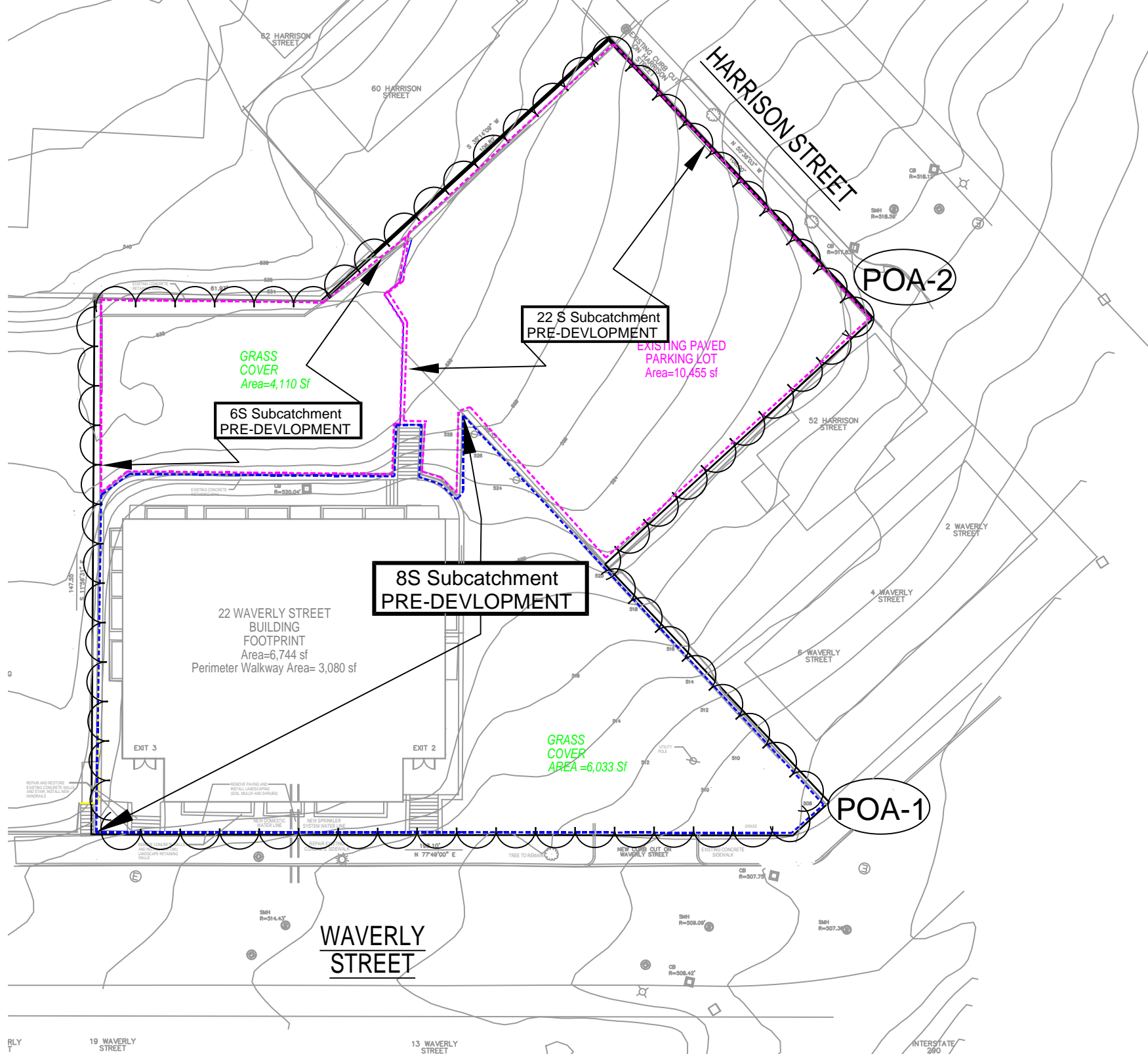
Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
602	Urban land	16.8	100.0%
Totals for Area of Interest		16.8	100.0%

5- HydroCad Worksheet



6S Subcatchment
PRE-DEVELOPMENT

22 S Subcatchment
PRE-DEVELOPMENT

8S Subcatchment
PRE-DEVELOPMENT

22 WAVERLY STREET
BUILDING
FOOTPRINT
Area=6,744 sf
Perimeter Walkway Area= 3,080 sf

GRASS
COVER
Area=4,110 Sf

EXISTING PAVED
PARKING LOT
Area=10,455 sf

GRASS
COVER
AREA =6,033 Sf

POA-2

POA-1

WAVERLY
STREET



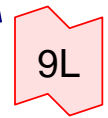
22 Waverly Street- Pre
Development-Upper



22 Waverly Street- Pre
Development-Upper



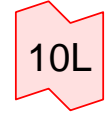
22 Waverly Street- Pre
Development-Lower



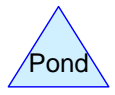
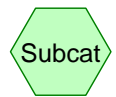
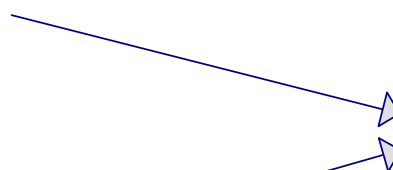
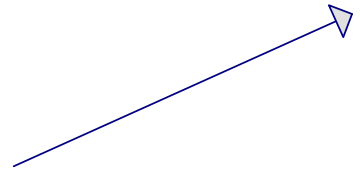
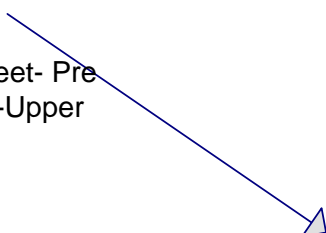
POA-2



POA-1



POA-1 & POA-2



Drainage Diagram for Worc-22 Waverly - Pre Development Rev-8-25-24
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Worc-22 Waverly - Pre Development Rev-8-25-24

Prepared by {enter your company name here}

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Page 2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.138	75	Grass Cover (8S)
0.094	86	<50% Grass cover, Poor, HSG C (6S)
0.156	98	Existing Building (8S)
0.240	98	Existing Paved parking (11S)
0.071	98	Walkways& Stairs (8S)
0.699		TOTAL AREA

Worc-22 Waverly - Pre Development Rev-8-25-24

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Page 3

Soil Listing (all nodes)

Area (acres)	Soil Goup	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.094	HSG C	6S
0.000	HSG D	
0.605	Other	8S, 11S
0.699		TOTAL AREA

Worc-22 Waverly - Pre Development Rev-8-25 Type III 24-hr 2-YEAR EVENT Rainfall=3.20"

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Page 4

Time span=0.00-33.00 hrs, dt=0.05 hrs, 661 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 6S: 22 Waverly Street- Pre Runoff Area=4,110 sf 0.00% Impervious Runoff Depth=1.84"
Tc=5.0 min CN=86 Runoff=0.20 cfs 0.014 af

Subcatchment 8S: 22 Waverly Street- Pre Runoff Area=15,887 sf 62.03% Impervious Runoff Depth=2.08"
Tc=5.0 min CN=89 Runoff=0.89 cfs 0.063 af

Subcatchment 11S: 22 Waverly Street- Runoff Area=10,455 sf 100.00% Impervious Runoff Depth=2.97"
Tc=5.0 min CN=98 Runoff=0.75 cfs 0.059 af

Link 7L: POA-1 Manual Hydrograph Inflow=0.89 cfs 0.063 af
Primary=0.89 cfs 0.063 af

Link 9L: POA-2 Inflow=0.95 cfs 0.074 af
Primary=0.95 cfs 0.074 af

Link 10L: POA-1 & POA-2 Inflow=1.84 cfs 0.137 af
Primary=1.84 cfs 0.137 af

Total Runoff Area = 0.699 ac Runoff Volume = 0.137 af Average Runoff Depth = 2.35"
33.31% Pervious = 0.233 ac 66.69% Impervious = 0.466 ac

Summary for Subcatchment 6S: 22 Waverly Street- Pre Development-Upper

Runoff = 0.20 cfs @ 12.08 hrs, Volume= 0.014 af, Depth= 1.84"

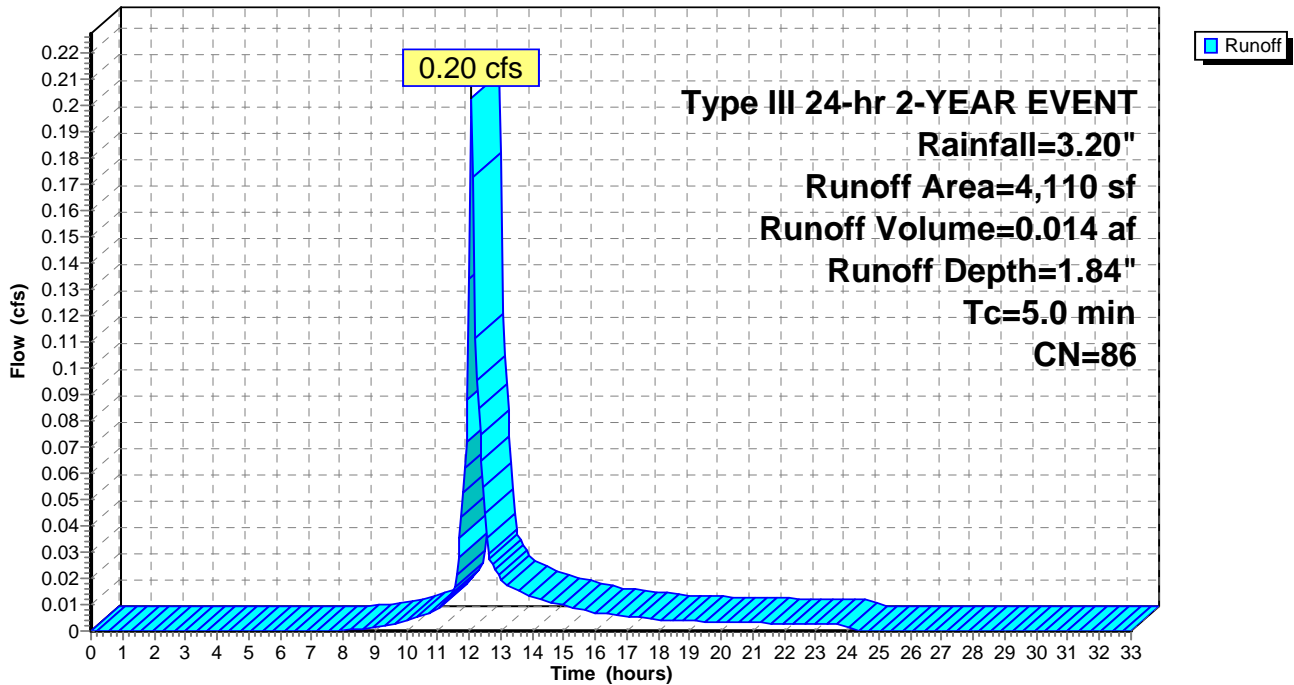
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-YEAR EVENT Rainfall=3.20"

Area (sf)	CN	Description
4,110	86	<50% Grass cover, Poor, HSG C
4,110		Pervious Area

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

Subcatchment 6S: 22 Waverly Street- Pre Development-Upper

Hydrograph



Summary for Subcatchment 8S: 22 Waverly Street- Pre Development-Lower

Runoff = 0.89 cfs @ 12.07 hrs, Volume= 0.063 af, Depth= 2.08"

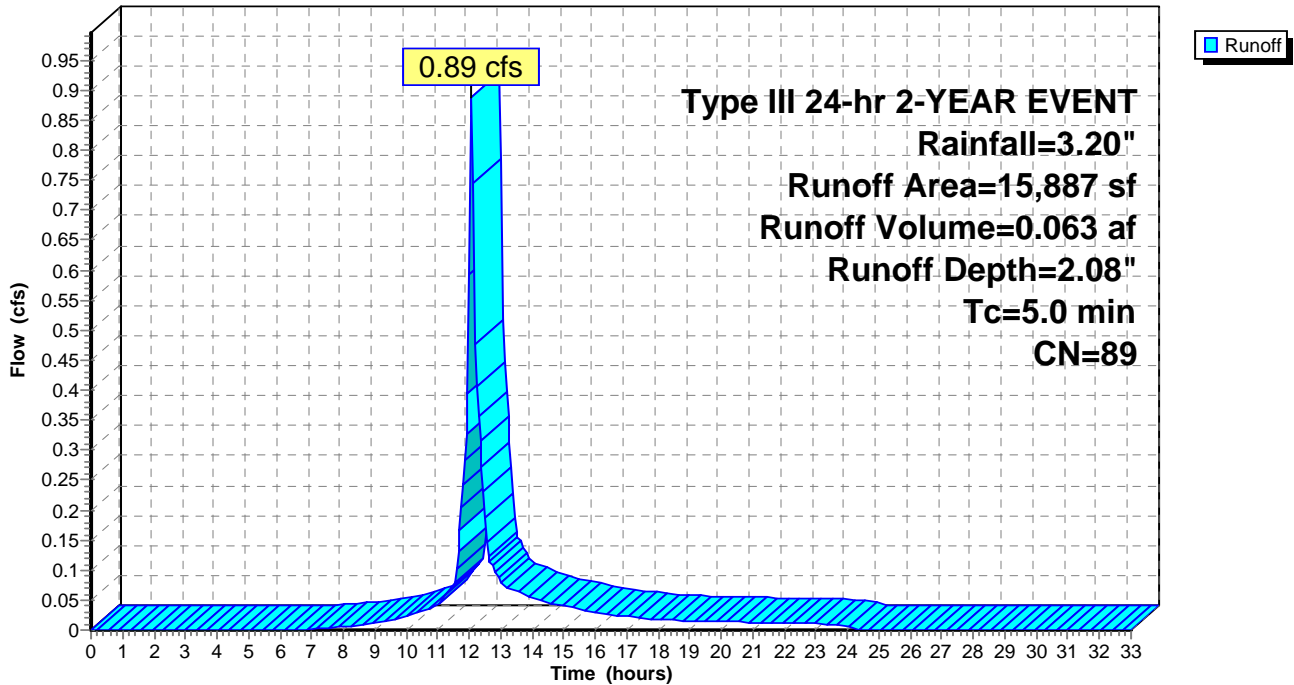
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-YEAR EVENT Rainfall=3.20"

	Area (sf)	CN	Description
*	6,774	98	Existing Building
*	3,080	98	Walkways& Stairs
*	6,033	75	Grass Cover
	15,887	89	Weighted Average
	6,033		Pervious Area
	9,854		Impervious Area

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

Subcatchment 8S: 22 Waverly Street- Pre Development-Lower

Hydrograph



Summary for Subcatchment 11S: 22 Waverly Street- Pre Development-Upper

Runoff = 0.75 cfs @ 12.07 hrs, Volume= 0.059 af, Depth= 2.97"

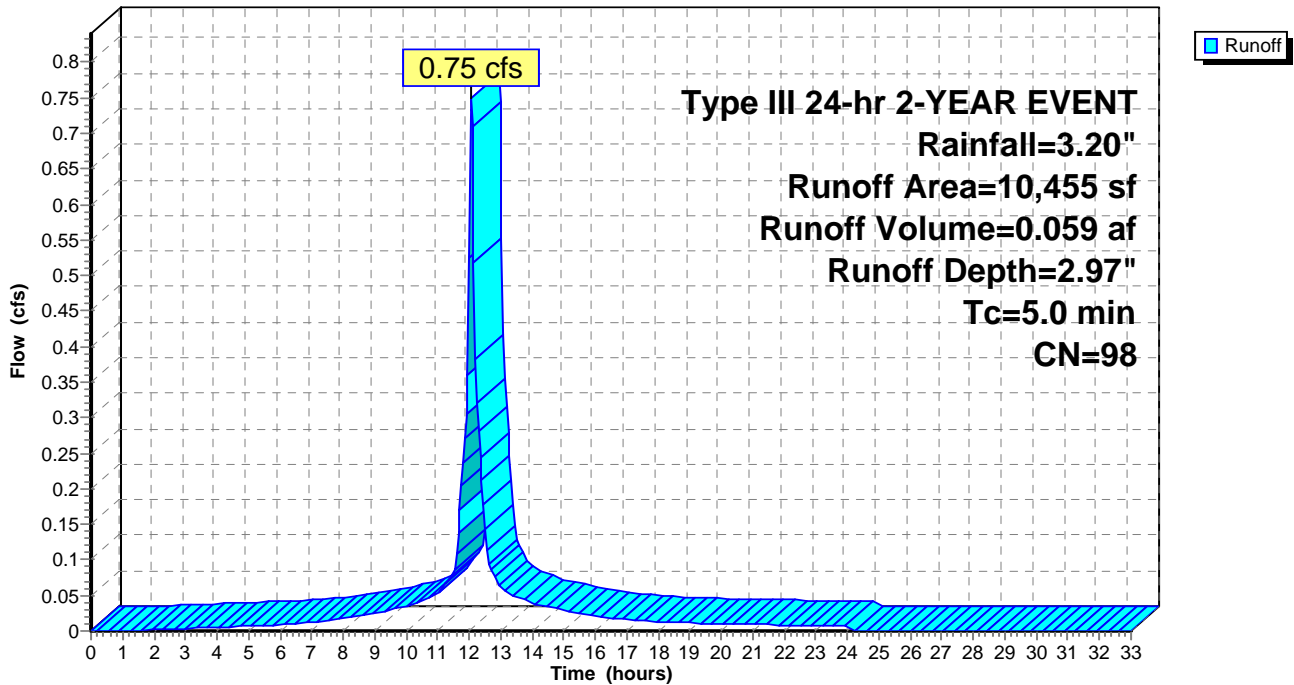
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-YEAR EVENT Rainfall=3.20"

Area (sf)	CN	Description
* 10,455	98	Existing Paved parking
10,455		Impervious Area

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

Subcatchment 11S: 22 Waverly Street- Pre Development-Upper

Hydrograph

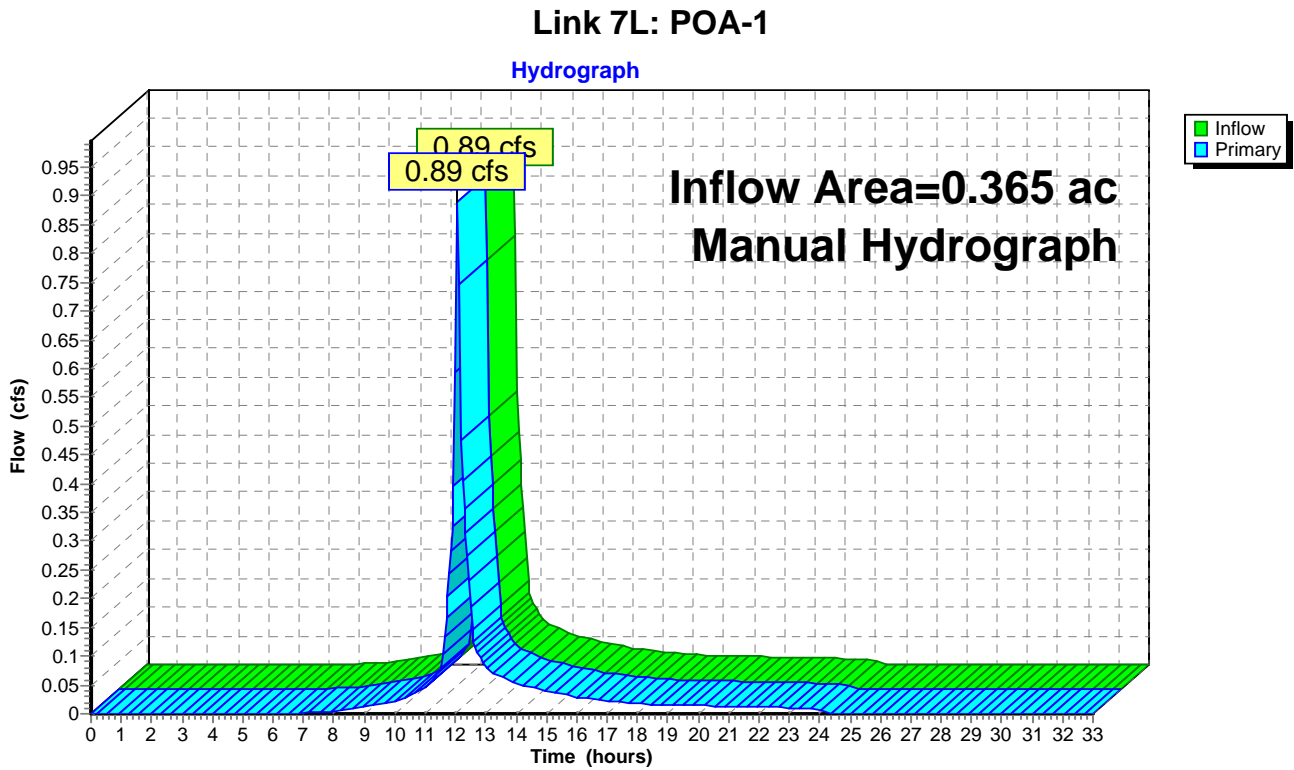


Summary for Link 7L: POA-1

Inflow Area = 0.365 ac, 62.03% Impervious, Inflow Depth = 2.08" for 2-YEAR EVENT event
Inflow = 0.89 cfs @ 12.07 hrs, Volume= 0.063 af
Primary = 0.89 cfs @ 12.07 hrs, Volume= 0.063 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs

Constant Inflow= 0.00 cfs

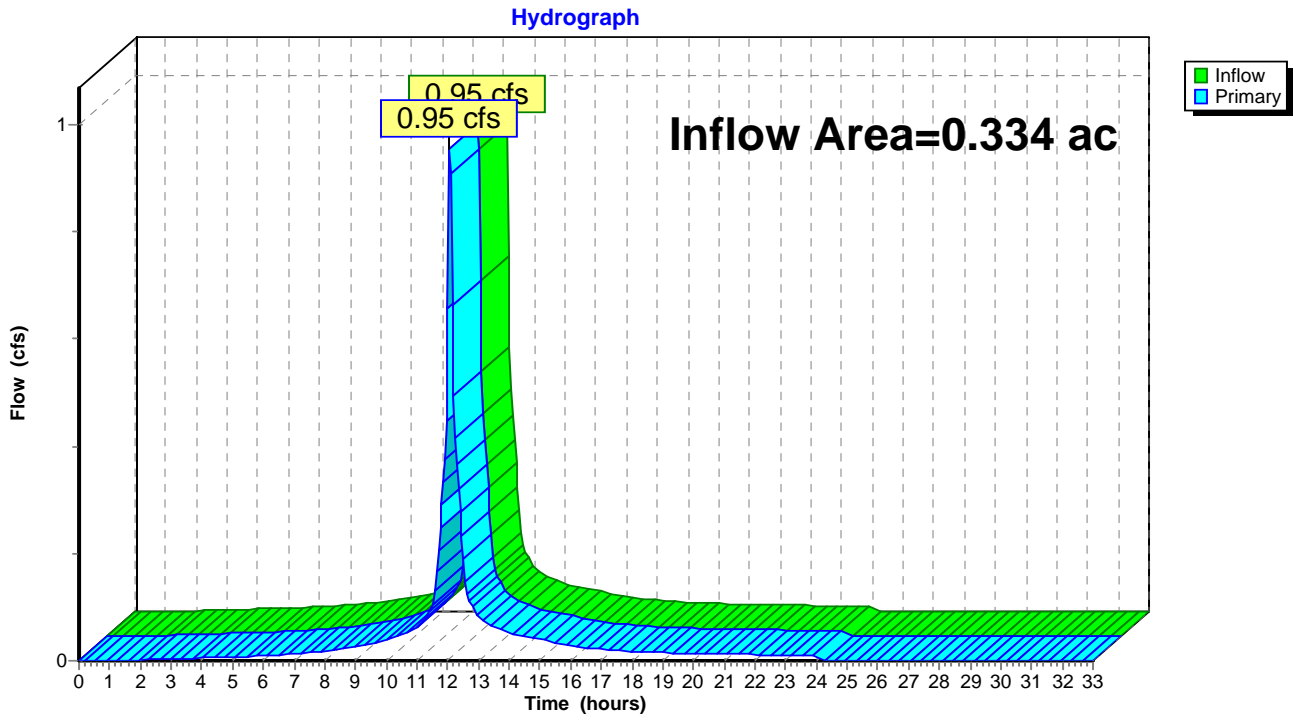


Summary for Link 9L: POA-2

Inflow Area = 0.334 ac, 71.78% Impervious, Inflow Depth = 2.65" for 2-YEAR EVENT event
Inflow = 0.95 cfs @ 12.07 hrs, Volume= 0.074 af
Primary = 0.95 cfs @ 12.07 hrs, Volume= 0.074 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs

Link 9L: POA-2

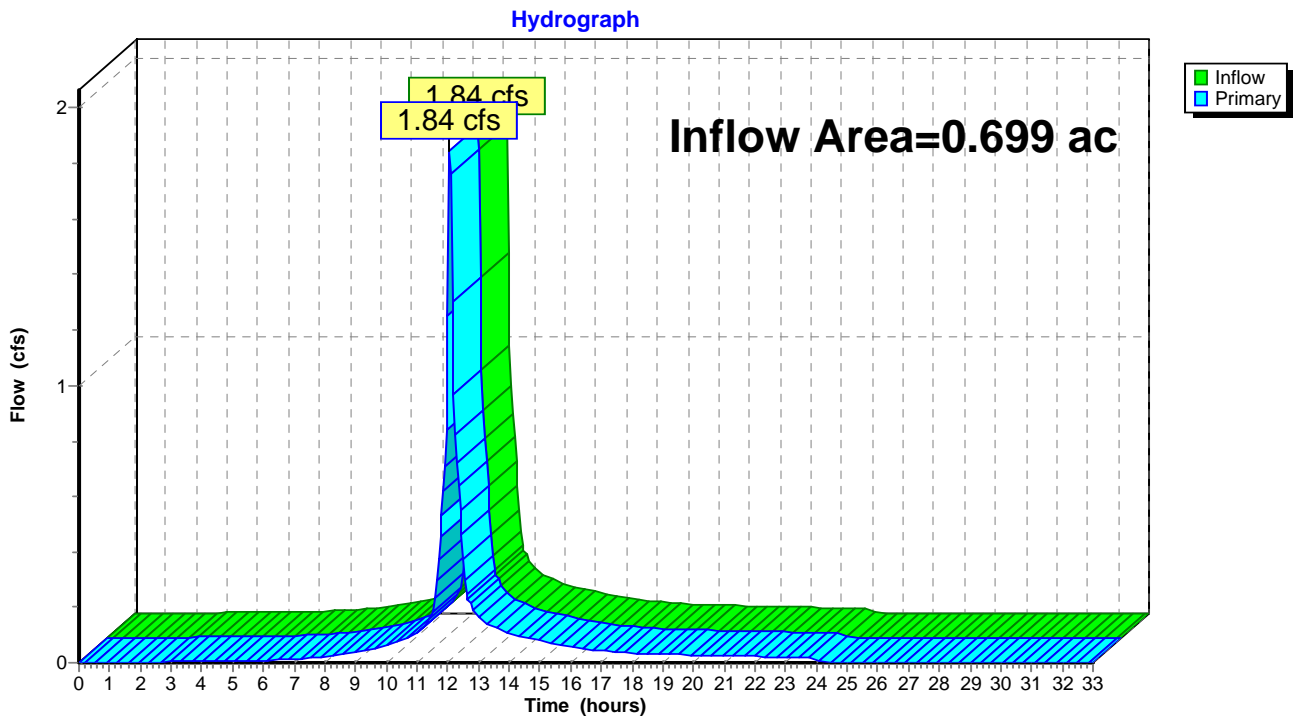


Summary for Link 10L: POA-1 & POA-2

Inflow Area = 0.699 ac, 66.69% Impervious, Inflow Depth = 2.35" for 2-YEAR EVENT event
Inflow = 1.84 cfs @ 12.07 hrs, Volume= 0.137 af
Primary = 1.84 cfs @ 12.07 hrs, Volume= 0.137 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs

Link 10L: POA-1 & POA-2



Worc-22 Waverly - Pre Development Rev-8-2 Type III 24-hr 10-YEAR EVENT Rainfall=4.90"

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Time span=0.00-33.00 hrs, dt=0.05 hrs, 661 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 6S: 22 Waverly Street- Pre Runoff Area=4,110 sf 0.00% Impervious Runoff Depth=3.37"
Tc=5.0 min CN=86 Runoff=0.37 cfs 0.027 af

Subcatchment 8S: 22 Waverly Street- Pre Runoff Area=15,887 sf 62.03% Impervious Runoff Depth=3.68"
Tc=5.0 min CN=89 Runoff=1.54 cfs 0.112 af

Subcatchment 11S: 22 Waverly Street- Runoff Area=10,455 sf 100.00% Impervious Runoff Depth=4.66"
Tc=5.0 min CN=98 Runoff=1.16 cfs 0.093 af

Link 7L: POA-1 Manual Hydrograph Inflow=1.54 cfs 0.112 af
Primary=1.54 cfs 0.112 af

Link 9L: POA-2 Inflow=1.53 cfs 0.120 af
Primary=1.53 cfs 0.120 af

Link 10L: POA-1 & POA-2 Inflow=3.07 cfs 0.232 af
Primary=3.07 cfs 0.232 af

Total Runoff Area = 0.699 ac Runoff Volume = 0.232 af Average Runoff Depth = 3.97"
33.31% Pervious = 0.233 ac 66.69% Impervious = 0.466 ac

Summary for Subcatchment 6S: 22 Waverly Street- Pre Development-Upper

Runoff = 0.37 cfs @ 12.07 hrs, Volume= 0.027 af, Depth= 3.37"

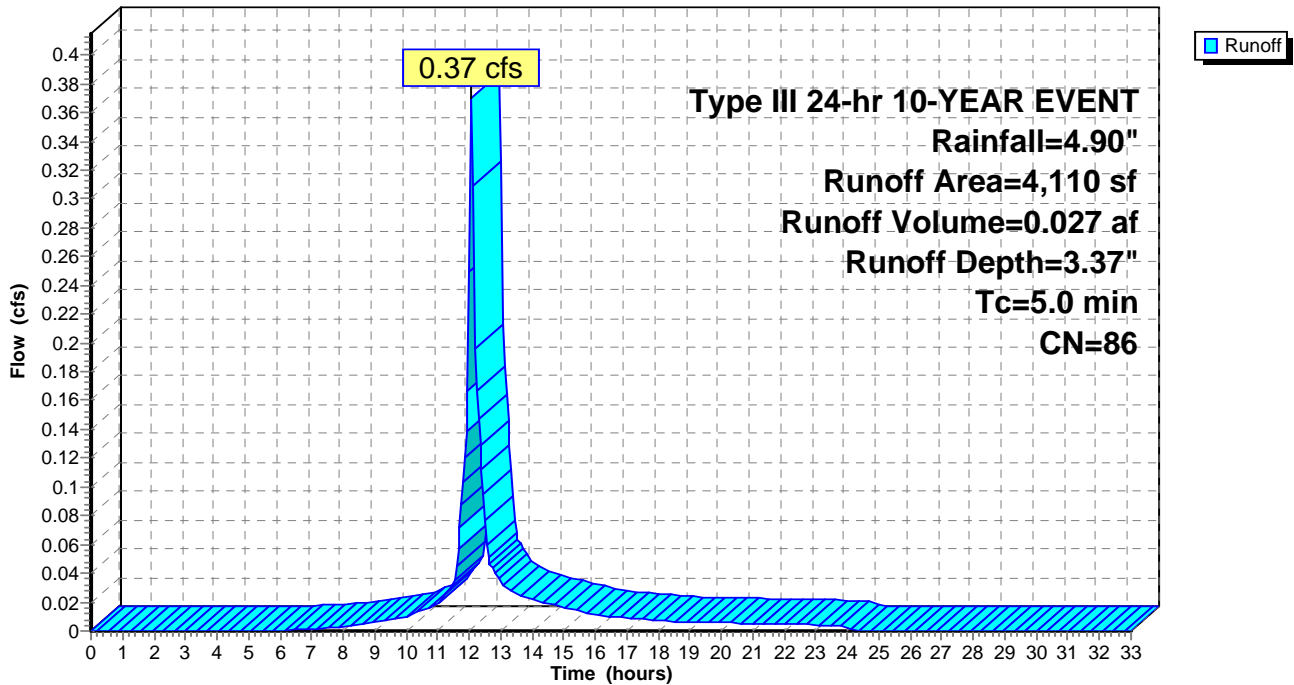
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10-YEAR EVENT Rainfall=4.90"

Area (sf)	CN	Description
4,110	86	<50% Grass cover, Poor, HSG C
4,110		Pervious Area

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

Subcatchment 6S: 22 Waverly Street- Pre Development-Upper

Hydrograph



Summary for Subcatchment 8S: 22 Waverly Street- Pre Development-Lower

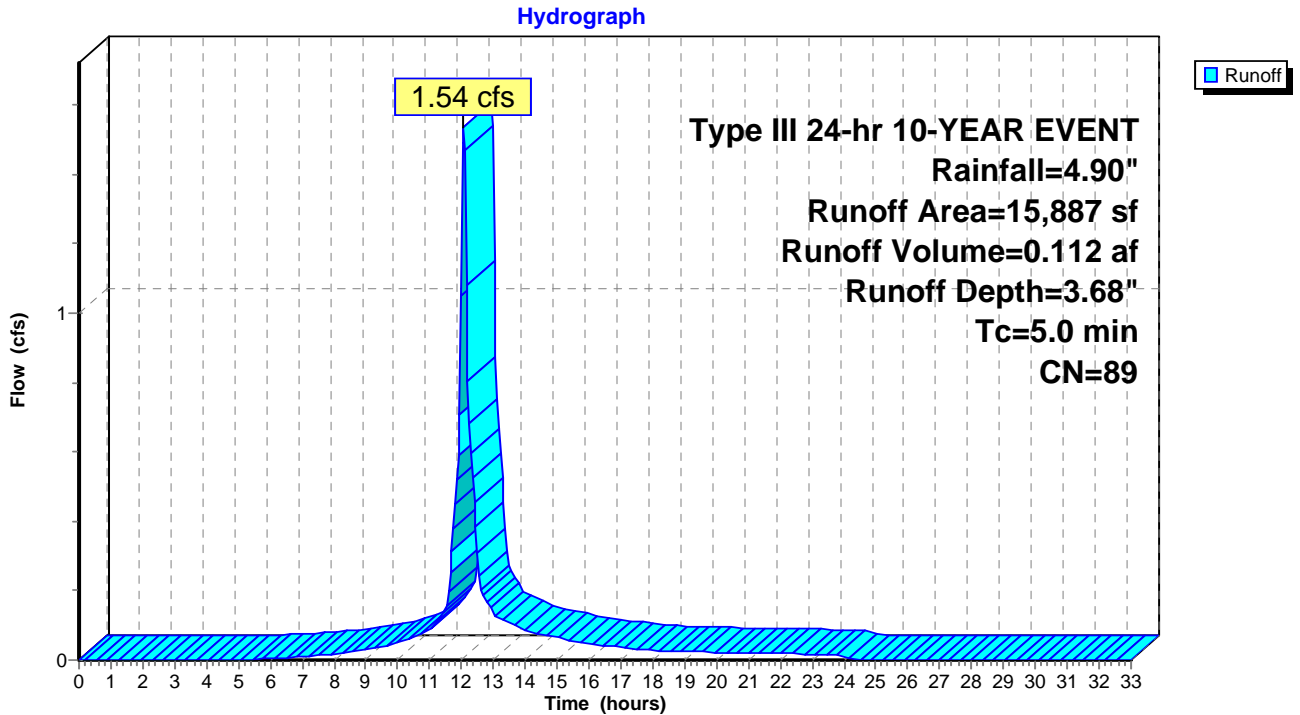
Runoff = 1.54 cfs @ 12.07 hrs, Volume= 0.112 af, Depth= 3.68"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10-YEAR EVENT Rainfall=4.90"

	Area (sf)	CN	Description
*	6,774	98	Existing Building
*	3,080	98	Walkways& Stairs
*	6,033	75	Grass Cover
	15,887	89	Weighted Average
	6,033		Pervious Area
	9,854		Impervious Area

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

Subcatchment 8S: 22 Waverly Street- Pre Development-Lower



Summary for Subcatchment 11S: 22 Waverly Street- Pre Development-Upper

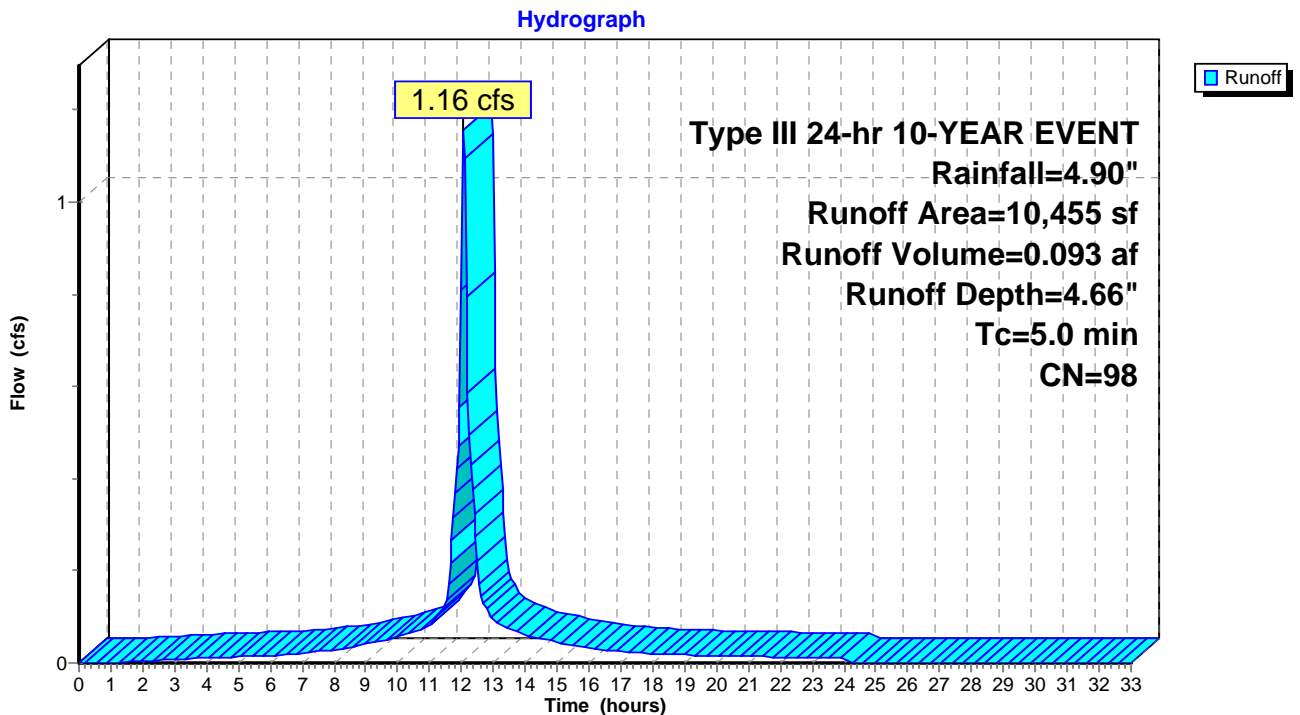
Runoff = 1.16 cfs @ 12.07 hrs, Volume= 0.093 af, Depth= 4.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10-YEAR EVENT Rainfall=4.90"

Area (sf)	CN	Description
* 10,455	98	Existing Paved parking
10,455		Impervious Area

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

Subcatchment 11S: 22 Waverly Street- Pre Development-Upper

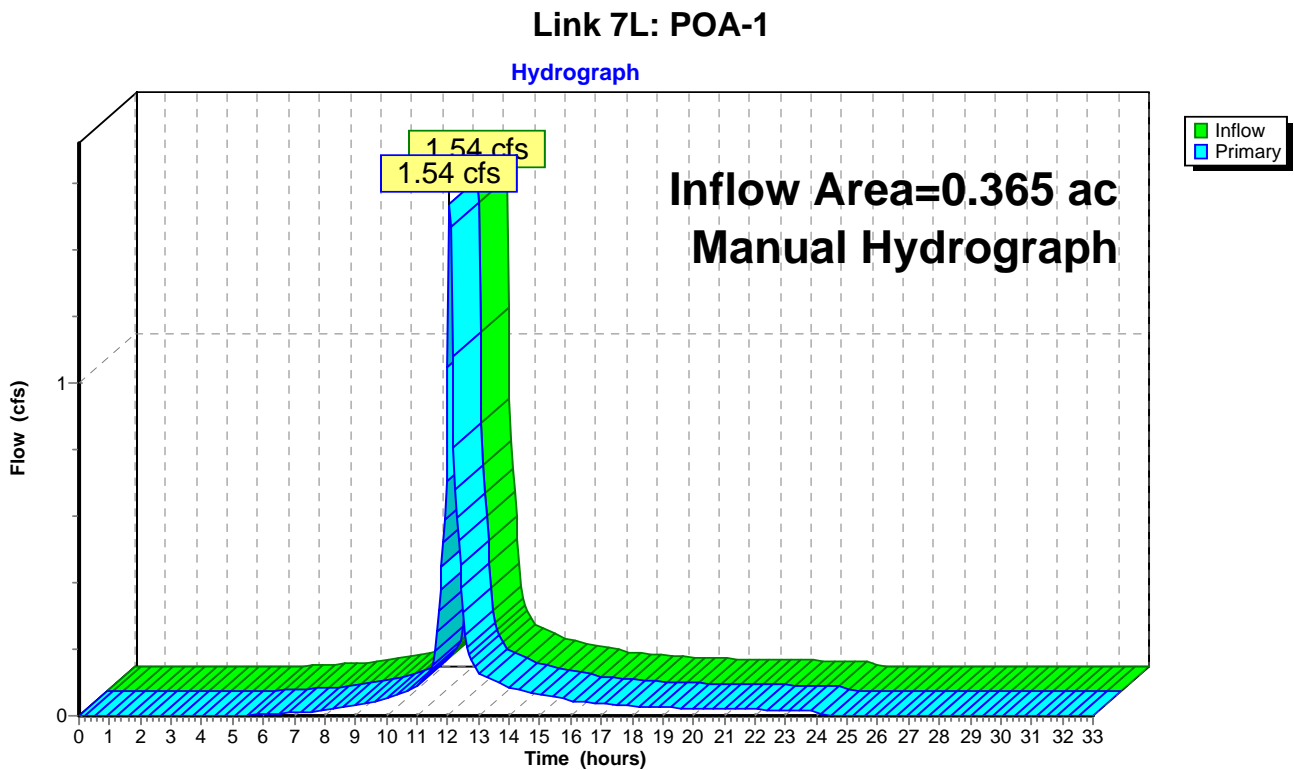


Summary for Link 7L: POA-1

Inflow Area = 0.365 ac, 62.03% Impervious, Inflow Depth = 3.68" for 10-YEAR EVENT event
Inflow = 1.54 cfs @ 12.07 hrs, Volume= 0.112 af
Primary = 1.54 cfs @ 12.07 hrs, Volume= 0.112 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs

Constant Inflow= 0.00 cfs

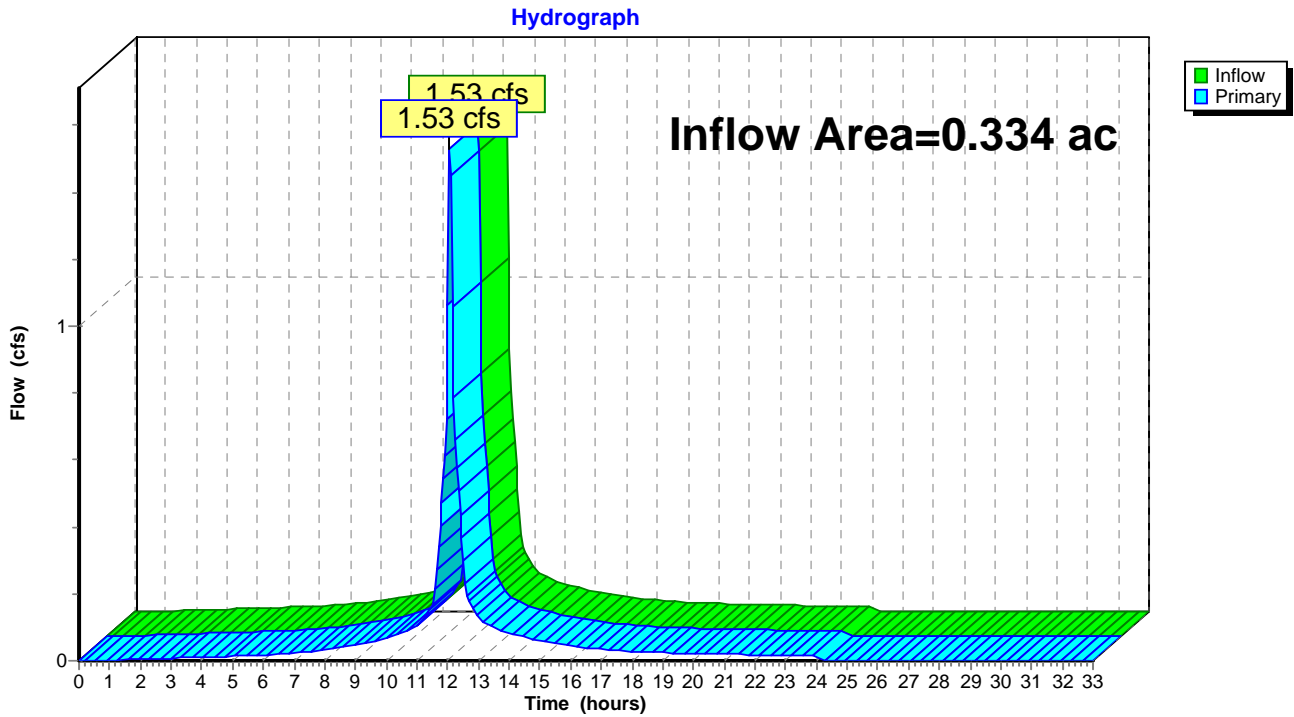


Summary for Link 9L: POA-2

Inflow Area = 0.334 ac, 71.78% Impervious, Inflow Depth = 4.30" for 10-YEAR EVENT event
Inflow = 1.53 cfs @ 12.07 hrs, Volume= 0.120 af
Primary = 1.53 cfs @ 12.07 hrs, Volume= 0.120 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs

Link 9L: POA-2

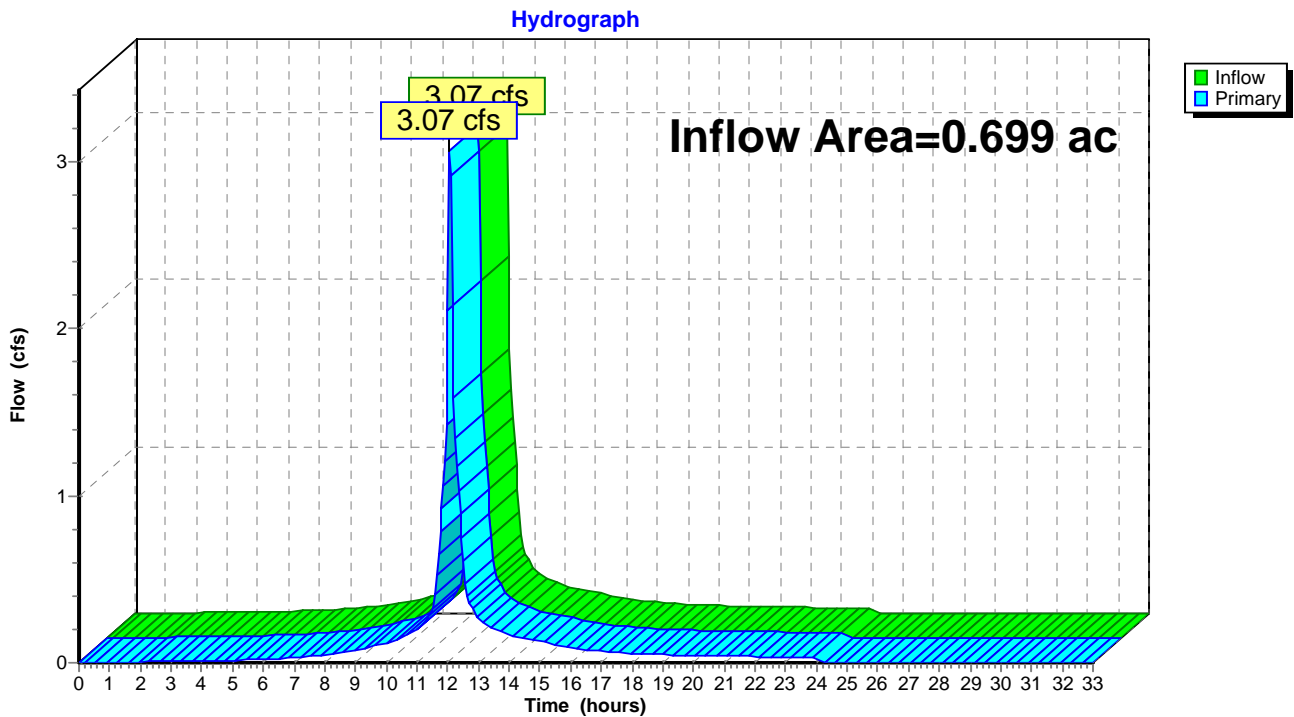


Summary for Link 10L: POA-1 & POA-2

Inflow Area = 0.699 ac, 66.69% Impervious, Inflow Depth = 3.97" for 10-YEAR EVENT event
Inflow = 3.07 cfs @ 12.07 hrs, Volume= 0.232 af
Primary = 3.07 cfs @ 12.07 hrs, Volume= 0.232 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs

Link 10L: POA-1 & POA-2



Worc-22 Waverly - Pre Development Rev-8-2 Type III 24-hr 25-YEAR EVENT Rainfall=6.20"

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Time span=0.00-33.00 hrs, dt=0.05 hrs, 661 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 6S: 22 Waverly Street- Pre Runoff Area=4,110 sf 0.00% Impervious Runoff Depth=4.60"
Tc=5.0 min CN=86 Runoff=0.50 cfs 0.036 af

Subcatchment 8S: 22 Waverly Street- Pre Runoff Area=15,887 sf 62.03% Impervious Runoff Depth=4.93"
Tc=5.0 min CN=89 Runoff=2.03 cfs 0.150 af

Subcatchment 11S: 22 Waverly Street- Runoff Area=10,455 sf 100.00% Impervious Runoff Depth=5.96"
Tc=5.0 min CN=98 Runoff=1.47 cfs 0.119 af

Link 7L: POA-1 Manual Hydrograph Inflow=2.03 cfs 0.150 af
Primary=2.03 cfs 0.150 af

Link 9L: POA-2 Inflow=1.97 cfs 0.155 af
Primary=1.97 cfs 0.155 af

Link 10L: POA-1 & POA-2 Inflow=4.00 cfs 0.305 af
Primary=4.00 cfs 0.305 af

Total Runoff Area = 0.699 ac Runoff Volume = 0.305 af Average Runoff Depth = 5.24"
33.31% Pervious = 0.233 ac 66.69% Impervious = 0.466 ac

Summary for Subcatchment 6S: 22 Waverly Street- Pre Development-Upper

Runoff = 0.50 cfs @ 12.07 hrs, Volume= 0.036 af, Depth= 4.60"

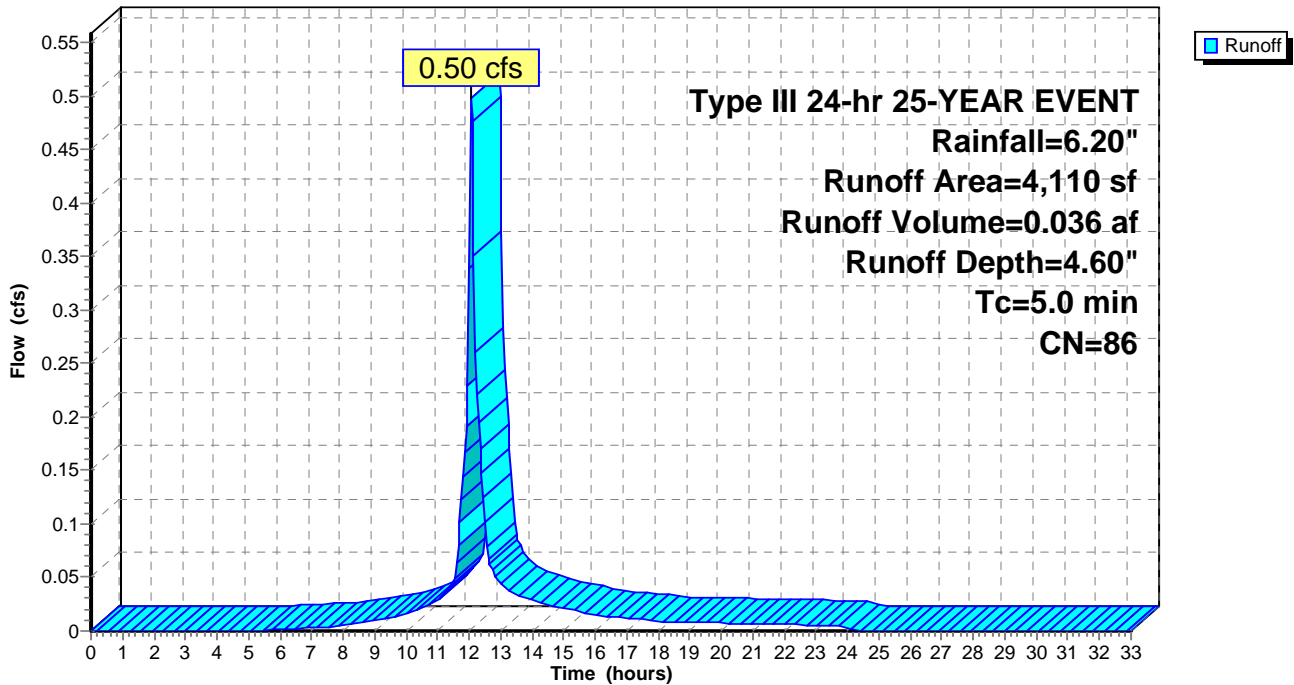
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25-YEAR EVENT Rainfall=6.20"

Area (sf)	CN	Description
4,110	86	<50% Grass cover, Poor, HSG C
4,110		Pervious Area

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

Subcatchment 6S: 22 Waverly Street- Pre Development-Upper

Hydrograph



Summary for Subcatchment 8S: 22 Waverly Street- Pre Development-Lower

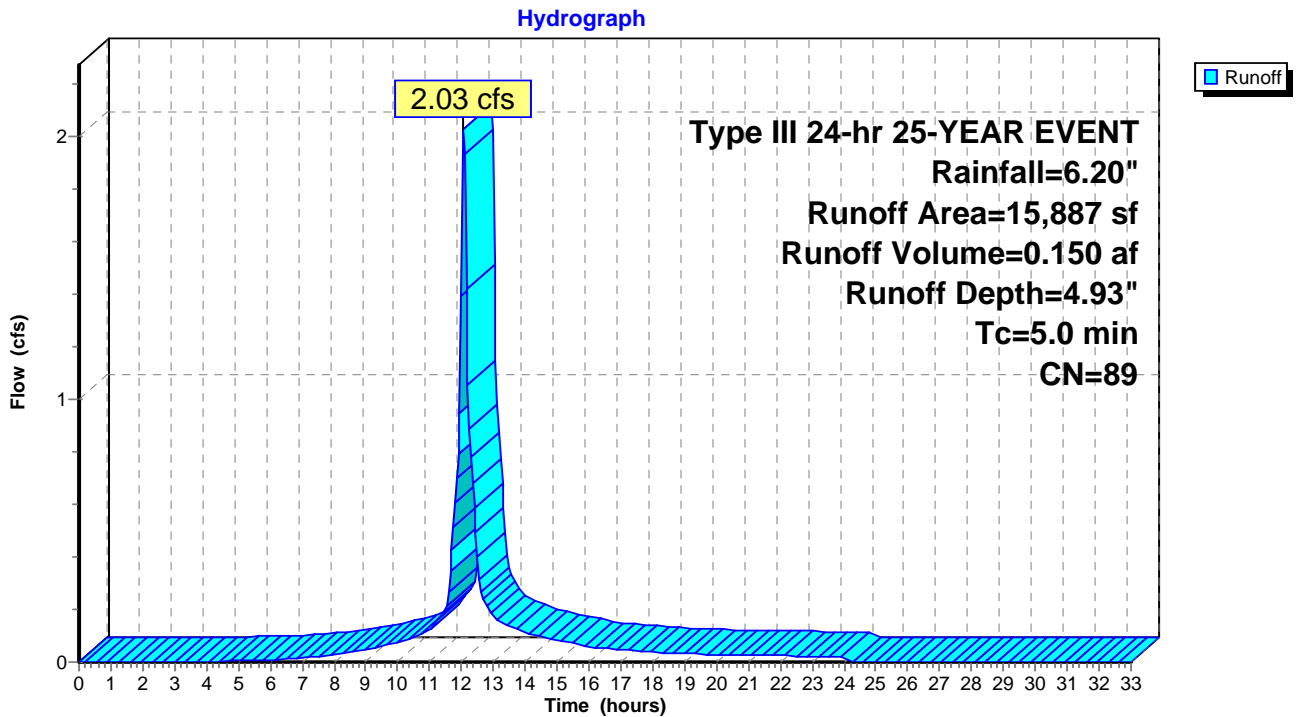
Runoff = 2.03 cfs @ 12.07 hrs, Volume= 0.150 af, Depth= 4.93"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25-YEAR EVENT Rainfall=6.20"

	Area (sf)	CN	Description
*	6,774	98	Existing Building
*	3,080	98	Walkways& Stairs
*	6,033	75	Grass Cover
	15,887	89	Weighted Average
	6,033		Pervious Area
	9,854		Impervious Area

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

Subcatchment 8S: 22 Waverly Street- Pre Development-Lower



Summary for Subcatchment 11S: 22 Waverly Street- Pre Development-Upper

Runoff = 1.47 cfs @ 12.07 hrs, Volume= 0.119 af, Depth= 5.96"

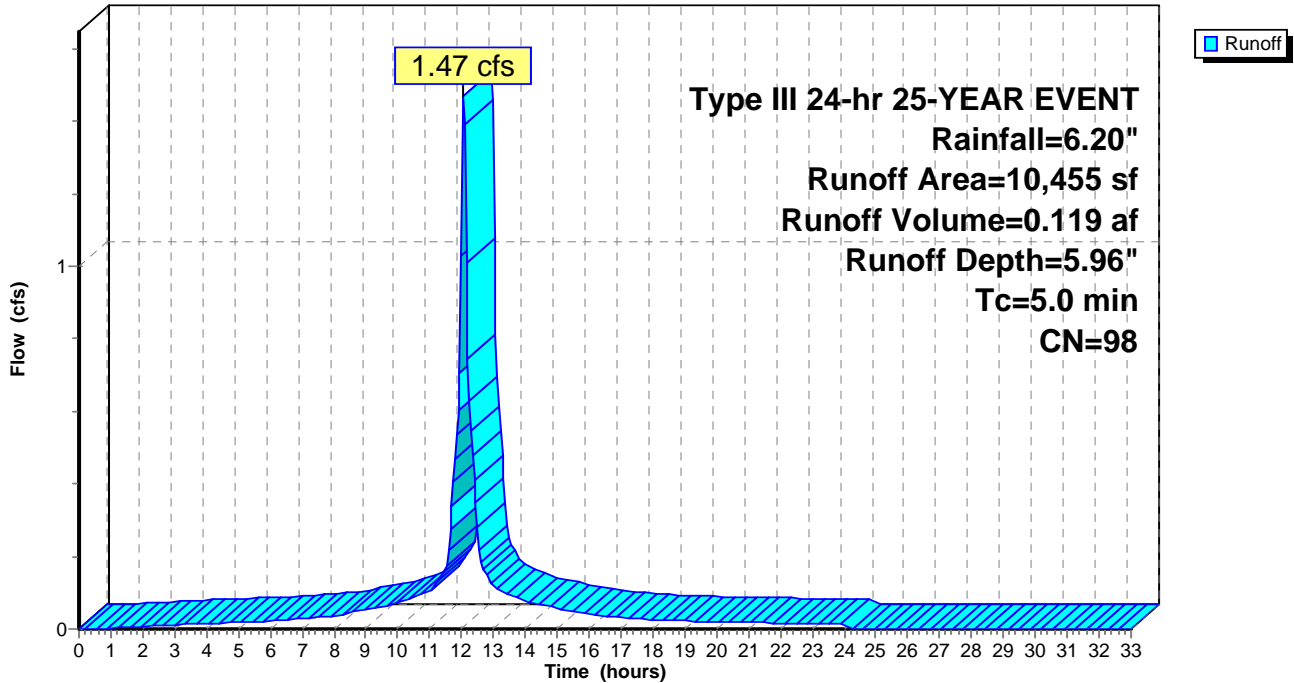
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25-YEAR EVENT Rainfall=6.20"

Area (sf)	CN	Description
* 10,455	98	Existing Paved parking
10,455		Impervious Area

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

Subcatchment 11S: 22 Waverly Street- Pre Development-Upper

Hydrograph

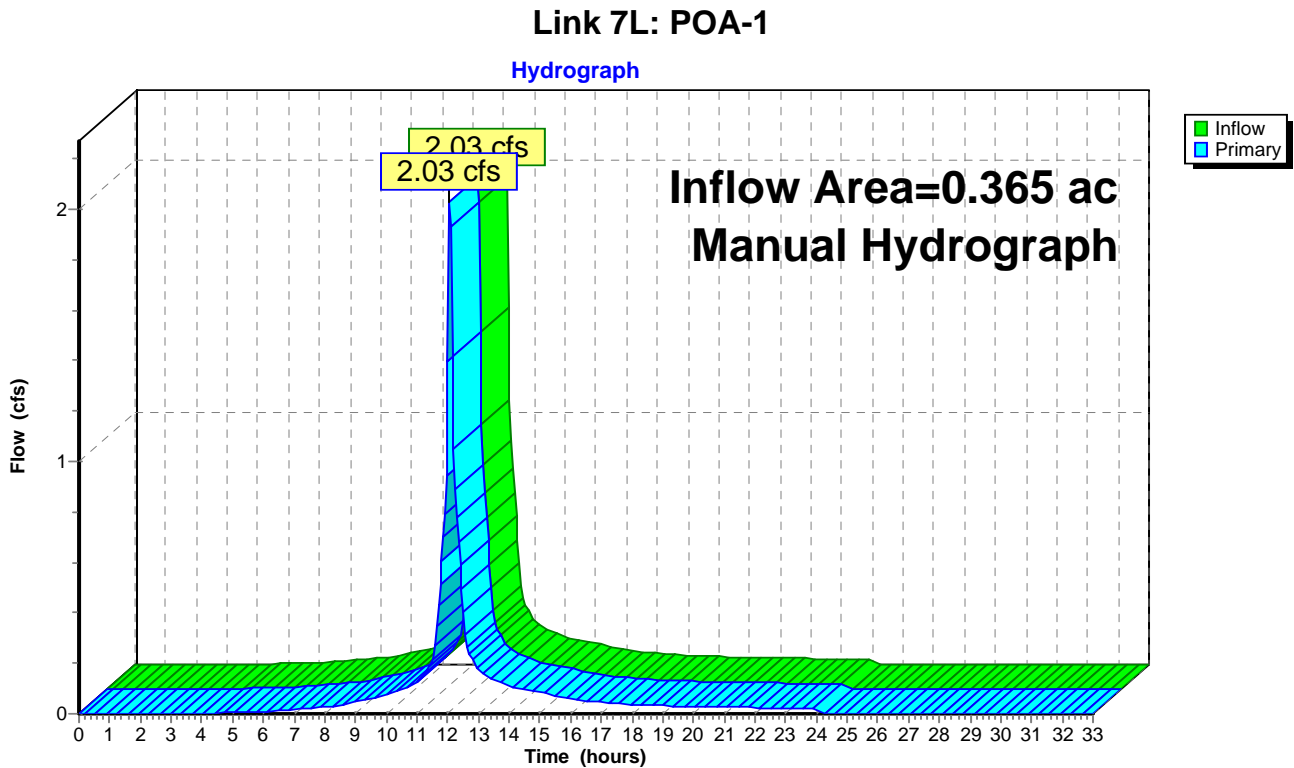


Summary for Link 7L: POA-1

Inflow Area = 0.365 ac, 62.03% Impervious, Inflow Depth = 4.93" for 25-YEAR EVENT event
Inflow = 2.03 cfs @ 12.07 hrs, Volume= 0.150 af
Primary = 2.03 cfs @ 12.07 hrs, Volume= 0.150 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs

Constant Inflow= 0.00 cfs

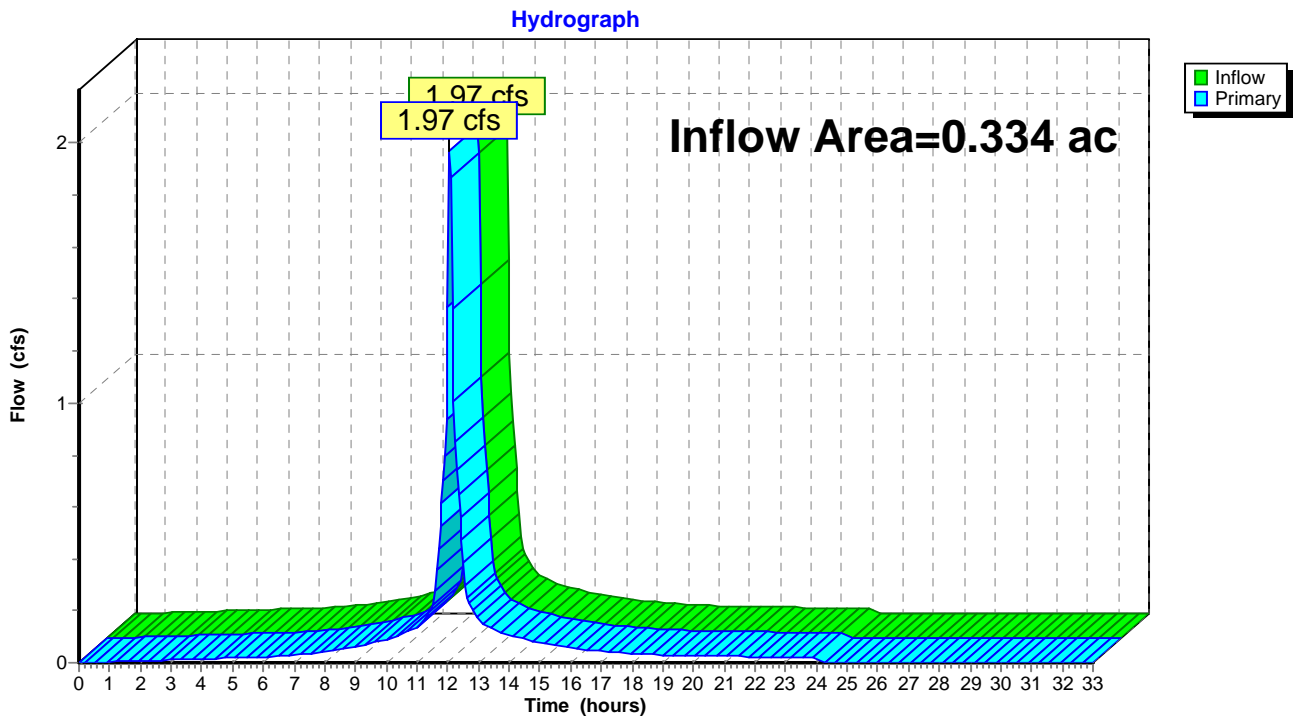


Summary for Link 9L: POA-2

Inflow Area = 0.334 ac, 71.78% Impervious, Inflow Depth = 5.58" for 25-YEAR EVENT event
Inflow = 1.97 cfs @ 12.07 hrs, Volume= 0.155 af
Primary = 1.97 cfs @ 12.07 hrs, Volume= 0.155 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs

Link 9L: POA-2

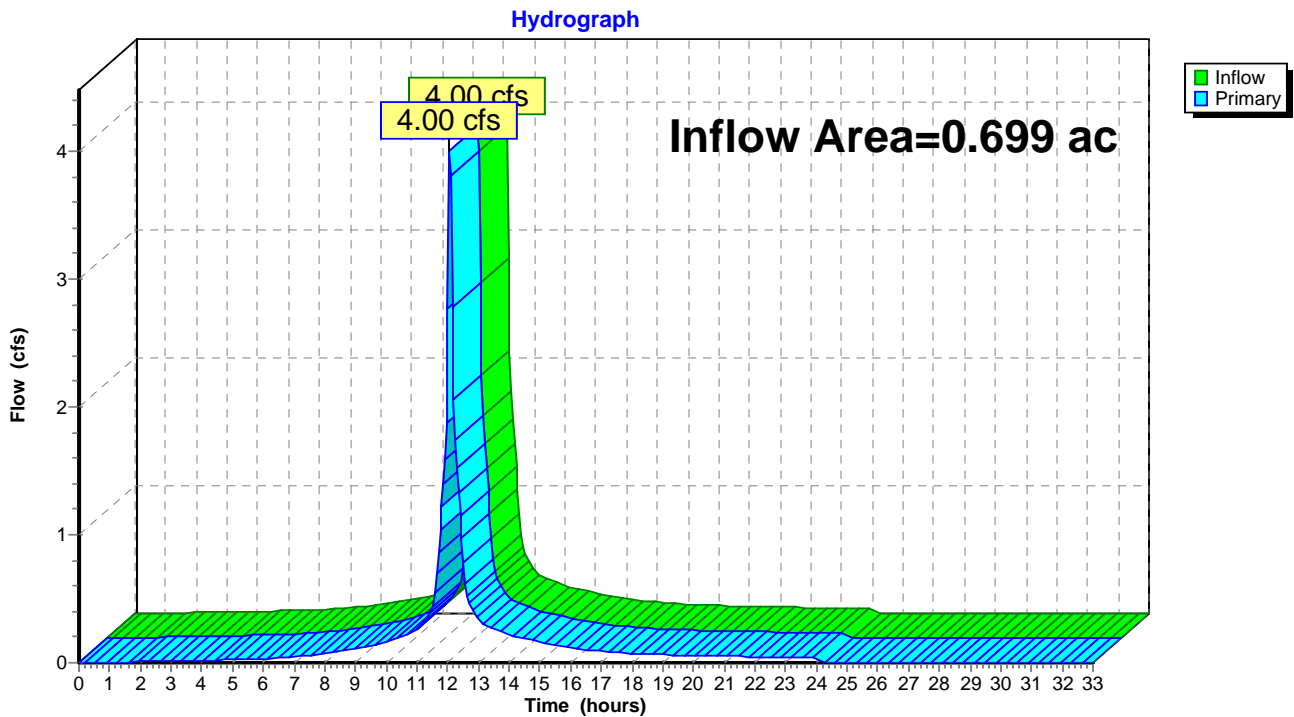


Summary for Link 10L: POA-1 & POA-2

Inflow Area = 0.699 ac, 66.69% Impervious, Inflow Depth = 5.24" for 25-YEAR EVENT event
Inflow = 4.00 cfs @ 12.07 hrs, Volume= 0.305 af
Primary = 4.00 cfs @ 12.07 hrs, Volume= 0.305 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs

Link 10L: POA-1 & POA-2



Worc-22 Waverly - Pre Development Rev-8-Type III 24-hr 100-YEAR EVENT Rainfall=8.90"

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Time span=0.00-33.00 hrs, dt=0.05 hrs, 661 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 6S: 22 Waverly Street- Pre Runoff Area=4,110 sf 0.00% Impervious Runoff Depth=7.21"
Tc=5.0 min CN=86 Runoff=0.76 cfs 0.057 af

Subcatchment 8S: 22 Waverly Street- Pre Runoff Area=15,887 sf 62.03% Impervious Runoff Depth=7.57"
Tc=5.0 min CN=89 Runoff=3.05 cfs 0.230 af

Subcatchment 11S: 22 Waverly Street- Runoff Area=10,455 sf 100.00% Impervious Runoff Depth=8.66"
Tc=5.0 min CN=98 Runoff=2.11 cfs 0.173 af

Link 7L: POA-1 Manual Hydrograph Inflow=3.05 cfs 0.230 af
Primary=3.05 cfs 0.230 af

Link 9L: POA-2 Inflow=2.88 cfs 0.230 af
Primary=2.88 cfs 0.230 af

Link 10L: POA-1 & POA-2 Inflow=5.92 cfs 0.460 af
Primary=5.92 cfs 0.460 af

Total Runoff Area = 0.699 ac Runoff Volume = 0.460 af Average Runoff Depth = 7.90"
33.31% Pervious = 0.233 ac 66.69% Impervious = 0.466 ac

Summary for Subcatchment 6S: 22 Waverly Street- Pre Development-Upper

Runoff = 0.76 cfs @ 12.07 hrs, Volume= 0.057 af, Depth= 7.21"

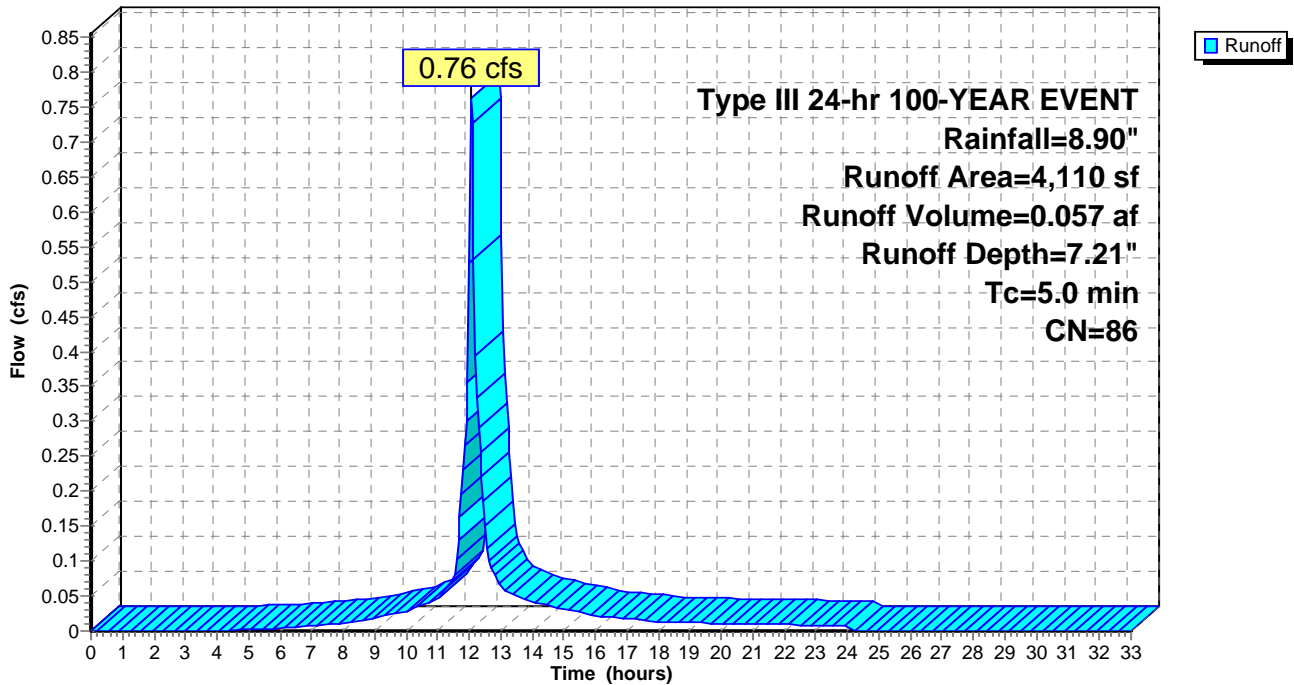
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-YEAR EVENT Rainfall=8.90"

Area (sf)	CN	Description
4,110	86	<50% Grass cover, Poor, HSG C
4,110		Pervious Area

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

Subcatchment 6S: 22 Waverly Street- Pre Development-Upper

Hydrograph



Summary for Subcatchment 8S: 22 Waverly Street- Pre Development-Lower

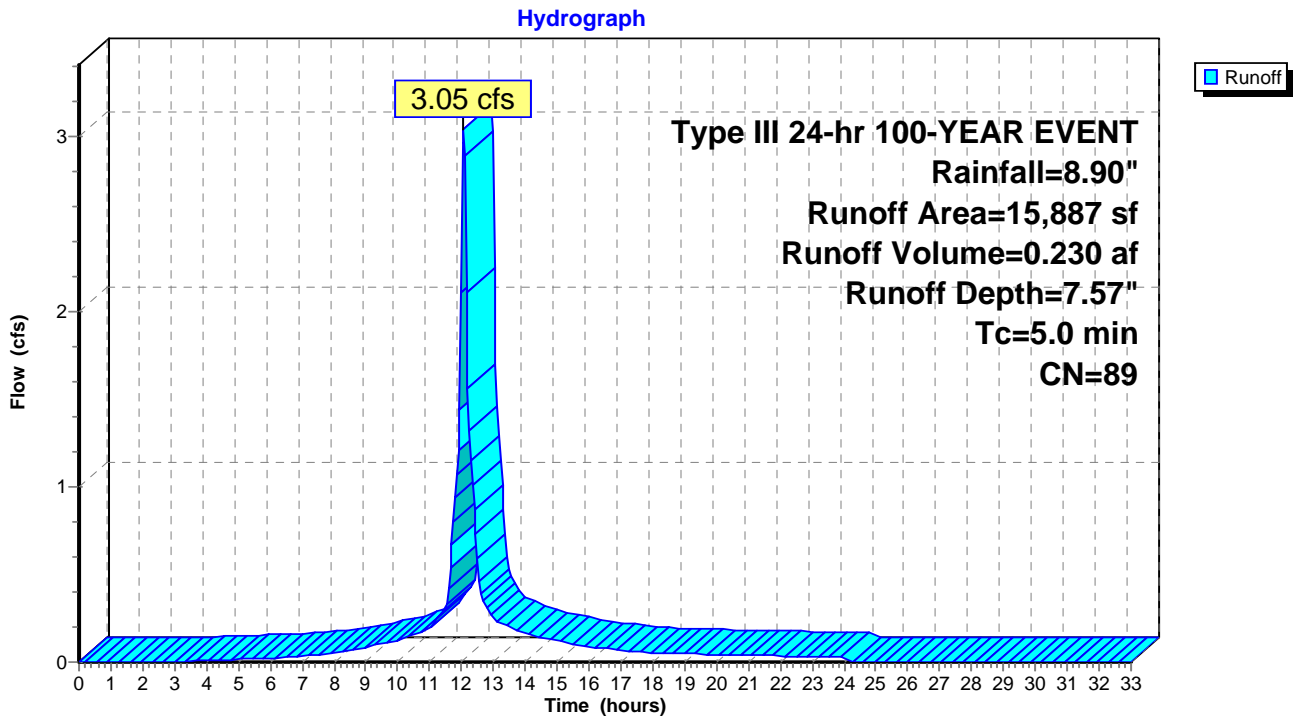
Runoff = 3.05 cfs @ 12.07 hrs, Volume= 0.230 af, Depth= 7.57"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-YEAR EVENT Rainfall=8.90"

	Area (sf)	CN	Description
*	6,774	98	Existing Building
*	3,080	98	Walkways& Stairs
*	6,033	75	Grass Cover
	15,887	89	Weighted Average
	6,033		Pervious Area
	9,854		Impervious Area

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

Subcatchment 8S: 22 Waverly Street- Pre Development-Lower



Summary for Subcatchment 11S: 22 Waverly Street- Pre Development-Upper

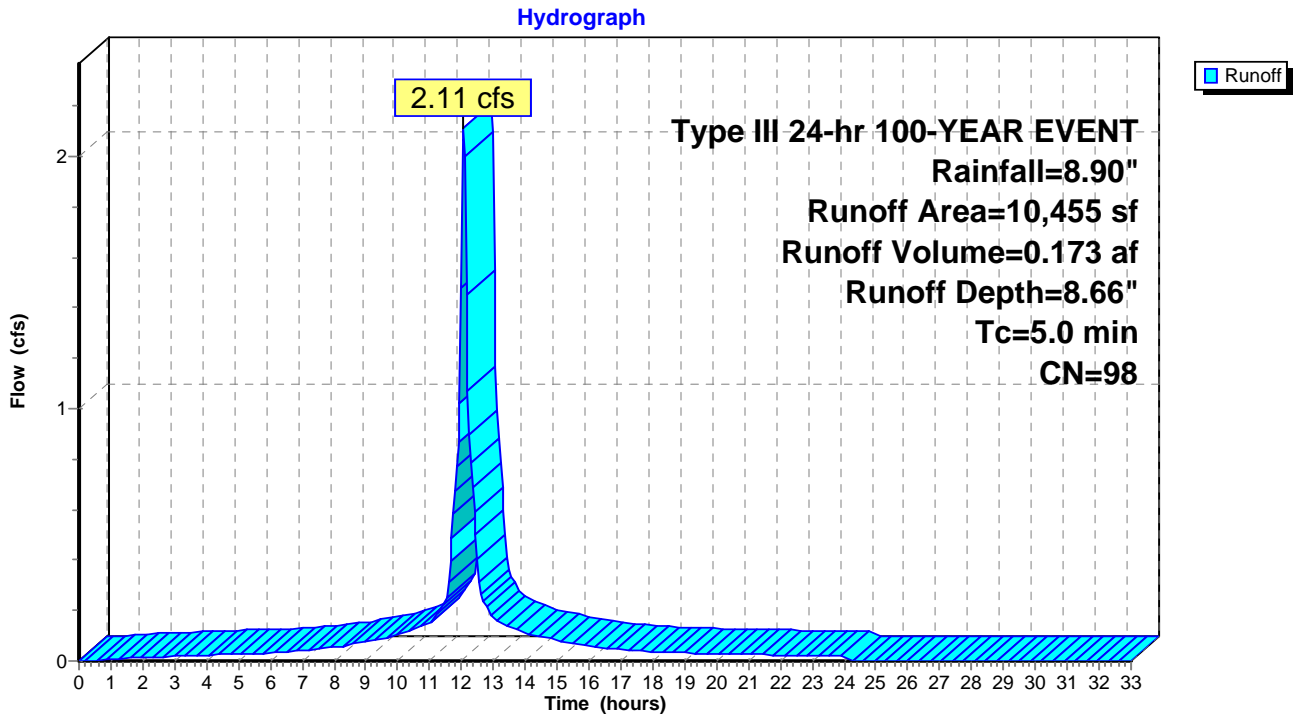
Runoff = 2.11 cfs @ 12.07 hrs, Volume= 0.173 af, Depth= 8.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-YEAR EVENT Rainfall=8.90"

Area (sf)	CN	Description
* 10,455	98	Existing Paved parking
10,455		Impervious Area

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

Subcatchment 11S: 22 Waverly Street- Pre Development-Upper

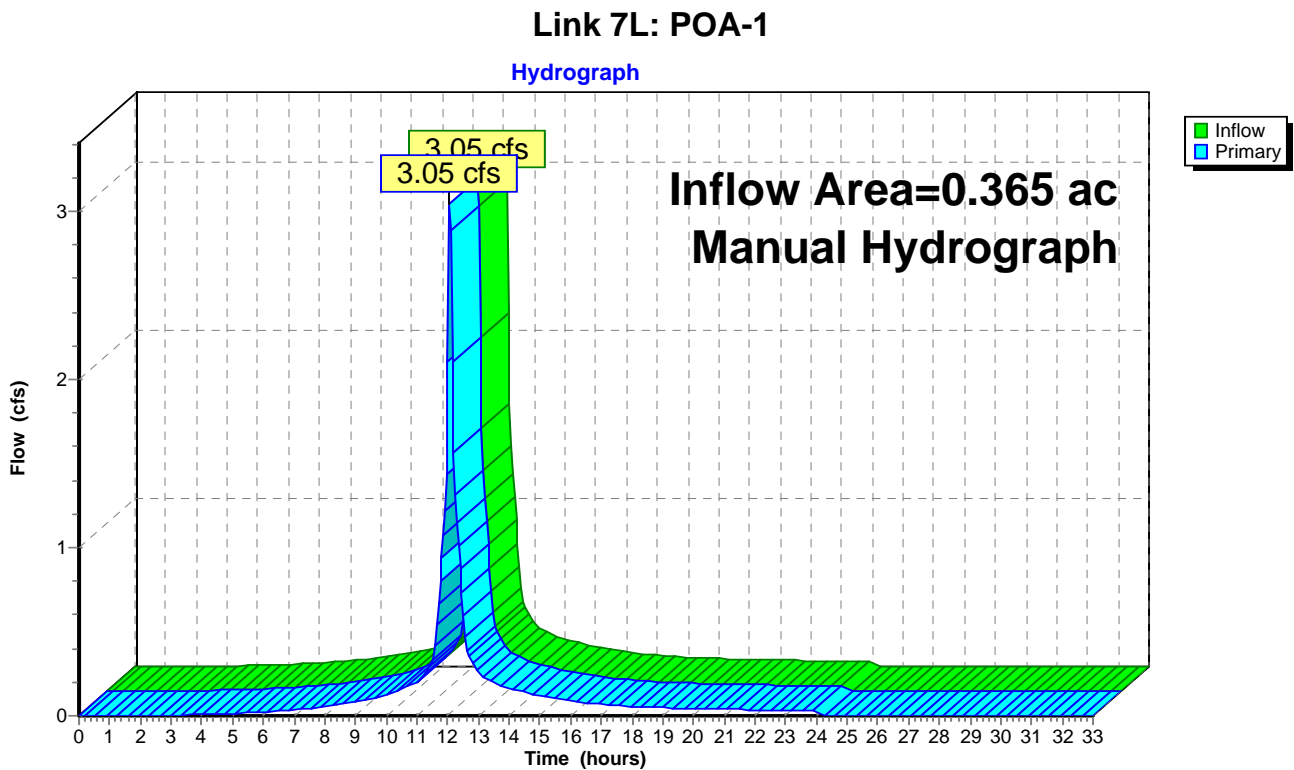


Summary for Link 7L: POA-1

Inflow Area = 0.365 ac, 62.03% Impervious, Inflow Depth = 7.57" for 100-YEAR EVENT event
Inflow = 3.05 cfs @ 12.07 hrs, Volume= 0.230 af
Primary = 3.05 cfs @ 12.07 hrs, Volume= 0.230 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs

Constant Inflow= 0.00 cfs

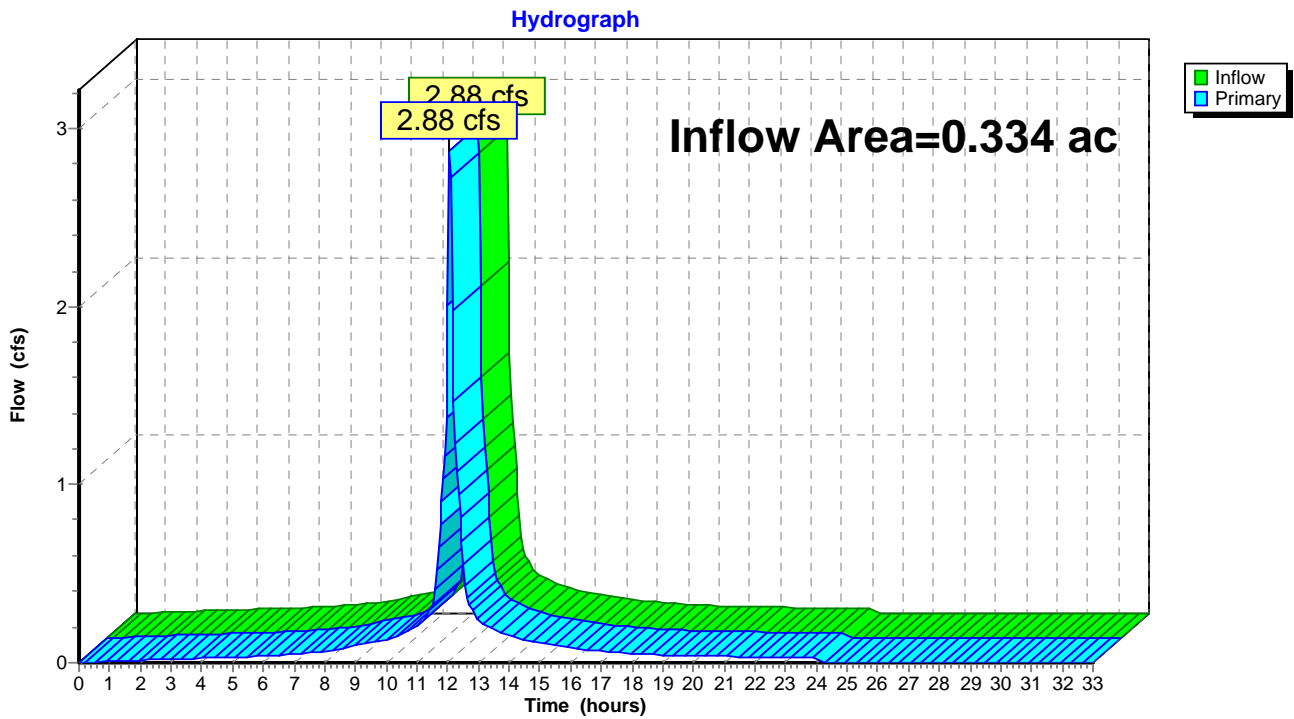


Summary for Link 9L: POA-2

Inflow Area = 0.334 ac, 71.78% Impervious, Inflow Depth = 8.25" for 100-YEAR EVENT event
Inflow = 2.88 cfs @ 12.07 hrs, Volume= 0.230 af
Primary = 2.88 cfs @ 12.07 hrs, Volume= 0.230 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs

Link 9L: POA-2

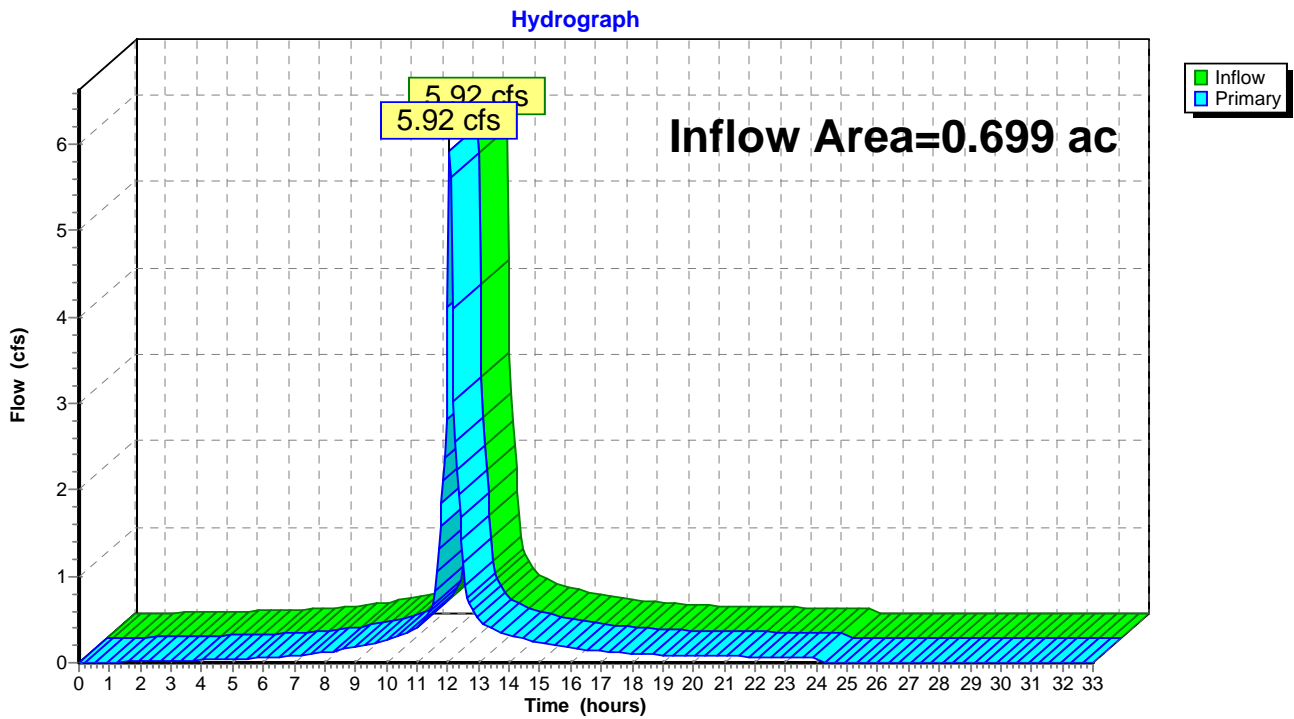


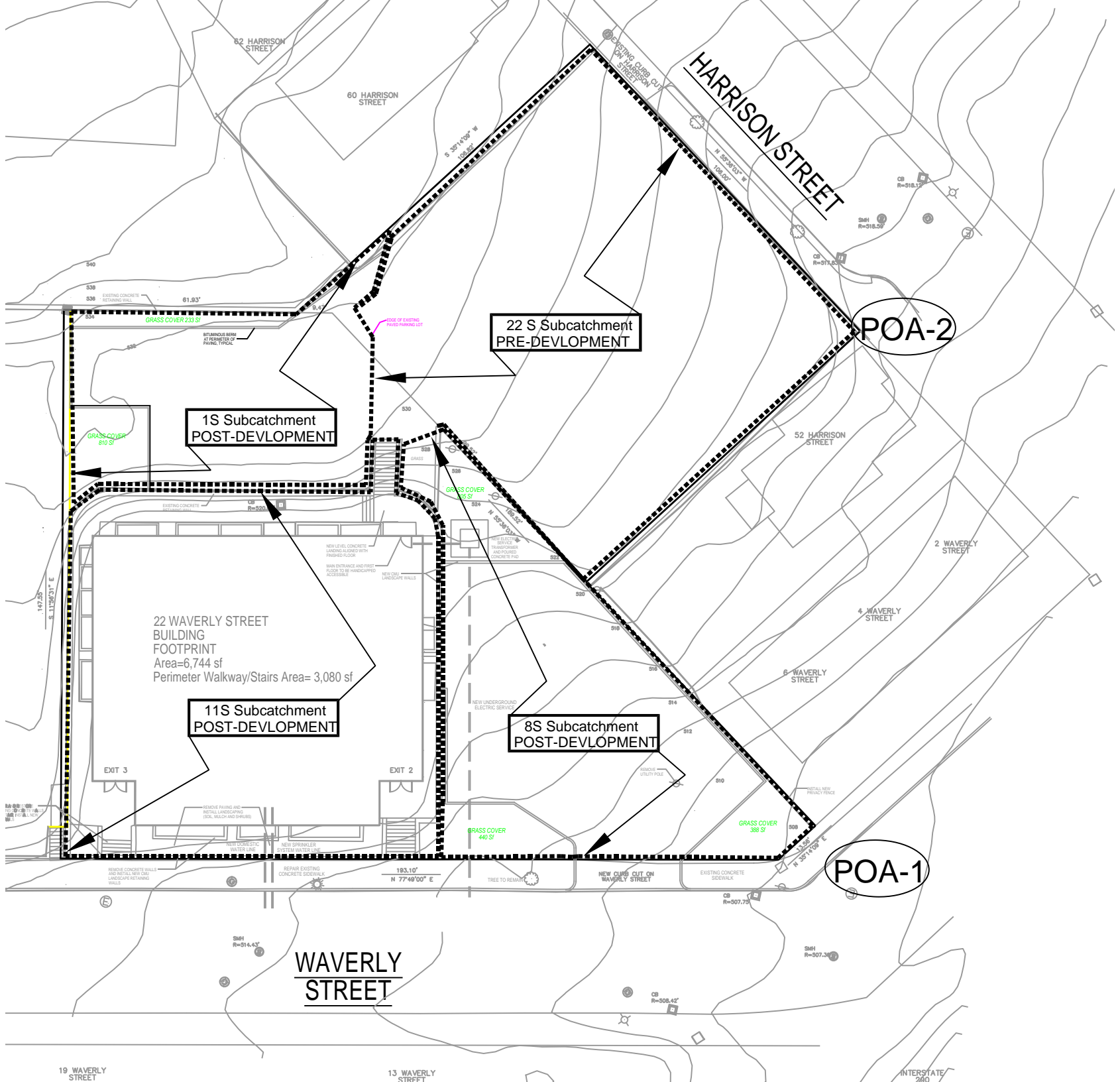
Summary for Link 10L: POA-1 & POA-2

Inflow Area = 0.699 ac, 66.69% Impervious, Inflow Depth = 7.90" for 100-YEAR EVENT event
Inflow = 5.92 cfs @ 12.07 hrs, Volume= 0.460 af
Primary = 5.92 cfs @ 12.07 hrs, Volume= 0.460 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs

Link 10L: POA-1 & POA-2





22 WAVERLY STREET
BUILDING
FOOTPRINT
Area=6,744 sf
Perimeter Walkway/Stairs Area= 3,080 sf

22 S Subcatchment
PRE-DEVELOPMENT

1S Subcatchment
POST-DEVELOPMENT

11S Subcatchment
POST-DEVELOPMENT

8S Subcatchment
POST-DEVELOPMENT

POA-2

POA-1

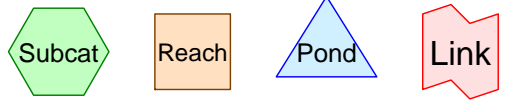
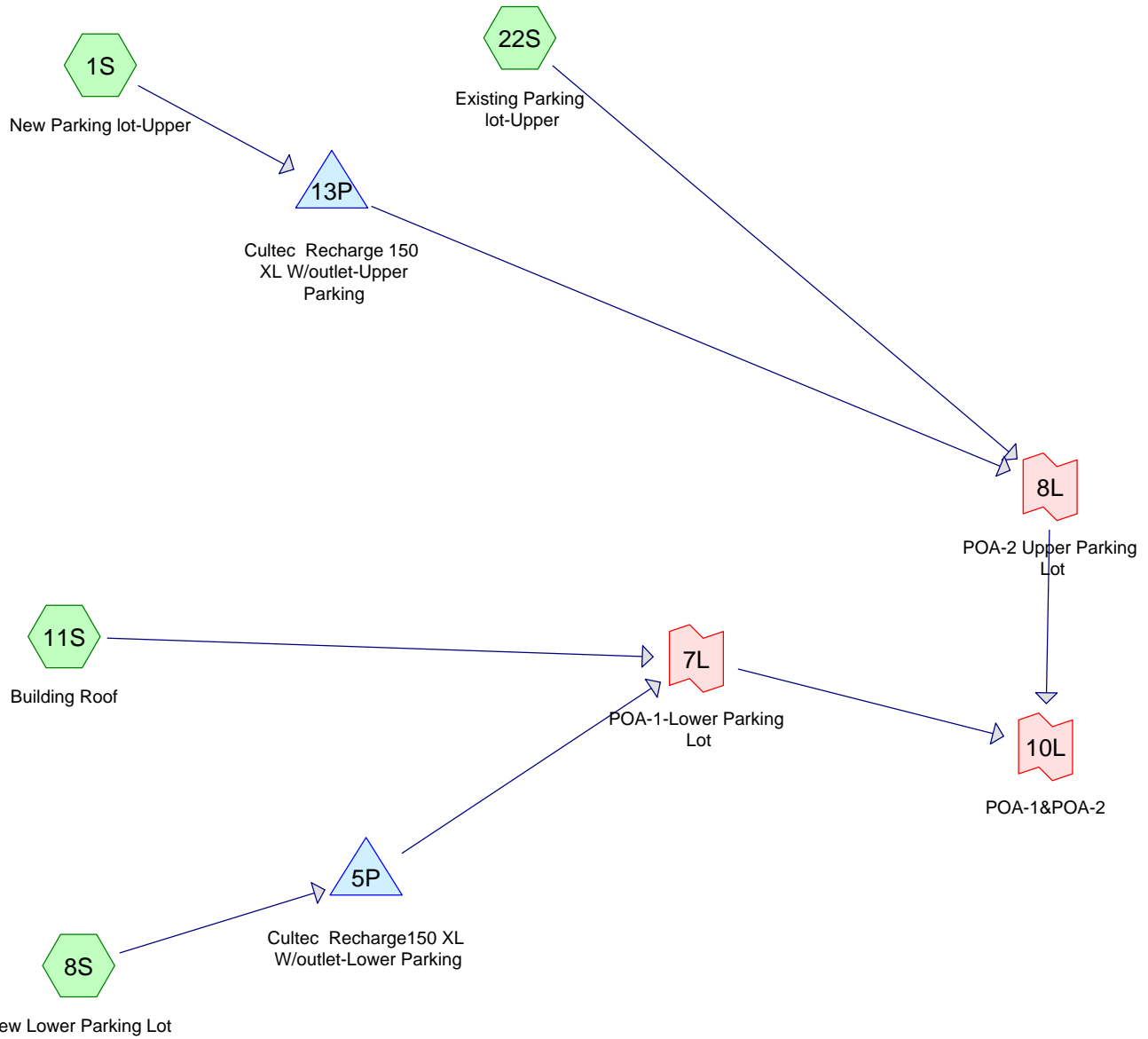
WAVERLY
STREET

HARRISON STREET

19 WAVERLY
STREET

13 WAVERLY
STREET

INTERSTATE
290



Drainage Diagram for Worc-22 Waverlyt- Post development Rev- 8-25-24
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Worc-22 Waverlyt- Post development Rev- 8-25-24

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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.019	39	Grass Cover (8S)
0.018	68	Grass cover (8S)
0.240	98	Existing Paved Parking lot (22S)
0.071	98	Existing Walkway & Stairs (11S)
0.155	98	Existing roof Building (11S)
0.024	98	Grass Cover (1S)
0.076	98	New Paved Parking lot (1S)
0.107	98	Parking Lot (8S)
0.709		TOTAL AREA

Worc-22 Waverlyt- Post development Rev- 8-25-24

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Soil Listing (all nodes)

Area (acres)	Soil Goup	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.709	Other	1S, 8S, 11S, 22S
0.709		TOTAL AREA

Worc-22 Waverlyt- Post development Rev- 8- Type III 24-hr 2-YEAR EVENT Rainfall=3.20"

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Time span=0.00-33.00 hrs, dt=0.05 hrs, 661 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: New Parking lot-Upper Runoff Area=4,343 sf 100.00% Impervious Runoff Depth=2.97"
Tc=5.0 min CN=98 Runoff=0.31 cfs 0.025 af

Subcatchment 8S: New Lower Parking Lot Runoff Area=6,258 sf 74.46% Impervious Runoff Depth=1.91"
Tc=0.0 min CN=87 Runoff=0.37 cfs 0.023 af

Subcatchment 11S: Building Roof Runoff Area=9,824 sf 100.00% Impervious Runoff Depth=2.97"
Tc=0.0 min CN=98 Runoff=0.80 cfs 0.056 af

Subcatchment 22S: Existing Parking Runoff Area=10,455 sf 100.00% Impervious Runoff Depth=2.97"
Tc=0.0 min CN=98 Runoff=0.85 cfs 0.059 af

Pond 5P: Cultec Recharge150 XL Peak Elev=508.00' Storage=658 cf Inflow=0.37 cfs 0.023 af
Outflow=0.01 cfs 0.017 af

Pond 13P: Cultec Recharge 150 XL Peak Elev=527.09' Storage=739 cf Inflow=0.31 cfs 0.025 af
Outflow=0.02 cfs 0.011 af

Link 7L: POA-1-Lower Parking Lot Manual Hydrograph Inflow=0.81 cfs 0.073 af
Primary=0.81 cfs 0.073 af

Link 8L: POA-2 Upper Parking Lot Manual Hydrograph Inflow=0.85 cfs 0.070 af
Primary=0.85 cfs 0.070 af

Link 10L: POA-1&POA-2 Inflow=1.66 cfs 0.143 af
Primary=1.66 cfs 0.143 af

Total Runoff Area = 0.709 ac Runoff Volume = 0.163 af Average Runoff Depth = 2.75"
5.17% Pervious = 0.037 ac 94.83% Impervious = 0.672 ac

Summary for Subcatchment 1S: New Parking lot-Upper

Runoff = 0.31 cfs @ 12.07 hrs, Volume= 0.025 af, Depth= 2.97"

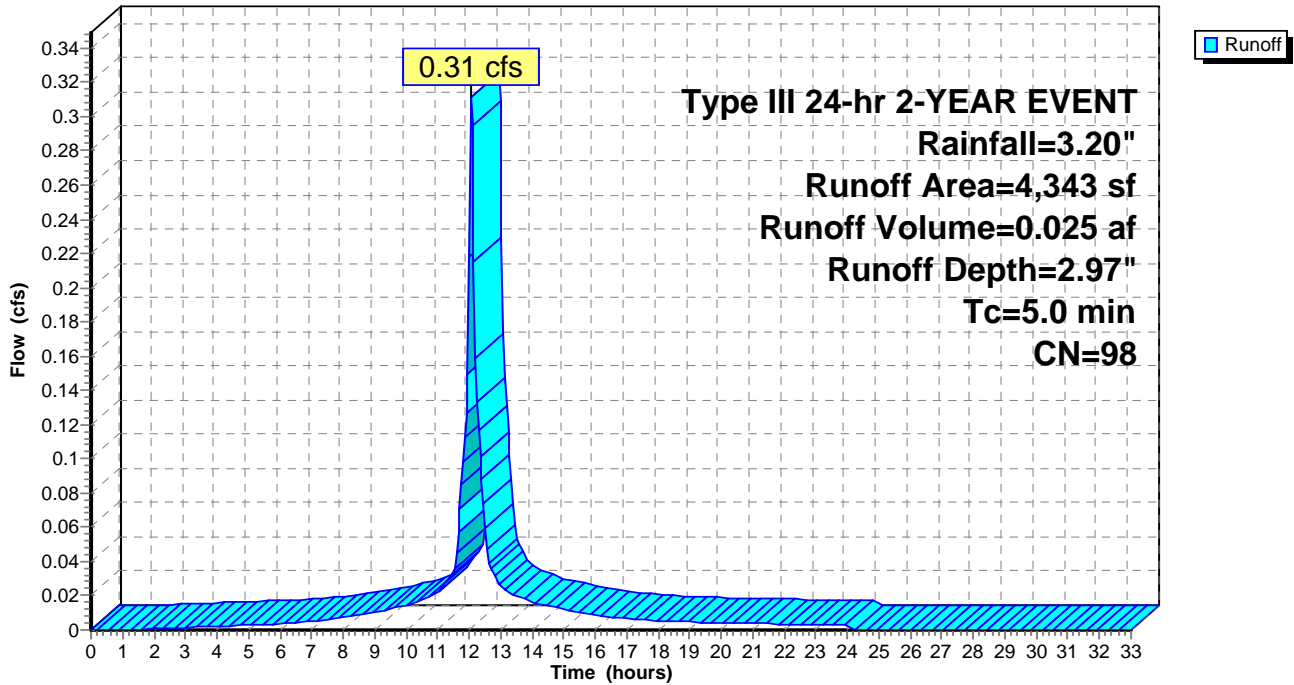
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-YEAR EVENT Rainfall=3.20"

	Area (sf)	CN	Description
*	1,043	98	Grass Cover
*	3,300	98	New Paved Parking lot
	4,343	98	Weighted Average
	4,343		Impervious Area

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

Subcatchment 1S: New Parking lot-Upper

Hydrograph



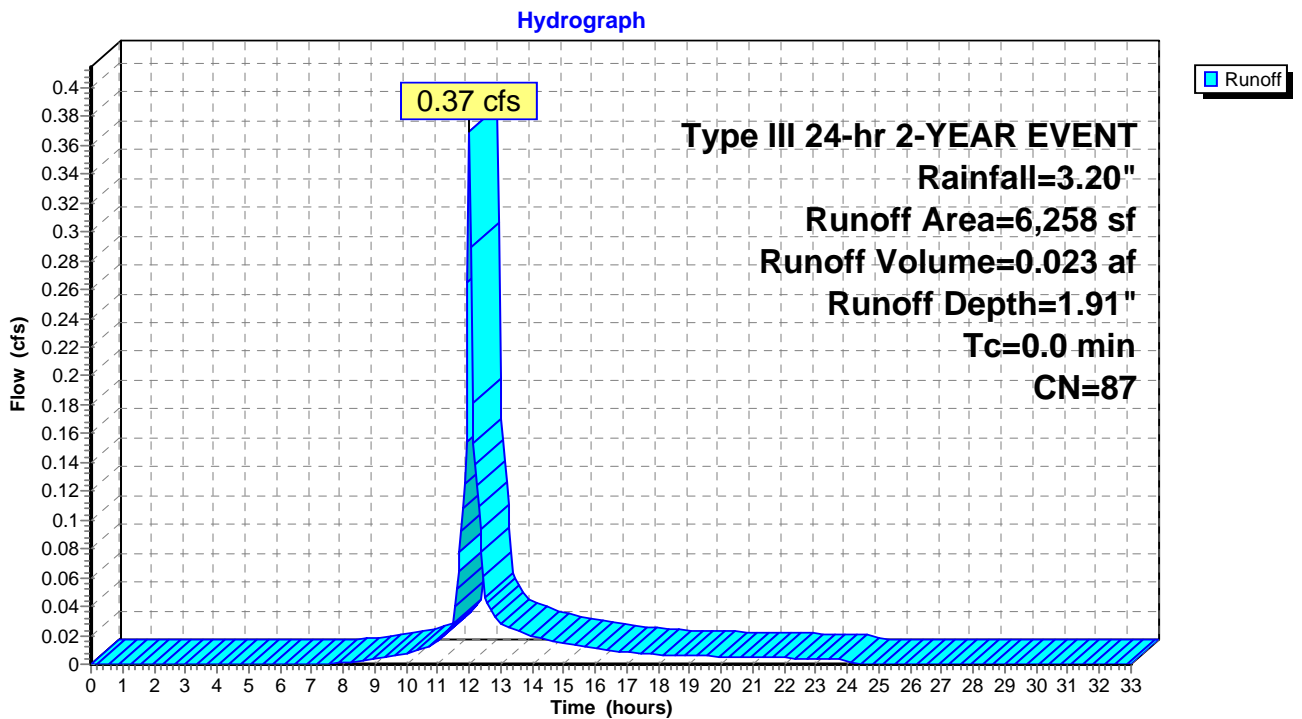
Summary for Subcatchment 8S: New Lower Parking Lot

Runoff = 0.37 cfs @ 12.00 hrs, Volume= 0.023 af, Depth= 1.91"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-YEAR EVENT Rainfall=3.20"

Area (sf)	CN	Description
* 770	68	Grass cover
* 440	39	Grass Cover
* 388	39	Grass Cover
* 4,660	98	Parking Lot
6,258	87	Weighted Average
1,598		Pervious Area
4,660		Impervious Area

Subcatchment 8S: New Lower Parking Lot



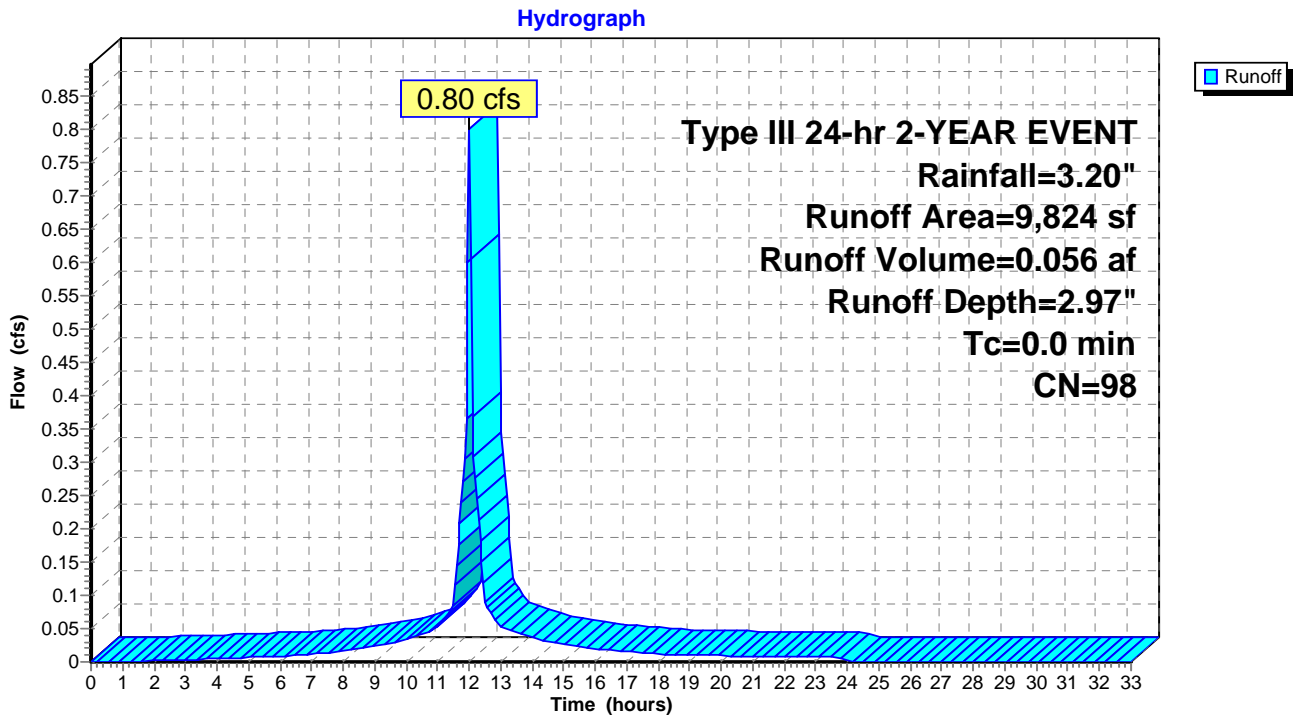
Summary for Subcatchment 11S: Building Roof

Runoff = 0.80 cfs @ 12.00 hrs, Volume= 0.056 af, Depth= 2.97"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-YEAR EVENT Rainfall=3.20"

	Area (sf)	CN	Description
*	6,744	98	Existing roof Building
*	3,080	98	Existing Walkway & Stairs
	9,824	98	Weighted Average
	9,824		Impervious Area

Subcatchment 11S: Building Roof



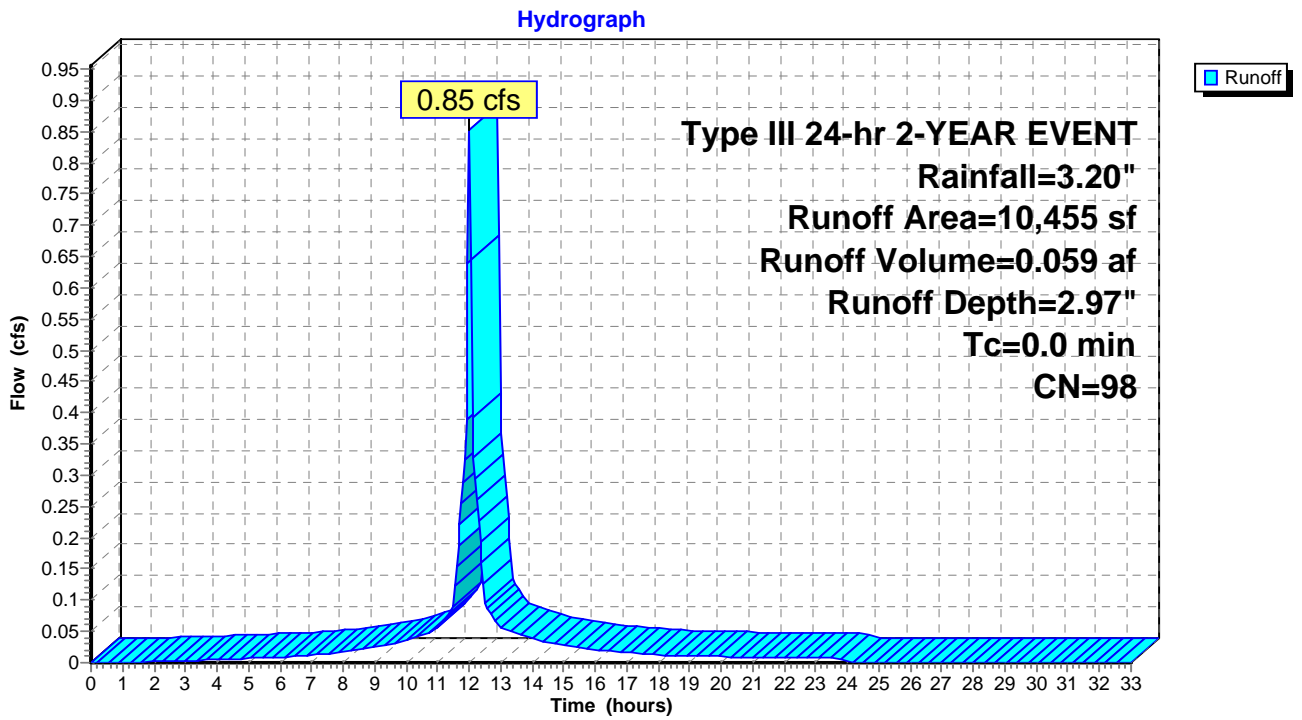
Summary for Subcatchment 22S: Existing Parking lot-Upper

Runoff = 0.85 cfs @ 12.00 hrs, Volume= 0.059 af, Depth= 2.97"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-YEAR EVENT Rainfall=3.20"

Area (sf)	CN	Description
* 10,455	98	Existing Paved Parking lot
10,455		Impervious Area

Subcatchment 22S: Existing Parking lot-Upper



Summary for Pond 5P: Cultec Recharge150 XL W/outlet-Lower Parking

Inflow Area = 0.144 ac, 74.46% Impervious, Inflow Depth = 1.91" for 2-YEAR EVENT event
 Inflow = 0.37 cfs @ 12.00 hrs, Volume= 0.023 af
 Outflow = 0.01 cfs @ 15.72 hrs, Volume= 0.017 af, Atten= 97%, Lag= 223.2 min
 Primary = 0.01 cfs @ 15.72 hrs, Volume= 0.017 af

Routing by Stor-Ind method, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
 Peak Elev= 508.00' @ 15.72 hrs Surf.Area= 1,313 sf Storage= 658 cf

Plug-Flow detention time= 554.0 min calculated for 0.017 af (74% of inflow)
 Center-of-Mass det. time= 465.6 min (1,278.9 - 813.3)

Volume	Invert	Avail.Storage	Storage Description
#1	507.05'	2,188 cf	46.00'W x 24.00'L x 4.00'H Prismatic Z=1.5 6,288 cf Overall - 817 cf Embedded = 5,471 cf x 40.0% Voids
#2	507.55'	817 cf	29.8"W x 19.0"H x 11.00'L Cultec R-150x 28 Inside #1
		3,005 cf	Total Available Storage

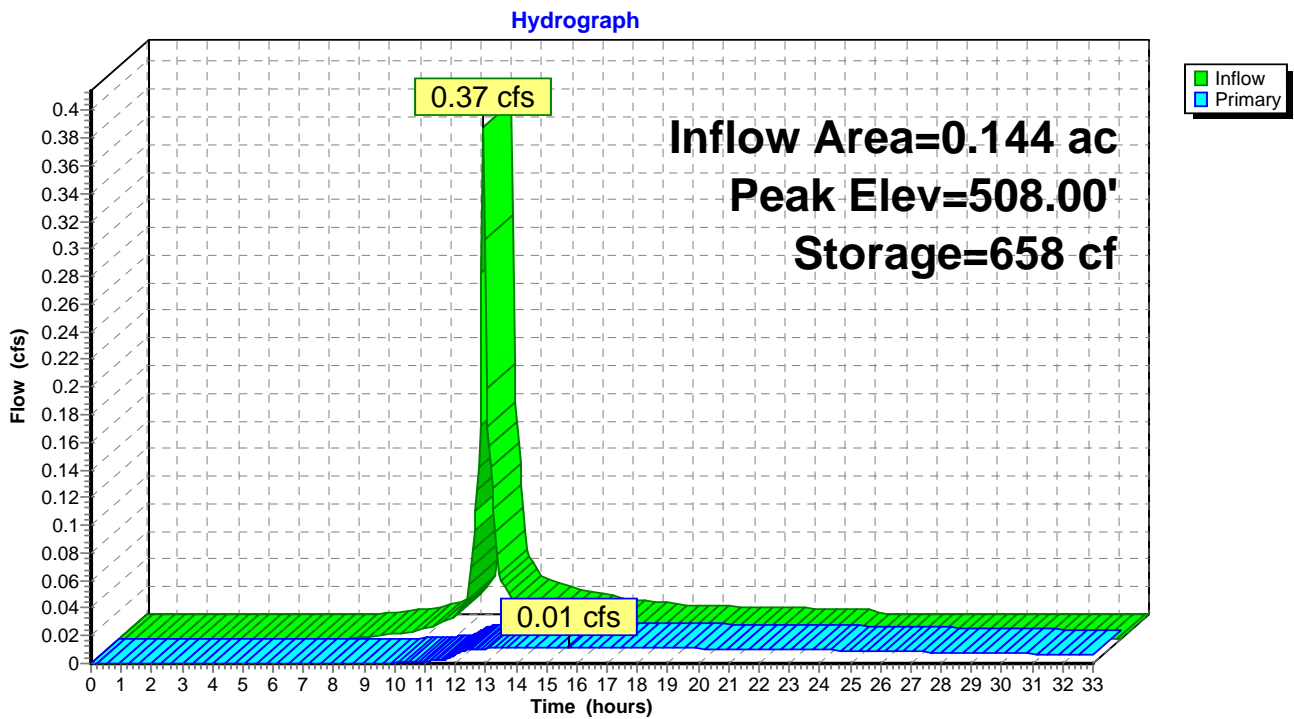
Device	Routing	Invert	Outlet Devices
#1	Primary	507.05'	2.410 in/hr Exfiltration over Horizontal area above invert Excluded Horizontal area = 1,104 sf
#2	Primary	508.44'	6.0" x 44.0' long Culvert CMP, projecting, no headwall, Ke= 0.900 Outlet Invert= 502.00' S= 0.1464 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean

Primary OutFlow Max=0.01 cfs @ 15.72 hrs HW=508.00' (Free Discharge)

1=Exfiltration (Exfiltration Controls 0.01 cfs)

2=Culvert (Controls 0.00 cfs)

Pond 5P: Cultec Recharge150 XL W/outlet-Lower Parking



Summary for Pond 13P: Cultec Recharge 150 XL W/outlet-Upper Parking

Inflow Area = 0.100 ac, 100.00% Impervious, Inflow Depth = 2.97" for 2-YEAR EVENT event
 Inflow = 0.31 cfs @ 12.07 hrs, Volume= 0.025 af
 Outflow = 0.02 cfs @ 13.20 hrs, Volume= 0.011 af, Atten= 93%, Lag= 67.7 min
 Primary = 0.02 cfs @ 13.20 hrs, Volume= 0.011 af

Routing by Stor-Ind method, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
 Peak Elev= 527.09' @ 13.20 hrs Surf.Area= 1,332 sf Storage= 739 cf

Plug-Flow detention time= 468.1 min calculated for 0.011 af (45% of inflow)
 Center-of-Mass det. time= 332.2 min (1,087.7 - 755.5)

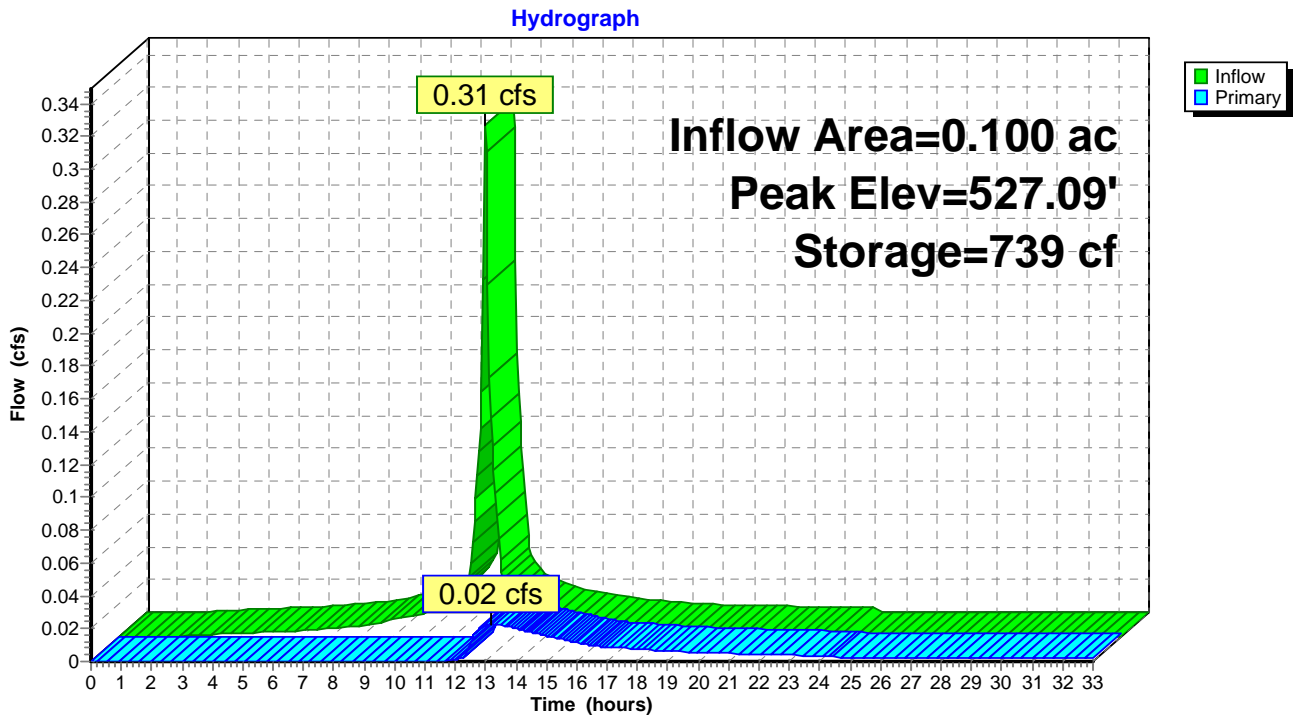
Volume	Invert	Avail.Storage	Storage Description
#1	526.05'	2,188 cf	46.00'W x 24.00'L x 4.00'H Prismatic Z=1.5 6,288 cf Overall - 817 cf Embedded = 5,471 cf x 40.0% Voids
#2	526.55'	817 cf	29.8"W x 19.0"H x 11.00'L Cultec R-150x 28 Inside #1
		3,005 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	526.55'	1.020 in/hr Exfiltration over Horizontal area above invert Excluded Horizontal area = 1,211 sf
#2	Primary	527.00'	6.0" x 181.0' long Culvert CMP, projecting, no headwall, Ke= 0.900 Outlet Invert= 502.00' S= 0.1381 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean

Primary OutFlow Max=0.02 cfs @ 13.20 hrs HW=527.09' (Free Discharge)

- 1=Exfiltration (Exfiltration Controls 0.00 cfs)
- 2=Culvert (Inlet Controls 0.02 cfs @ 0.81 fps)

Pond 13P: Cultec Recharge 150 XL W/outlet-Upper Parking



Summary for Link 7L: POA-1-Lower Parking Lot

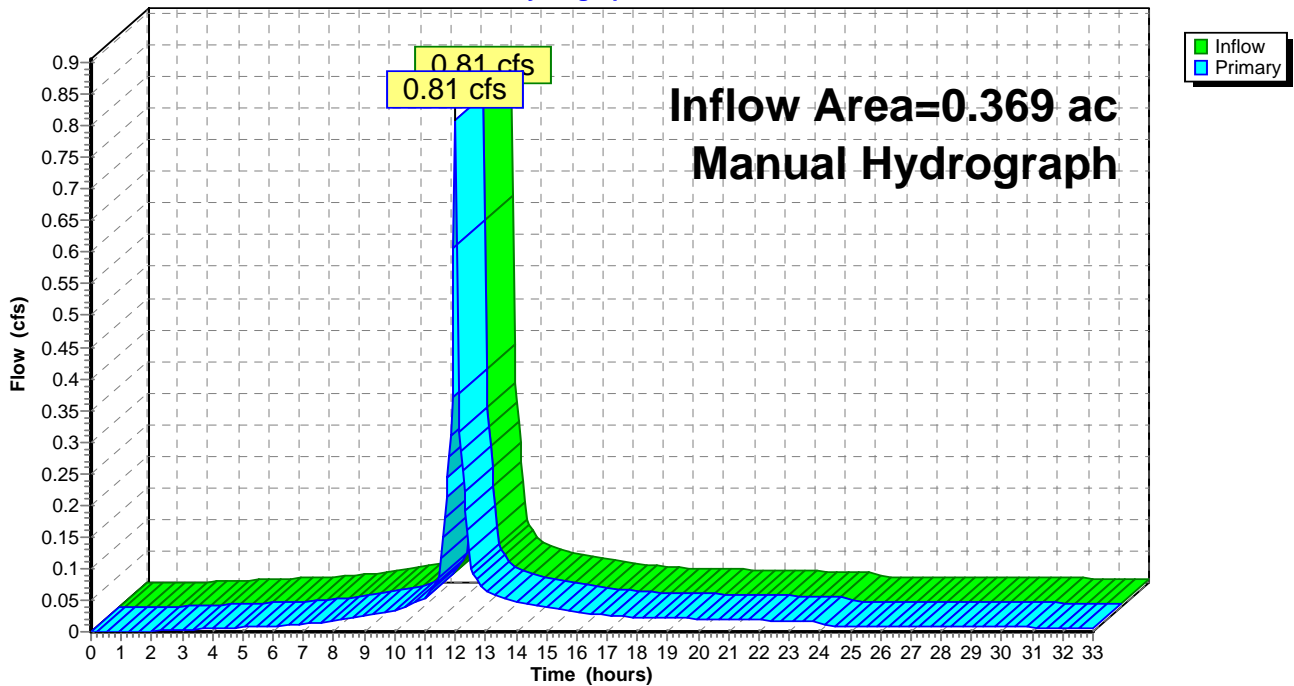
Inflow Area = 0.369 ac, 90.06% Impervious, Inflow Depth > 2.37" for 2-YEAR EVENT event
Inflow = 0.81 cfs @ 12.00 hrs, Volume= 0.073 af
Primary = 0.81 cfs @ 12.00 hrs, Volume= 0.073 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs

Constant Inflow= 0.00 cfs

Link 7L: POA-1-Lower Parking Lot

Hydrograph



Summary for Link 8L: POA-2 Upper Parking Lot

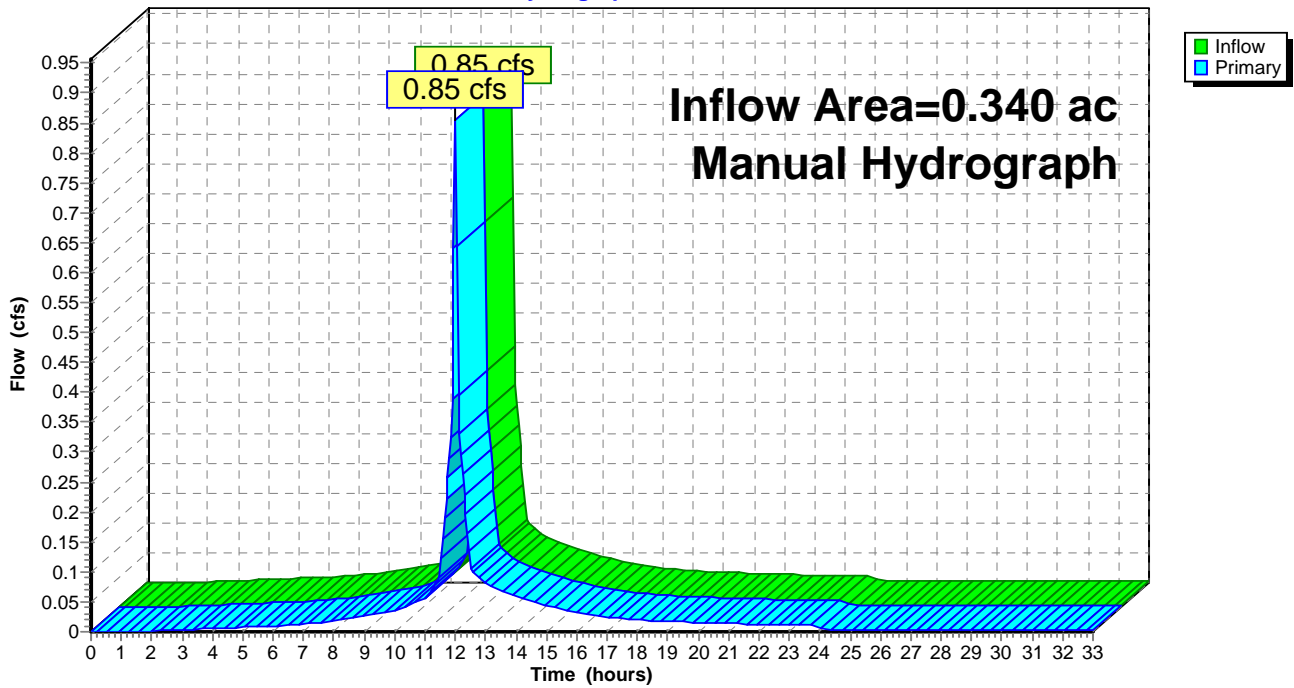
Inflow Area = 0.340 ac, 100.00% Impervious, Inflow Depth > 2.49" for 2-YEAR EVENT event
Inflow = 0.85 cfs @ 12.00 hrs, Volume= 0.070 af
Primary = 0.85 cfs @ 12.00 hrs, Volume= 0.070 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs

Constant Inflow= 0.00 cfs

Link 8L: POA-2 Upper Parking Lot

Hydrograph

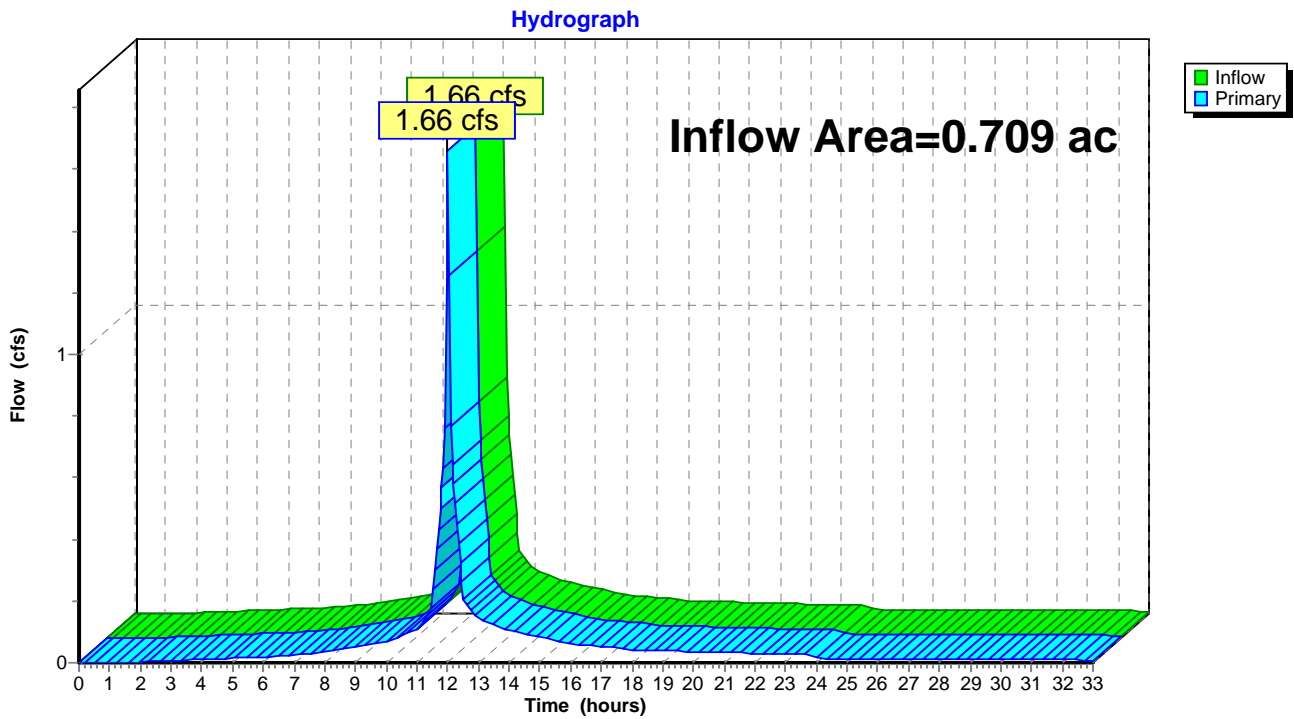


Summary for Link 10L: POA-1&POA-2

Inflow Area = 0.709 ac, 94.83% Impervious, Inflow Depth > 2.42" for 2-YEAR EVENT event
Inflow = 1.66 cfs @ 12.00 hrs, Volume= 0.143 af
Primary = 1.66 cfs @ 12.00 hrs, Volume= 0.143 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs

Link 10L: POA-1&POA-2



Worc-22 Waverlyt- Post development Rev- 8 Type III 24-hr 10-YEAR EVENT Rainfall=4.90"

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Time span=0.00-33.00 hrs, dt=0.05 hrs, 661 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: New Parking lot-Upper	Runoff Area=4,343 sf 100.00% Impervious Runoff Depth=4.66" Tc=5.0 min CN=98 Runoff=0.48 cfs 0.039 af
Subcatchment 8S: New Lower Parking Lot	Runoff Area=6,258 sf 74.46% Impervious Runoff Depth=3.47" Tc=0.0 min CN=87 Runoff=0.66 cfs 0.042 af
Subcatchment 11S: Building Roof	Runoff Area=9,824 sf 100.00% Impervious Runoff Depth=4.66" Tc=0.0 min CN=98 Runoff=1.24 cfs 0.088 af
Subcatchment 22S: Existing Parking	Runoff Area=10,455 sf 100.00% Impervious Runoff Depth=4.66" Tc=0.0 min CN=98 Runoff=1.32 cfs 0.093 af
Pond 5P: Cultec Recharge150 XL	Peak Elev=508.52' Storage=1,138 cf Inflow=0.66 cfs 0.042 af Outflow=0.04 cfs 0.030 af
Pond 13P: Cultec Recharge 150 XL	Peak Elev=527.28' Storage=921 cf Inflow=0.48 cfs 0.039 af Outflow=0.17 cfs 0.025 af
Link 7L: POA-1-Lower Parking Lot	Manual Hydrograph Inflow=1.25 cfs 0.118 af Primary=1.25 cfs 0.118 af
Link 8L: POA-2 Upper Parking Lot	Manual Hydrograph Inflow=1.32 cfs 0.118 af Primary=1.32 cfs 0.118 af
Link 10L: POA-1&POA-2	Inflow=2.57 cfs 0.236 af Primary=2.57 cfs 0.236 af

Total Runoff Area = 0.709 ac Runoff Volume = 0.261 af Average Runoff Depth = 4.42"
5.17% Pervious = 0.037 ac 94.83% Impervious = 0.672 ac

Summary for Subcatchment 1S: New Parking lot-Upper

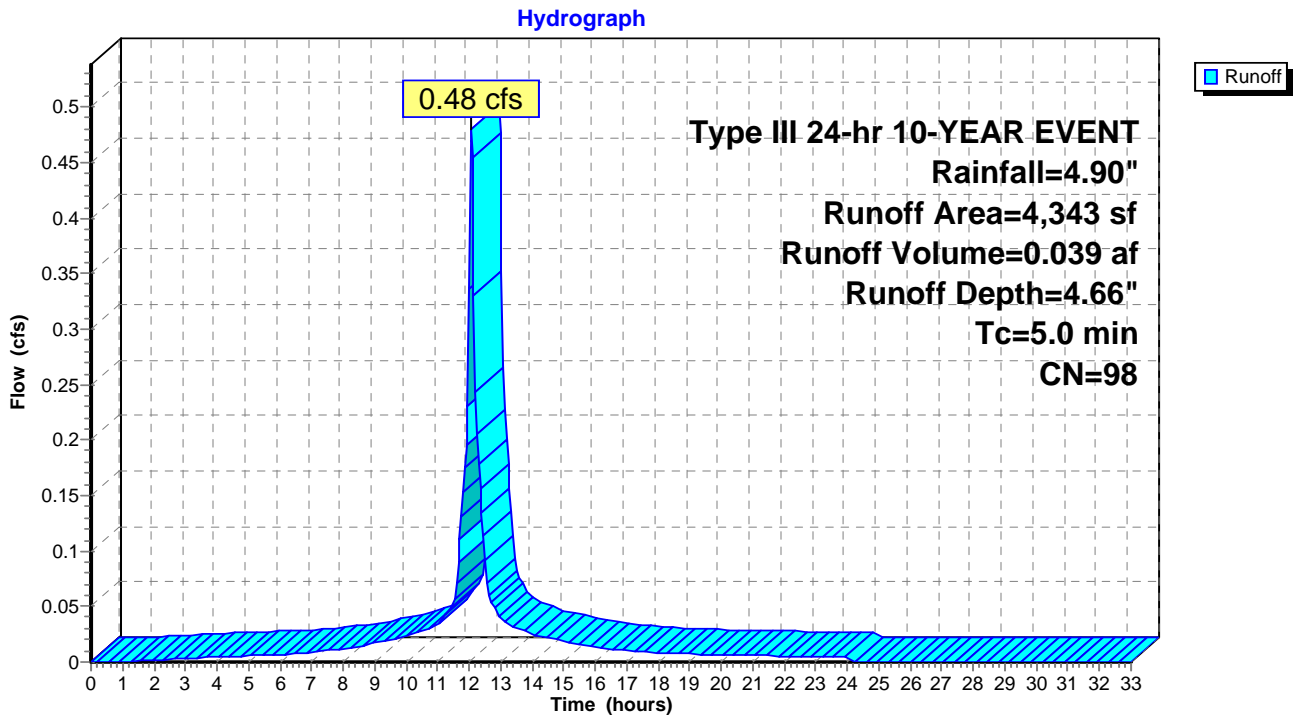
Runoff = 0.48 cfs @ 12.07 hrs, Volume= 0.039 af, Depth= 4.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10-YEAR EVENT Rainfall=4.90"

	Area (sf)	CN	Description
*	1,043	98	Grass Cover
*	3,300	98	New Paved Parking lot
	4,343	98	Weighted Average
	4,343		Impervious Area

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

Subcatchment 1S: New Parking lot-Upper



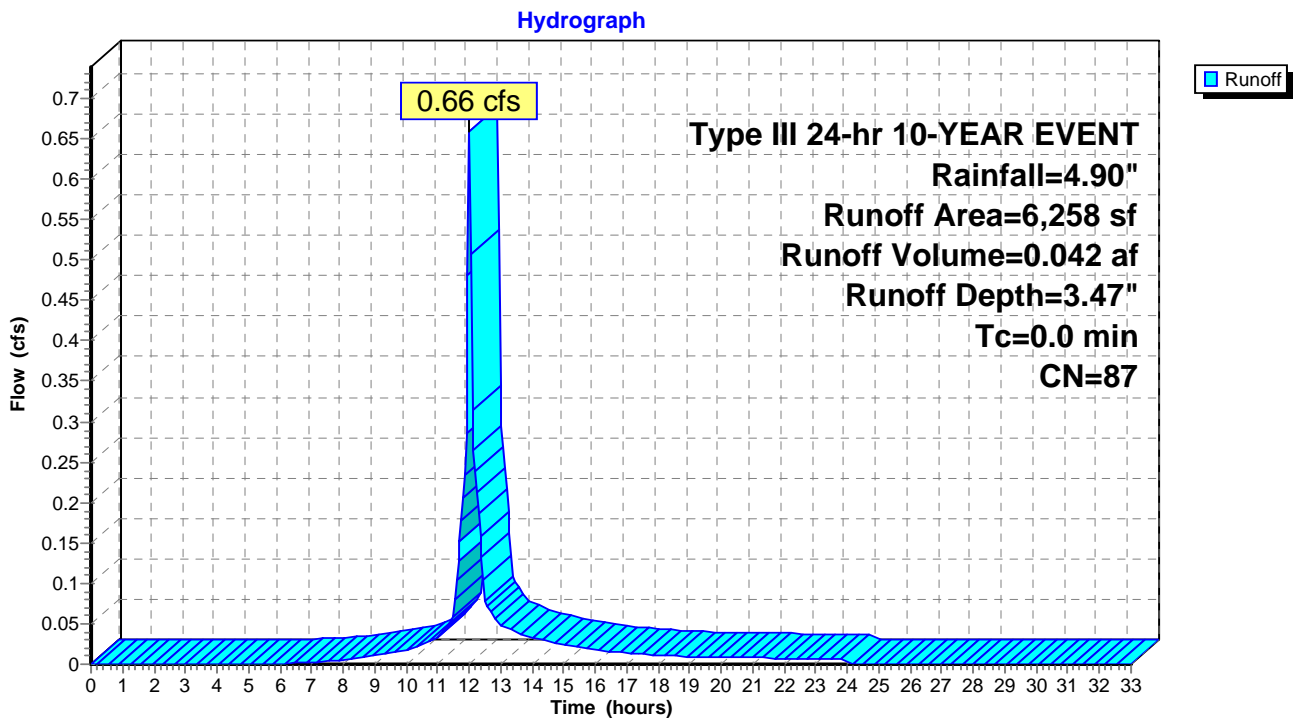
Summary for Subcatchment 8S: New Lower Parking Lot

Runoff = 0.66 cfs @ 12.00 hrs, Volume= 0.042 af, Depth= 3.47"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10-YEAR EVENT Rainfall=4.90"

	Area (sf)	CN	Description
*	770	68	Grass cover
*	440	39	Grass Cover
*	388	39	Grass Cover
*	4,660	98	Parking Lot
	6,258	87	Weighted Average
	1,598		Pervious Area
	4,660		Impervious Area

Subcatchment 8S: New Lower Parking Lot



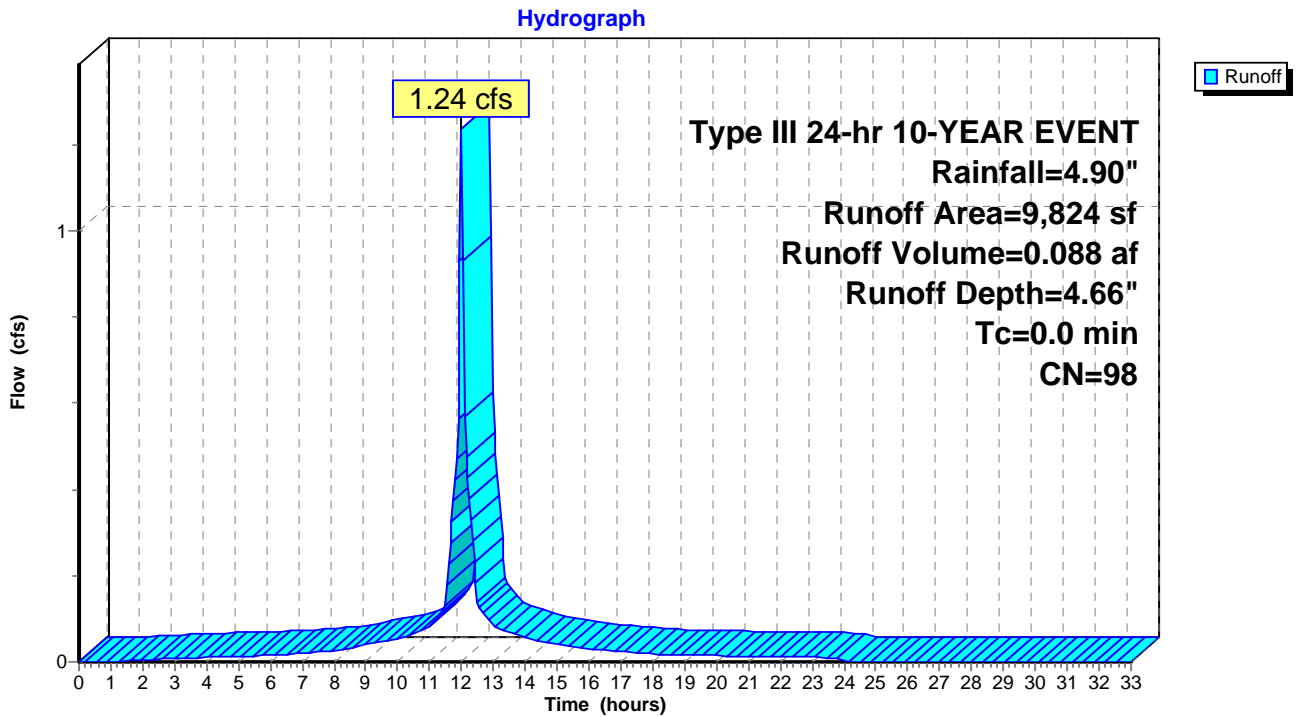
Summary for Subcatchment 11S: Building Roof

Runoff = 1.24 cfs @ 12.00 hrs, Volume= 0.088 af, Depth= 4.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10-YEAR EVENT Rainfall=4.90"

	Area (sf)	CN	Description
*	6,744	98	Existing roof Building
*	3,080	98	Existing Walkway & Stairs
	9,824	98	Weighted Average
	9,824		Impervious Area

Subcatchment 11S: Building Roof



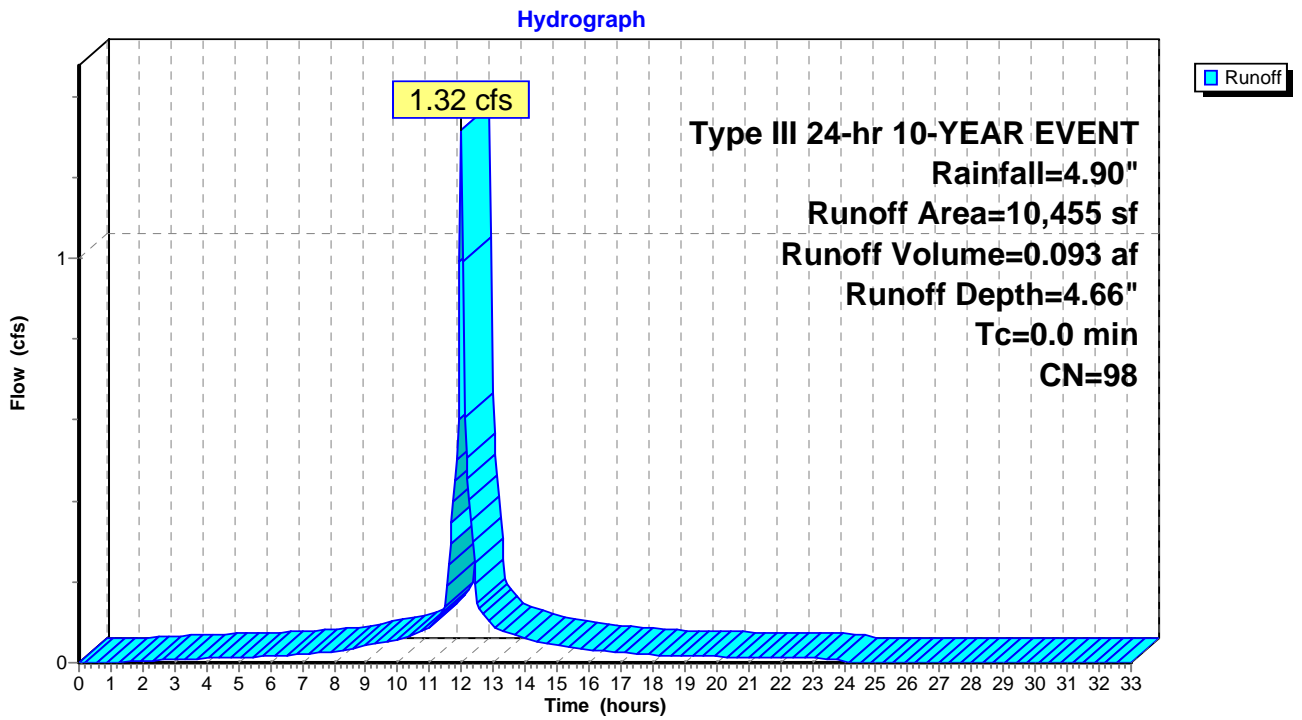
Summary for Subcatchment 22S: Existing Parking lot-Upper

Runoff = 1.32 cfs @ 12.00 hrs, Volume= 0.093 af, Depth= 4.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10-YEAR EVENT Rainfall=4.90"

Area (sf)	CN	Description
* 10,455	98	Existing Paved Parking lot
10,455		Impervious Area

Subcatchment 22S: Existing Parking lot-Upper



Summary for Pond 5P: Cultec Recharge150 XL W/outlet-Lower Parking

Inflow Area = 0.144 ac, 74.46% Impervious, Inflow Depth = 3.47" for 10-YEAR EVENT event
 Inflow = 0.66 cfs @ 12.00 hrs, Volume= 0.042 af
 Outflow = 0.04 cfs @ 13.78 hrs, Volume= 0.030 af, Atten= 95%, Lag= 106.6 min
 Primary = 0.04 cfs @ 13.78 hrs, Volume= 0.030 af

Routing by Stor-Ind method, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
 Peak Elev= 508.52' @ 13.78 hrs Surf.Area= 1,433 sf Storage= 1,138 cf

Plug-Flow detention time= 508.5 min calculated for 0.030 af (72% of inflow)
 Center-of-Mass det. time= 420.0 min (1,216.4 - 796.4)

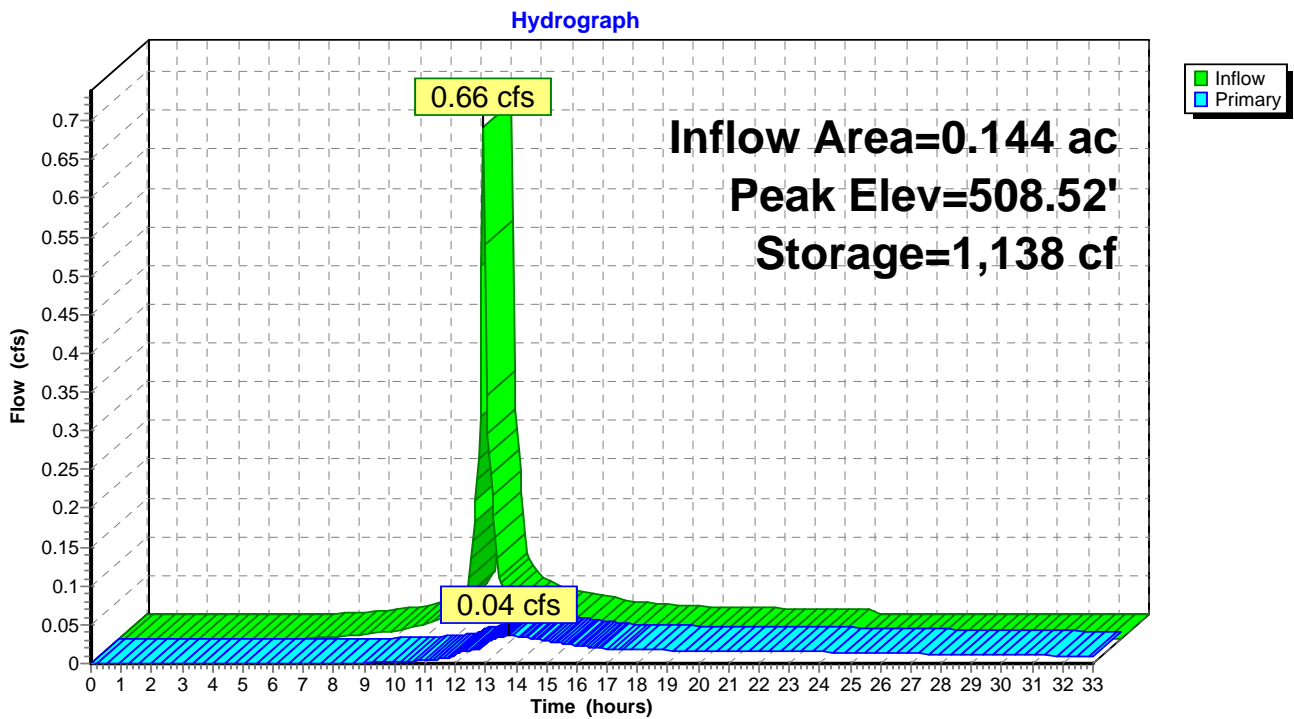
Volume	Invert	Avail.Storage	Storage Description
#1	507.05'	2,188 cf	46.00'W x 24.00'L x 4.00'H Prismatic Z=1.5 6,288 cf Overall - 817 cf Embedded = 5,471 cf x 40.0% Voids
#2	507.55'	817 cf	29.8"W x 19.0"H x 11.00'L Cultec R-150x 28 Inside #1
		3,005 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	507.05'	2.410 in/hr Exfiltration over Horizontal area above invert Excluded Horizontal area = 1,104 sf
#2	Primary	508.44'	6.0" x 44.0' long Culvert CMP, projecting, no headwall, Ke= 0.900 Outlet Invert= 502.00' S= 0.1464 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean

Primary OutFlow Max=0.03 cfs @ 13.78 hrs HW=508.52' (Free Discharge)

- 1=Exfiltration (Exfiltration Controls 0.02 cfs)
- 2=Culvert (Inlet Controls 0.02 cfs @ 0.77 fps)

Pond 5P: Cultec Recharge150 XL W/outlet-Lower Parking



Summary for Pond 13P: Cultec Recharge 150 XL W/outlet-Upper Parking

Inflow Area = 0.100 ac, 100.00% Impervious, Inflow Depth = 4.66" for 10-YEAR EVENT event
 Inflow = 0.48 cfs @ 12.07 hrs, Volume= 0.039 af
 Outflow = 0.17 cfs @ 12.32 hrs, Volume= 0.025 af, Atten= 65%, Lag= 15.1 min
 Primary = 0.17 cfs @ 12.32 hrs, Volume= 0.025 af

Routing by Stor-Ind method, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
 Peak Elev= 527.28' @ 12.32 hrs Surf.Area= 1,377 sf Storage= 921 cf

Plug-Flow detention time= 296.8 min calculated for 0.025 af (64% of inflow)
 Center-of-Mass det. time= 195.0 min (942.4 - 747.4)

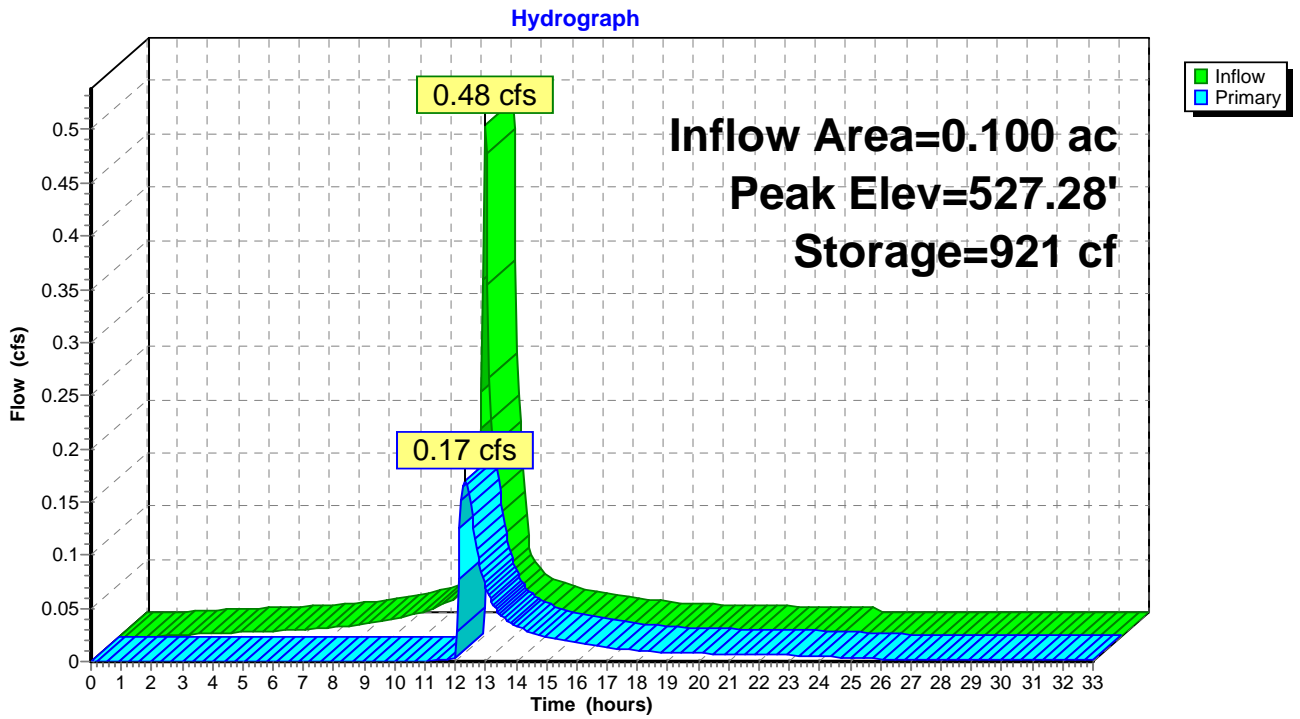
Volume	Invert	Avail.Storage	Storage Description
#1	526.05'	2,188 cf	46.00'W x 24.00'L x 4.00'H Prismatic Z=1.5 6,288 cf Overall - 817 cf Embedded = 5,471 cf x 40.0% Voids
#2	526.55'	817 cf	29.8"W x 19.0"H x 11.00'L Cultec R-150x 28 Inside #1
		3,005 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	526.55'	1.020 in/hr Exfiltration over Horizontal area above invert Excluded Horizontal area = 1,211 sf
#2	Primary	527.00'	6.0" x 181.0' long Culvert CMP, projecting, no headwall, Ke= 0.900 Outlet Invert= 502.00' S= 0.1381 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean

Primary OutFlow Max=0.17 cfs @ 12.32 hrs HW=527.28' (Free Discharge)

- 1=Exfiltration (Exfiltration Controls 0.00 cfs)
- 2=Culvert (Inlet Controls 0.17 cfs @ 1.43 fps)

Pond 13P: Cultec Recharge 150 XL W/outlet-Upper Parking



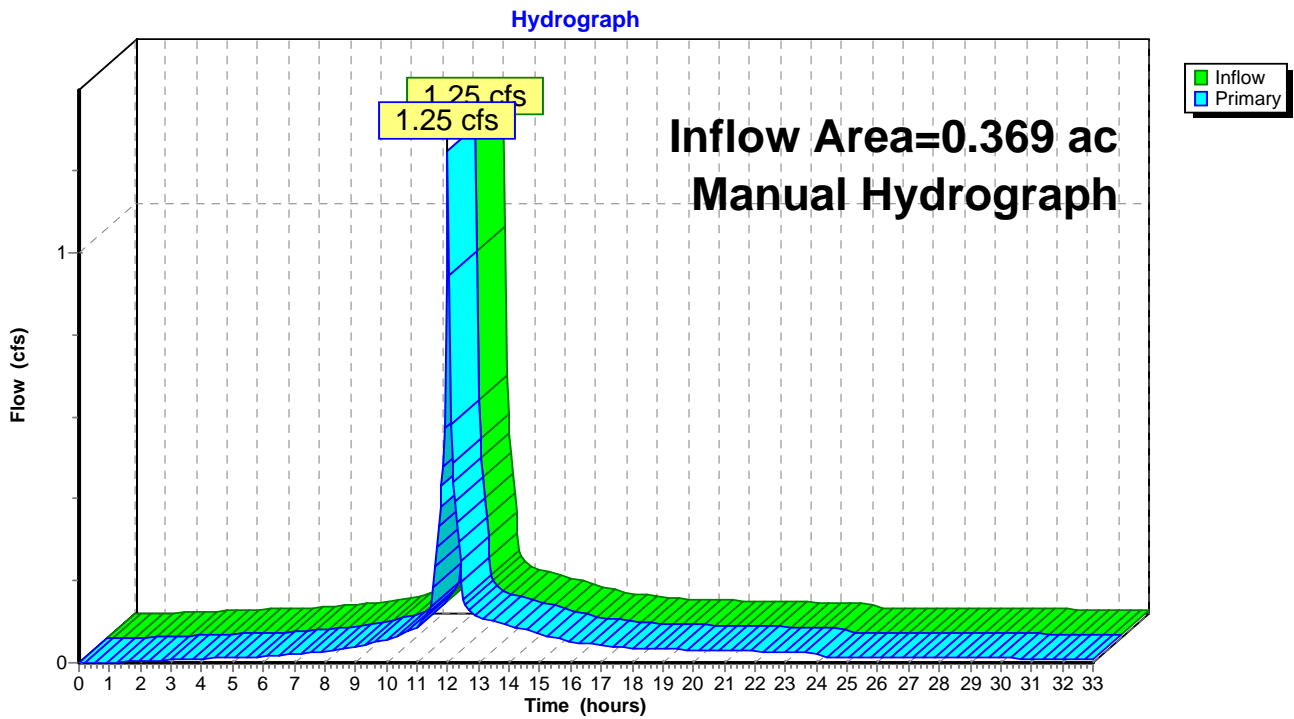
Summary for Link 7L: POA-1-Lower Parking Lot

Inflow Area = 0.369 ac, 90.06% Impervious, Inflow Depth > 3.83" for 10-YEAR EVENT event
Inflow = 1.25 cfs @ 12.00 hrs, Volume= 0.118 af
Primary = 1.25 cfs @ 12.00 hrs, Volume= 0.118 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs

Constant Inflow= 0.00 cfs

Link 7L: POA-1-Lower Parking Lot



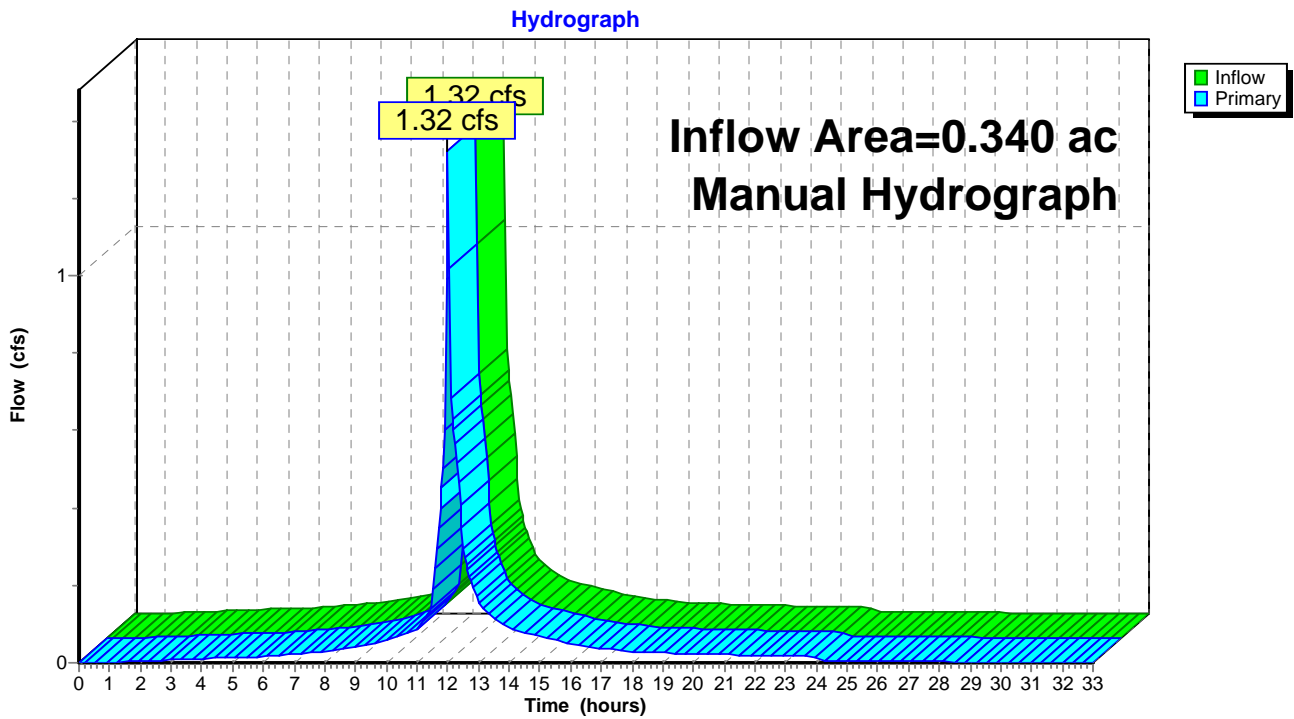
Summary for Link 8L: POA-2 Upper Parking Lot

Inflow Area = 0.340 ac, 100.00% Impervious, Inflow Depth > 4.18" for 10-YEAR EVENT event
Inflow = 1.32 cfs @ 12.00 hrs, Volume= 0.118 af
Primary = 1.32 cfs @ 12.00 hrs, Volume= 0.118 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs

Constant Inflow= 0.00 cfs

Link 8L: POA-2 Upper Parking Lot

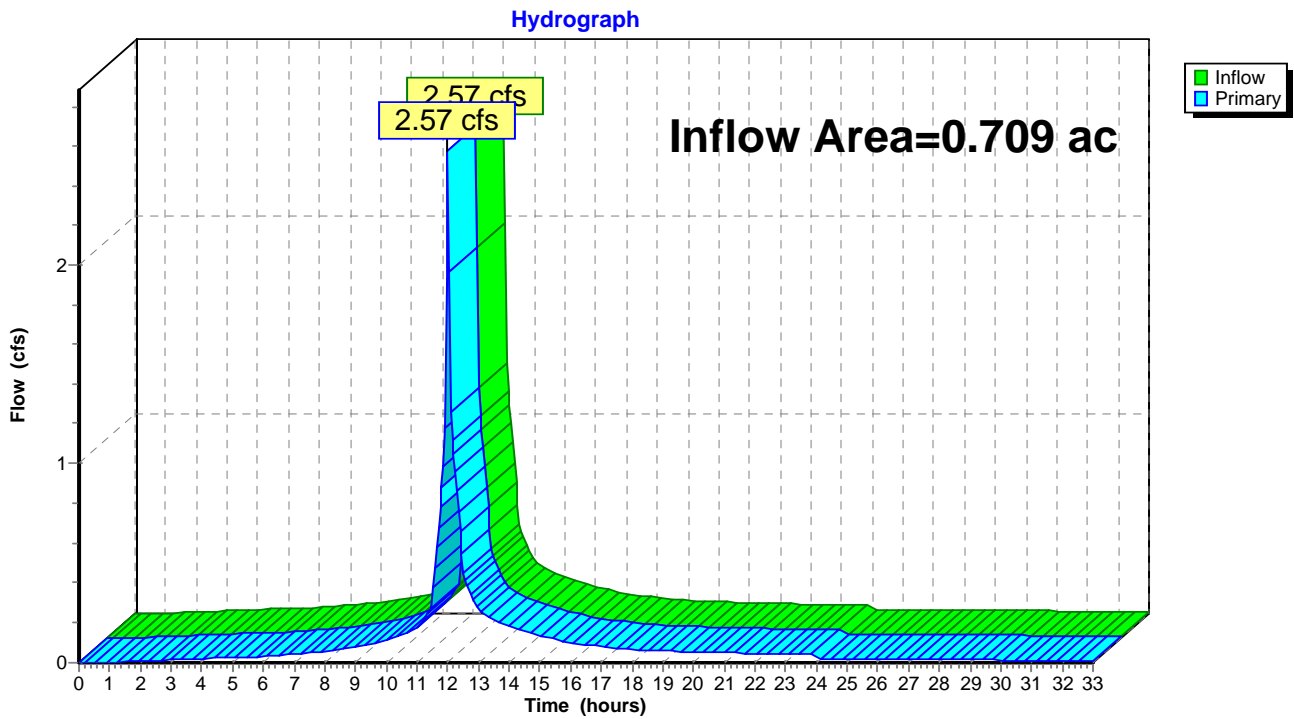


Summary for Link 10L: POA-1&POA-2

Inflow Area = 0.709 ac, 94.83% Impervious, Inflow Depth > 3.99" for 10-YEAR EVENT event
Inflow = 2.57 cfs @ 12.00 hrs, Volume= 0.236 af
Primary = 2.57 cfs @ 12.00 hrs, Volume= 0.236 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs

Link 10L: POA-1&POA-2



Worc-22 Waverlyt- Post development Rev- 8 Type III 24-hr 25-YEAR EVENT Rainfall=6.20"

Prepared by {enter your company name here}

Printed 9/22/2024

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Time span=0.00-33.00 hrs, dt=0.05 hrs, 661 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: New Parking lot-Upper Runoff Area=4,343 sf 100.00% Impervious Runoff Depth=5.96"
Tc=5.0 min CN=98 Runoff=0.61 cfs 0.056 af

Subcatchment 8S: New Lower Parking Lot Runoff Area=6,258 sf 74.46% Impervious Runoff Depth=4.71"
Tc=0.0 min CN=87 Runoff=0.88 cfs 0.056 af

Subcatchment 11S: Building Roof Runoff Area=9,824 sf 100.00% Impervious Runoff Depth=5.96"
Tc=0.0 min CN=98 Runoff=1.57 cfs 0.112 af

Subcatchment 22S: Existing Parking Runoff Area=10,455 sf 100.00% Impervious Runoff Depth=5.96"
Tc=0.0 min CN=98 Runoff=1.67 cfs 0.119 af

Pond 5P: Cultec Recharge150 XL Peak Elev=508.71' Storage=1,297 cf Inflow=0.88 cfs 0.056 af
Outflow=0.17 cfs 0.044 af

Pond 13P: Cultec Recharge 150 XL Peak Elev=527.42' Storage=1,041 cf Inflow=0.61 cfs 0.050 af
Outflow=0.31 cfs 0.036 af

Link 7L: POA-1-Lower Parking Lot Manual Hydrograph Inflow=1.58 cfs 0.156 af
Primary=1.58 cfs 0.156 af

Link 8L: POA-2 Upper Parking Lot Manual Hydrograph Inflow=1.77 cfs 0.155 af
Primary=1.77 cfs 0.155 af

Link 10L: POA-1&POA-2 Inflow=3.35 cfs 0.311 af
Primary=3.35 cfs 0.311 af

Total Runoff Area = 0.709 ac Runoff Volume = 0.337 af Average Runoff Depth = 5.71"
5.17% Pervious = 0.037 ac 94.83% Impervious = 0.672 ac

Summary for Subcatchment 1S: New Parking lot-Upper

Runoff = 0.61 cfs @ 12.07 hrs, Volume= 0.050 af, Depth= 5.96"

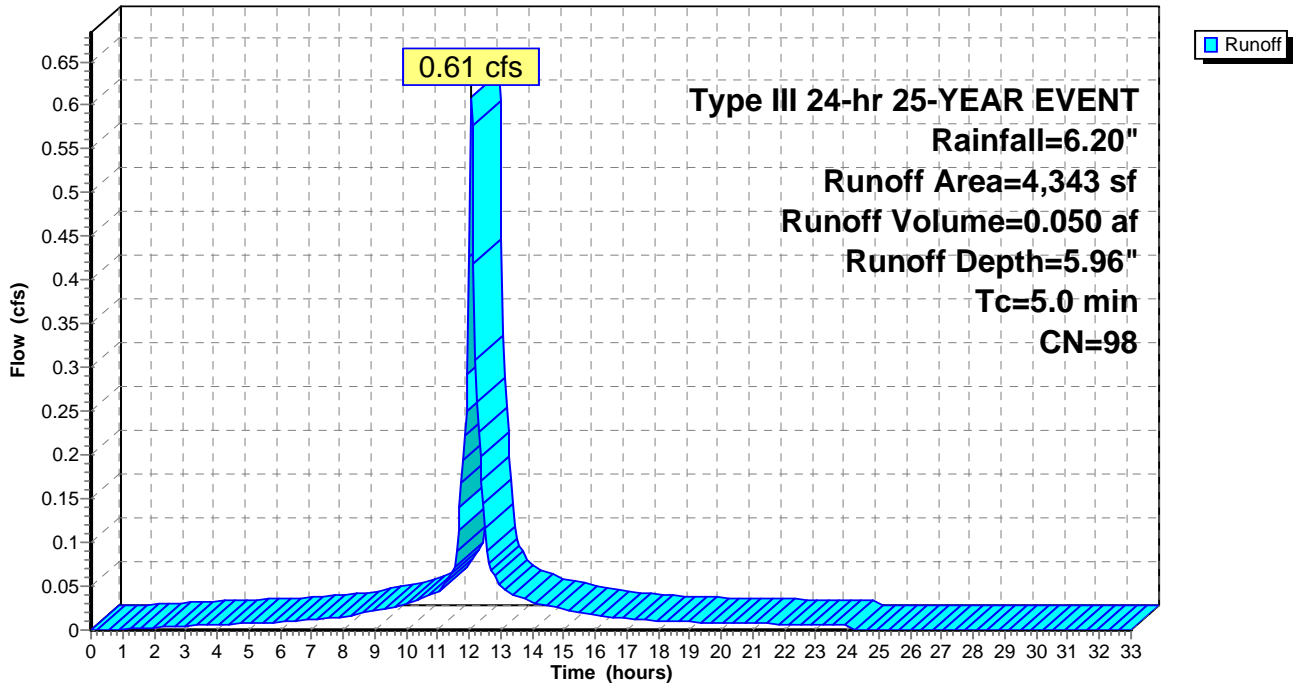
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25-YEAR EVENT Rainfall=6.20"

	Area (sf)	CN	Description
*	1,043	98	Grass Cover
*	3,300	98	New Paved Parking lot
	4,343	98	Weighted Average
	4,343		Impervious Area

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

Subcatchment 1S: New Parking lot-Upper

Hydrograph



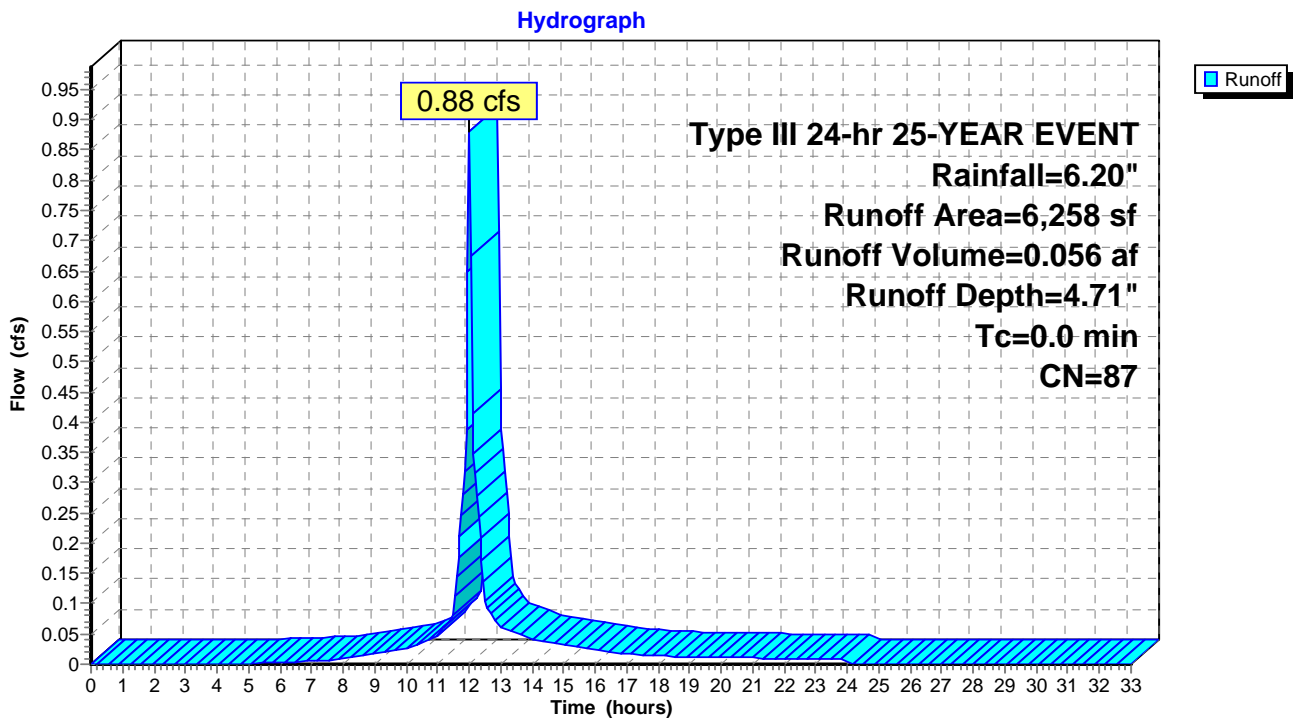
Summary for Subcatchment 8S: New Lower Parking Lot

Runoff = 0.88 cfs @ 12.00 hrs, Volume= 0.056 af, Depth= 4.71"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25-YEAR EVENT Rainfall=6.20"

	Area (sf)	CN	Description
*	770	68	Grass cover
*	440	39	Grass Cover
*	388	39	Grass Cover
*	4,660	98	Parking Lot
<hr/>			
	6,258	87	Weighted Average
	1,598		Pervious Area
	4,660		Impervious Area

Subcatchment 8S: New Lower Parking Lot



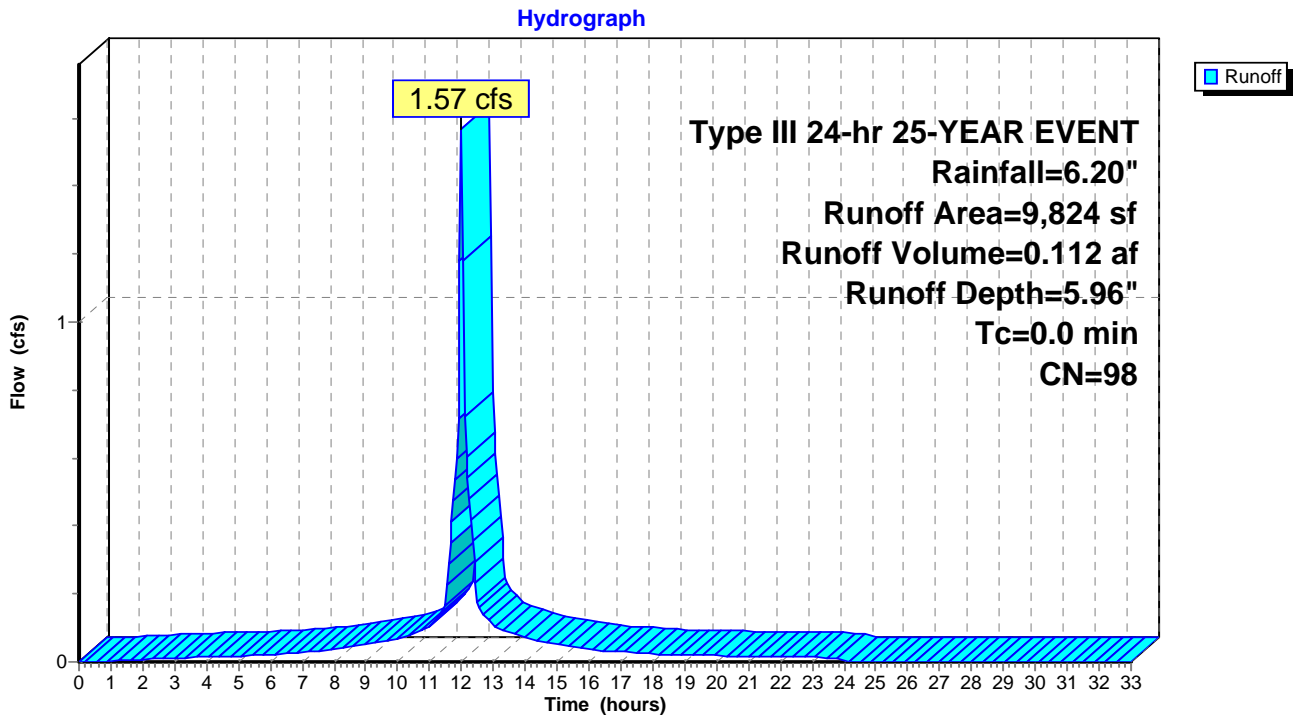
Summary for Subcatchment 11S: Building Roof

Runoff = 1.57 cfs @ 12.00 hrs, Volume= 0.112 af, Depth= 5.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25-YEAR EVENT Rainfall=6.20"

	Area (sf)	CN	Description
*	6,744	98	Existing roof Building
*	3,080	98	Existing Walkway & Stairs
	9,824	98	Weighted Average
	9,824		Impervious Area

Subcatchment 11S: Building Roof



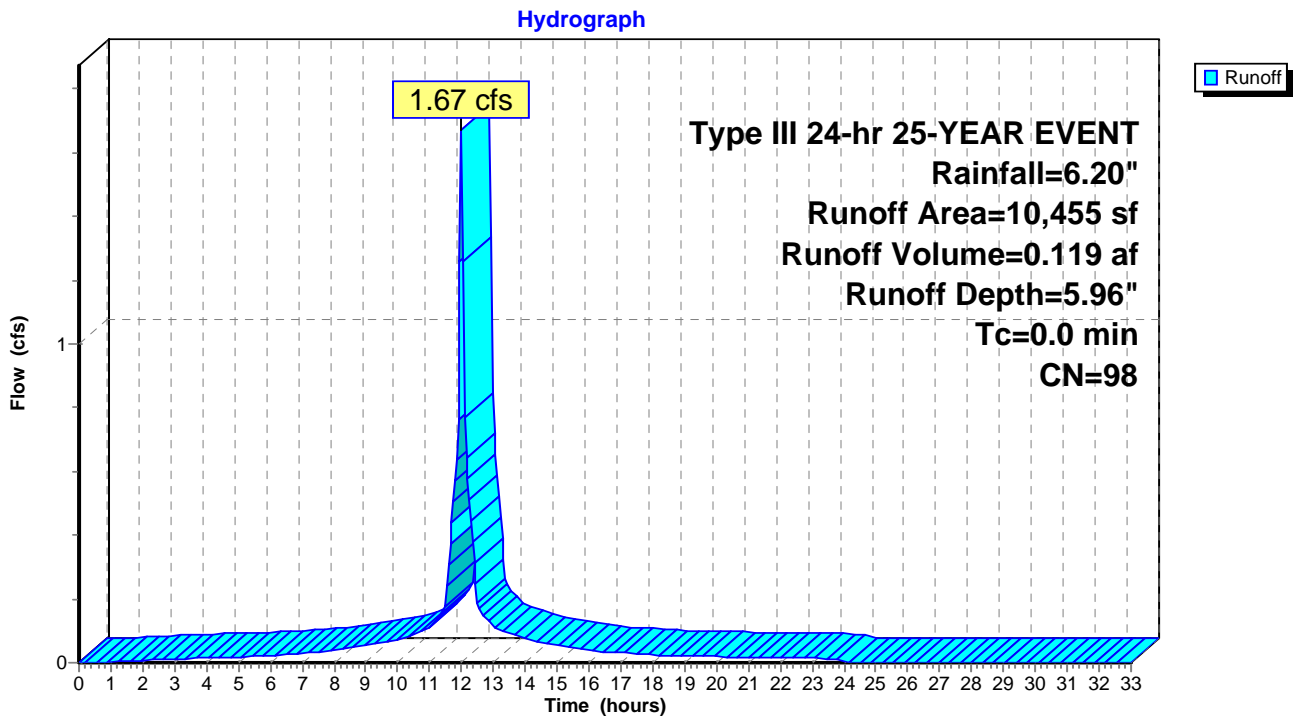
Summary for Subcatchment 22S: Existing Parking lot-Upper

Runoff = 1.67 cfs @ 12.00 hrs, Volume= 0.119 af, Depth= 5.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25-YEAR EVENT Rainfall=6.20"

Area (sf)	CN	Description
* 10,455	98	Existing Paved Parking lot
10,455		Impervious Area

Subcatchment 22S: Existing Parking lot-Upper



Summary for Pond 5P: Cultec Recharge150 XL W/outlet-Lower Parking

Inflow Area = 0.144 ac, 74.46% Impervious, Inflow Depth = 4.71" for 25-YEAR EVENT event
 Inflow = 0.88 cfs @ 12.00 hrs, Volume= 0.056 af
 Outflow = 0.17 cfs @ 12.41 hrs, Volume= 0.044 af, Atten= 81%, Lag= 24.4 min
 Primary = 0.17 cfs @ 12.41 hrs, Volume= 0.044 af

Routing by Stor-Ind method, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
 Peak Elev= 508.71' @ 12.41 hrs Surf.Area= 1,476 sf Storage= 1,297 cf

Plug-Flow detention time= 382.7 min calculated for 0.044 af (78% of inflow)
 Center-of-Mass det. time= 304.6 min (1,092.6 - 787.9)

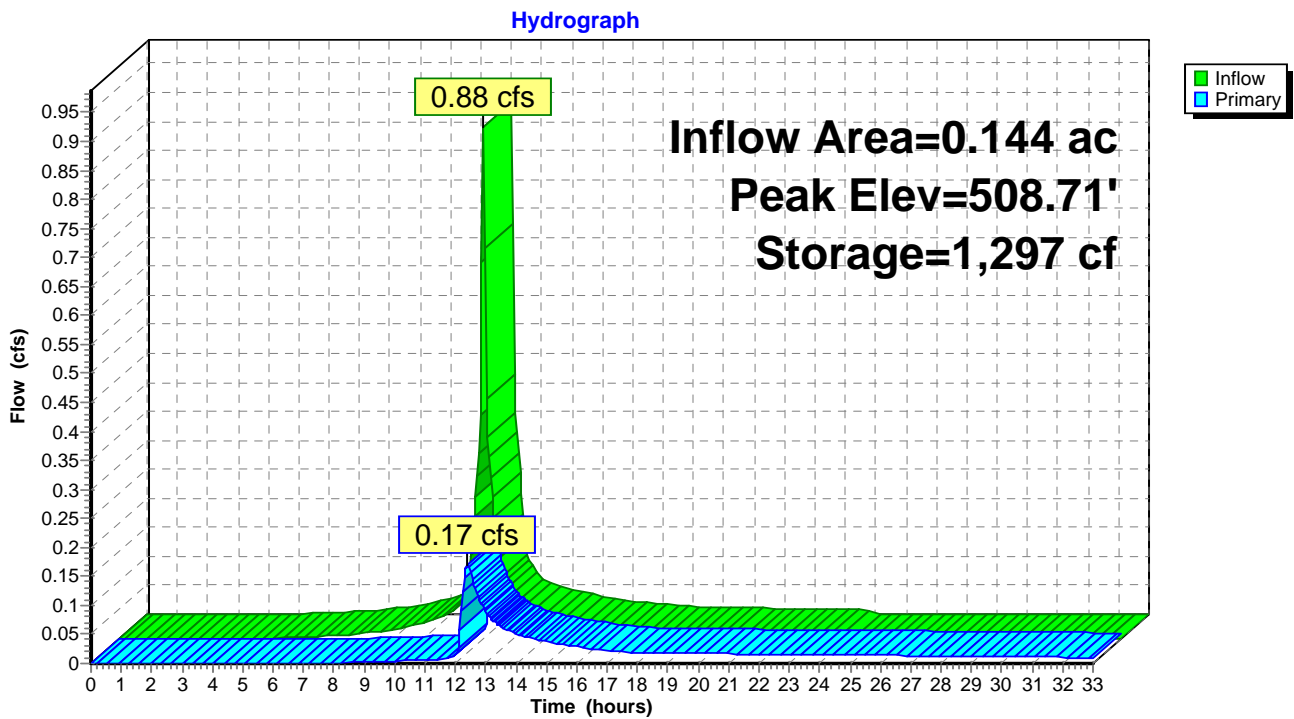
Volume	Invert	Avail.Storage	Storage Description
#1	507.05'	2,188 cf	46.00'W x 24.00'L x 4.00'H Prismatic Z=1.5 6,288 cf Overall - 817 cf Embedded = 5,471 cf x 40.0% Voids
#2	507.55'	817 cf	29.8"W x 19.0"H x 11.00'L Cultec R-150x 28 Inside #1
		3,005 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	507.05'	2.410 in/hr Exfiltration over Horizontal area above invert Excluded Horizontal area = 1,104 sf
#2	Primary	508.44'	6.0" x 44.0' long Culvert CMP, projecting, no headwall, Ke= 0.900 Outlet Invert= 502.00' S= 0.1464 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean

Primary OutFlow Max=0.17 cfs @ 12.41 hrs HW=508.71' (Free Discharge)

- 1=Exfiltration (Exfiltration Controls 0.02 cfs)
- 2=Culvert (Inlet Controls 0.15 cfs @ 1.38 fps)

Pond 5P: Cultec Recharge150 XL W/outlet-Lower Parking



Summary for Pond 13P: Cultec Recharge 150 XL W/outlet-Upper Parking

Inflow Area = 0.100 ac, 100.00% Impervious, Inflow Depth = 5.96" for 25-YEAR EVENT event
 Inflow = 0.61 cfs @ 12.07 hrs, Volume= 0.050 af
 Outflow = 0.31 cfs @ 12.21 hrs, Volume= 0.036 af, Atten= 50%, Lag= 8.6 min
 Primary = 0.31 cfs @ 12.21 hrs, Volume= 0.036 af

Routing by Stor-Ind method, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
 Peak Elev= 527.42' @ 12.21 hrs Surf.Area= 1,408 sf Storage= 1,041 cf

Plug-Flow detention time= 251.1 min calculated for 0.036 af (72% of inflow)
 Center-of-Mass det. time= 160.3 min (904.0 - 743.7)

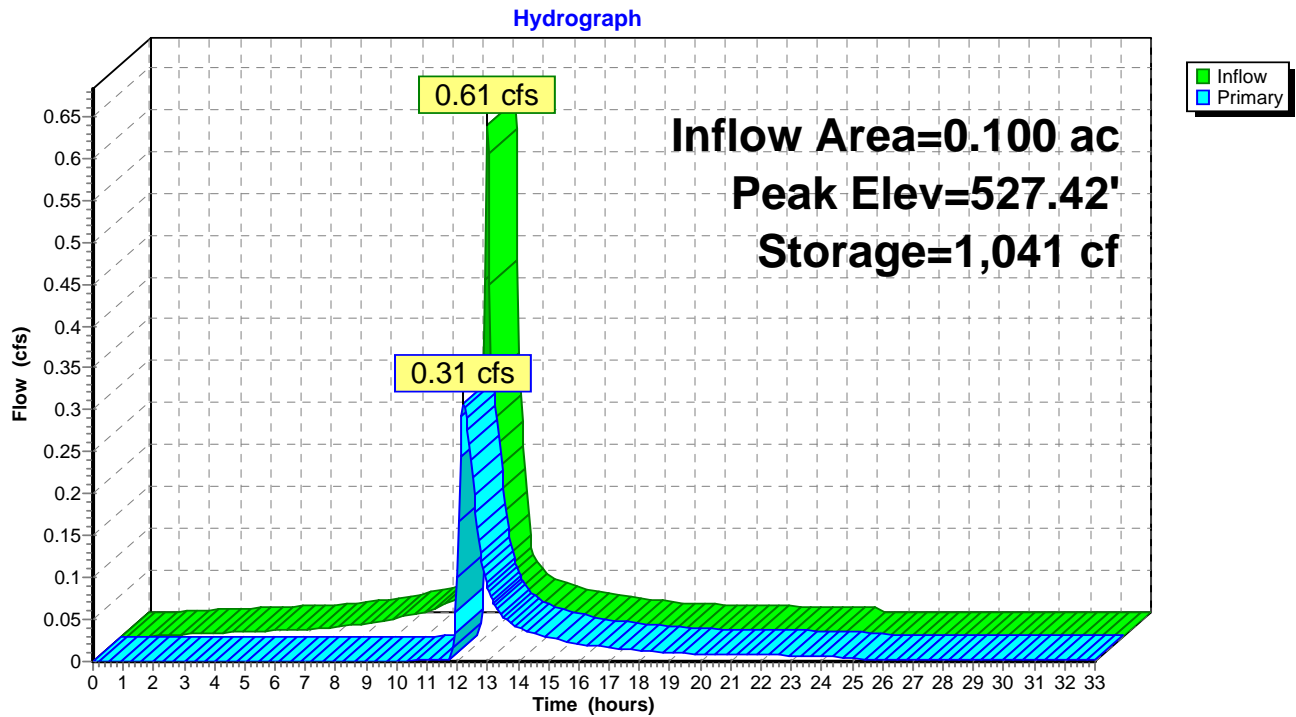
Volume	Invert	Avail.Storage	Storage Description
#1	526.05'	2,188 cf	46.00'W x 24.00'L x 4.00'H Prismatic Z=1.5 6,288 cf Overall - 817 cf Embedded = 5,471 cf x 40.0% Voids
#2	526.55'	817 cf	29.8"W x 19.0"H x 11.00'L Cultec R-150x 28 Inside #1
		3,005 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	526.55'	1.020 in/hr Exfiltration over Horizontal area above invert Excluded Horizontal area = 1,211 sf
#2	Primary	527.00'	6.0" x 181.0' long Culvert CMP, projecting, no headwall, Ke= 0.900 Outlet Invert= 502.00' S= 0.1381 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean

Primary OutFlow Max=0.30 cfs @ 12.21 hrs HW=527.41' (Free Discharge)

- 1=Exfiltration (Exfiltration Controls 0.00 cfs)
- 2=Culvert (Inlet Controls 0.30 cfs @ 1.73 fps)

Pond 13P: Cultec Recharge 150 XL W/outlet-Upper Parking



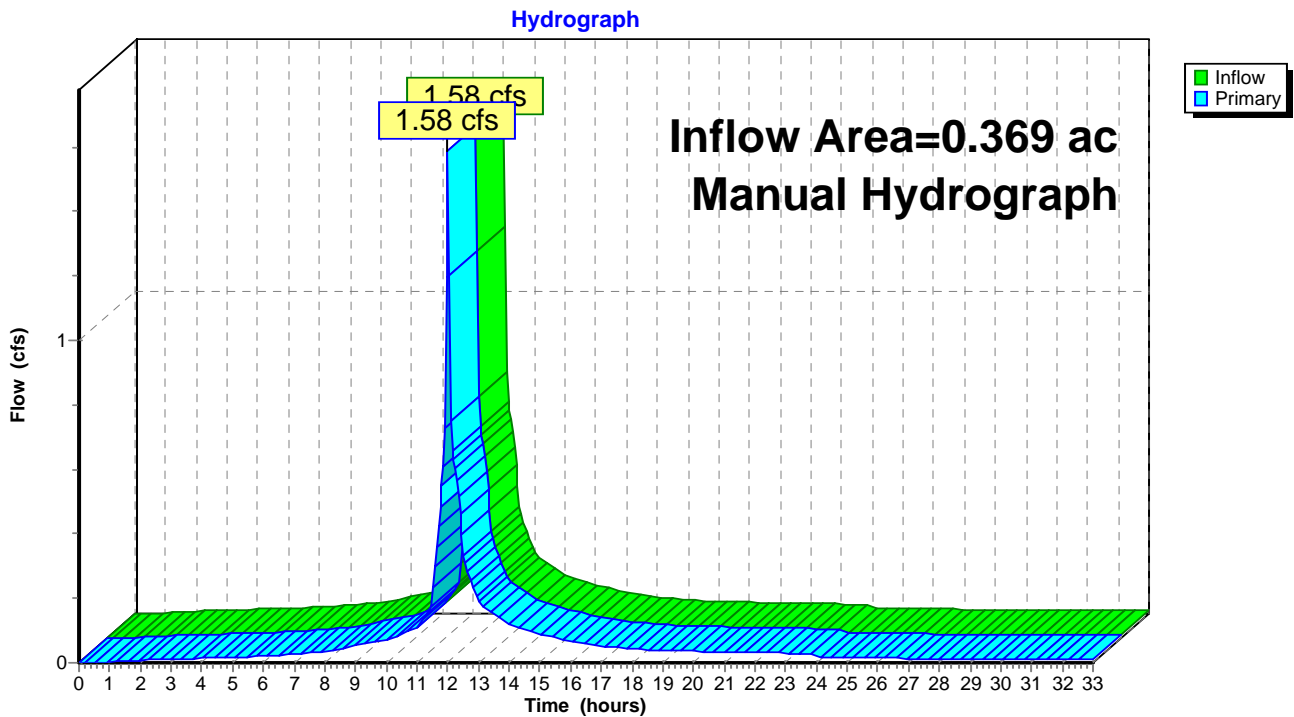
Summary for Link 7L: POA-1-Lower Parking Lot

Inflow Area = 0.369 ac, 90.06% Impervious, Inflow Depth > 5.07" for 25-YEAR EVENT event
Inflow = 1.58 cfs @ 12.00 hrs, Volume= 0.156 af
Primary = 1.58 cfs @ 12.00 hrs, Volume= 0.156 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs

Constant Inflow= 0.00 cfs

Link 7L: POA-1-Lower Parking Lot



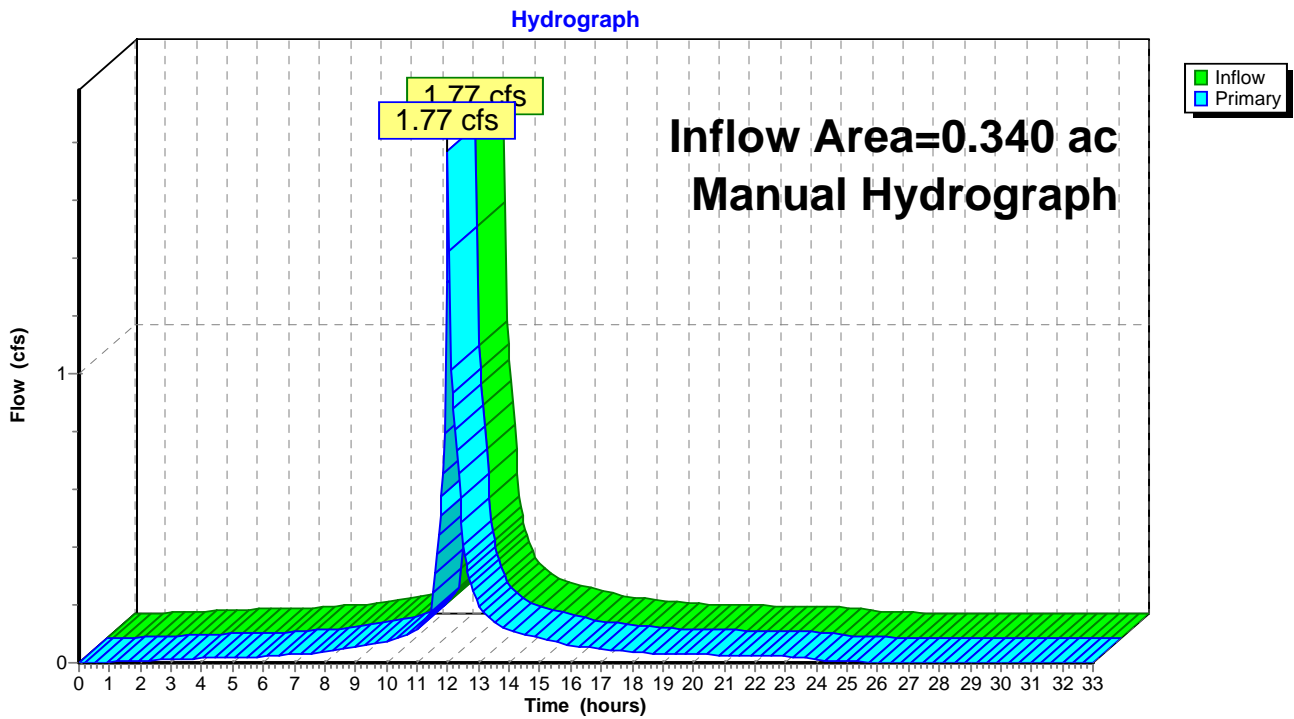
Summary for Link 8L: POA-2 Upper Parking Lot

Inflow Area = 0.340 ac, 100.00% Impervious, Inflow Depth > 5.47" for 25-YEAR EVENT event
Inflow = 1.77 cfs @ 12.00 hrs, Volume= 0.155 af
Primary = 1.77 cfs @ 12.00 hrs, Volume= 0.155 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs

Constant Inflow= 0.00 cfs

Link 8L: POA-2 Upper Parking Lot

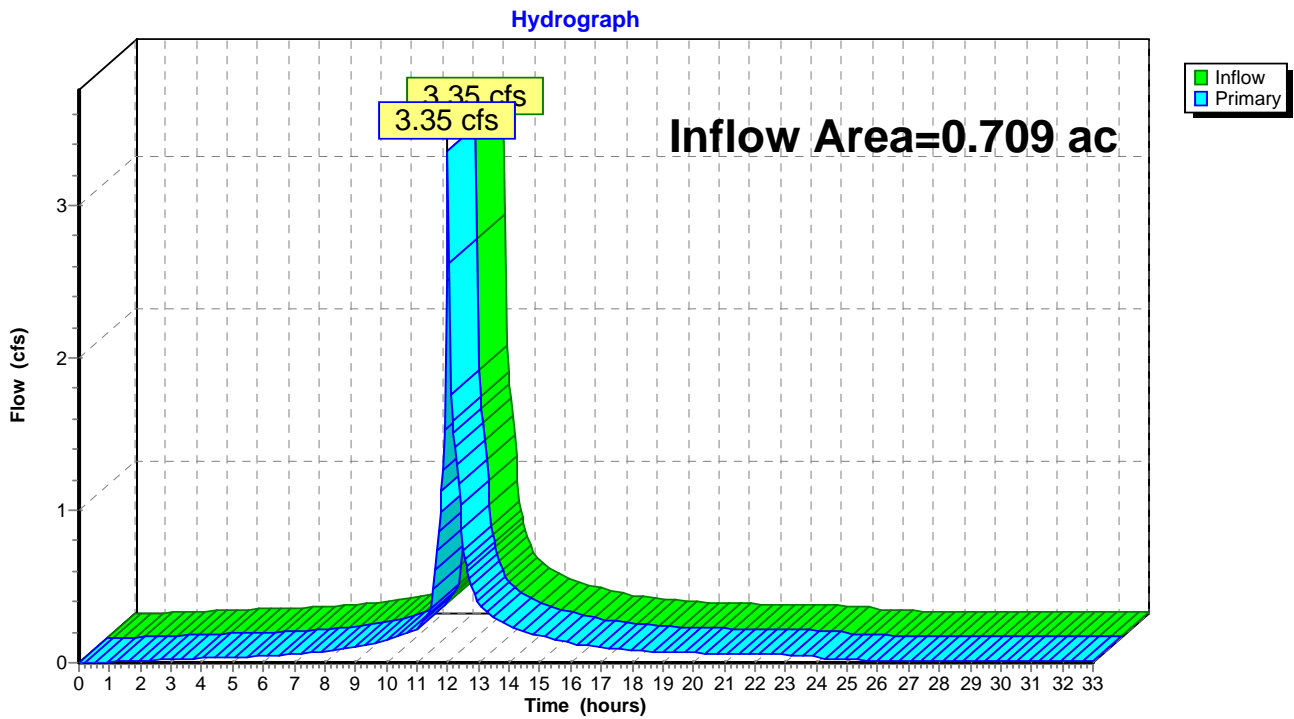


Summary for Link 10L: POA-1&POA-2

Inflow Area = 0.709 ac, 94.83% Impervious, Inflow Depth > 5.26" for 25-YEAR EVENT event
Inflow = 3.35 cfs @ 12.00 hrs, Volume= 0.311 af
Primary = 3.35 cfs @ 12.00 hrs, Volume= 0.311 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs

Link 10L: POA-1&POA-2



Worc-22 Waverlyt- Post development Rev- Type III 24-hr 100-YEAR EVENT Rainfall=8.90"

Prepared by {enter your company name here}

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Time span=0.00-33.00 hrs, dt=0.05 hrs, 661 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: New Parking lot-Upper Runoff Area=4,343 sf 100.00% Impervious Runoff Depth=8.66"
Tc=5.0 min CN=98 Runoff=0.88 cfs 0.072 af

Subcatchment 8S: New Lower Parking Lot Runoff Area=6,258 sf 74.46% Impervious Runoff Depth=7.33"
Tc=0.0 min CN=87 Runoff=1.34 cfs 0.088 af

Subcatchment 11S: Building Roof Runoff Area=9,824 sf 100.00% Impervious Runoff Depth=8.66"
Tc=0.0 min CN=98 Runoff=2.26 cfs 0.163 af

Subcatchment 22S: Existing Parking Runoff Area=10,455 sf 100.00% Impervious Runoff Depth=8.66"
Tc=0.0 min CN=98 Runoff=2.40 cfs 0.173 af

Pond 5P: Cultec Recharge150 XL Peak Elev=509.16' Storage=1,622 cf Inflow=1.34 cfs 0.088 af
Outflow=0.54 cfs 0.074 af

Pond 13P: Cultec Recharge 150 XL Peak Elev=527.64' Storage=1,236 cf Inflow=0.88 cfs 0.072 af
Outflow=0.47 cfs 0.058 af

Link 7L: POA-1-Lower Parking Lot Manual Hydrograph Inflow=2.60 cfs 0.237 af
Primary=2.60 cfs 0.237 af

Link 8L: POA-2 Upper Parking Lot Manual Hydrograph Inflow=2.69 cfs 0.231 af
Primary=2.69 cfs 0.231 af

Link 10L: POA-1&POA-2 Inflow=5.29 cfs 0.468 af
Primary=5.29 cfs 0.468 af

Total Runoff Area = 0.709 ac Runoff Volume = 0.496 af Average Runoff Depth = 8.39"
5.17% Pervious = 0.037 ac 94.83% Impervious = 0.672 ac

Summary for Subcatchment 1S: New Parking lot-Upper

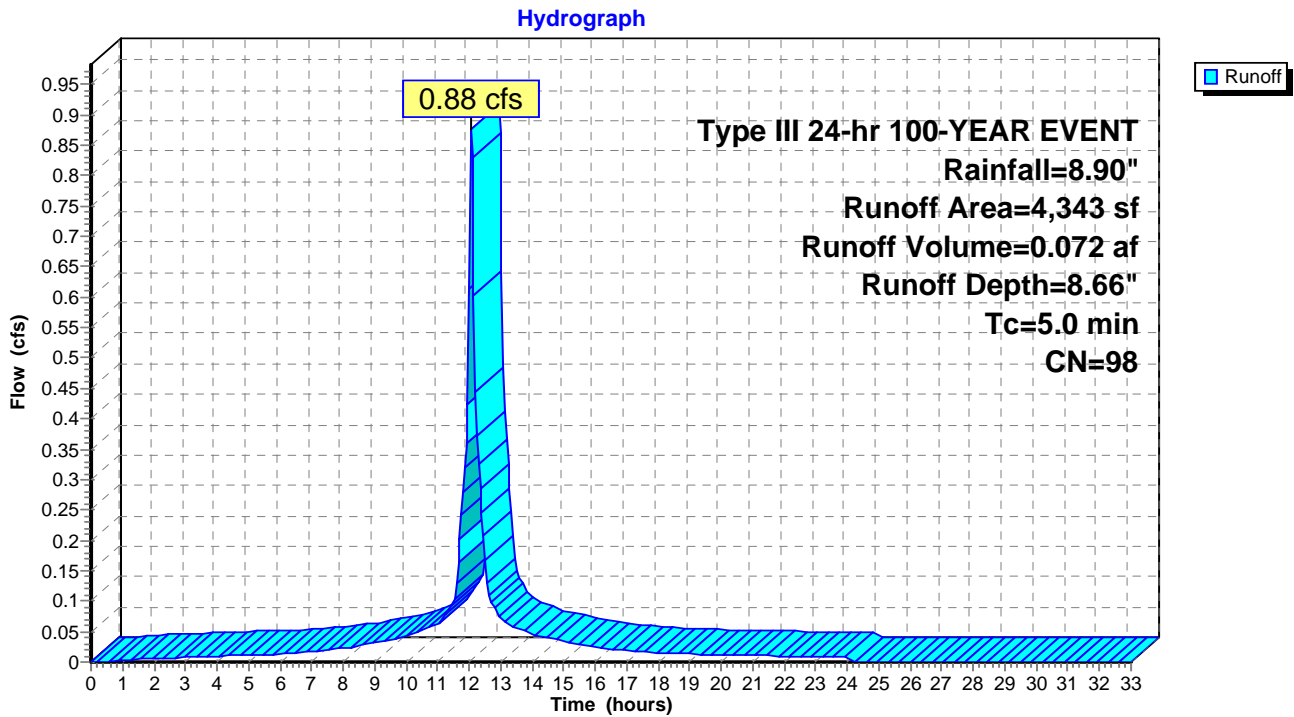
Runoff = 0.88 cfs @ 12.07 hrs, Volume= 0.072 af, Depth= 8.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-YEAR EVENT Rainfall=8.90"

	Area (sf)	CN	Description
*	1,043	98	Grass Cover
*	3,300	98	New Paved Parking lot
	4,343	98	Weighted Average
	4,343		Impervious Area

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

Subcatchment 1S: New Parking lot-Upper



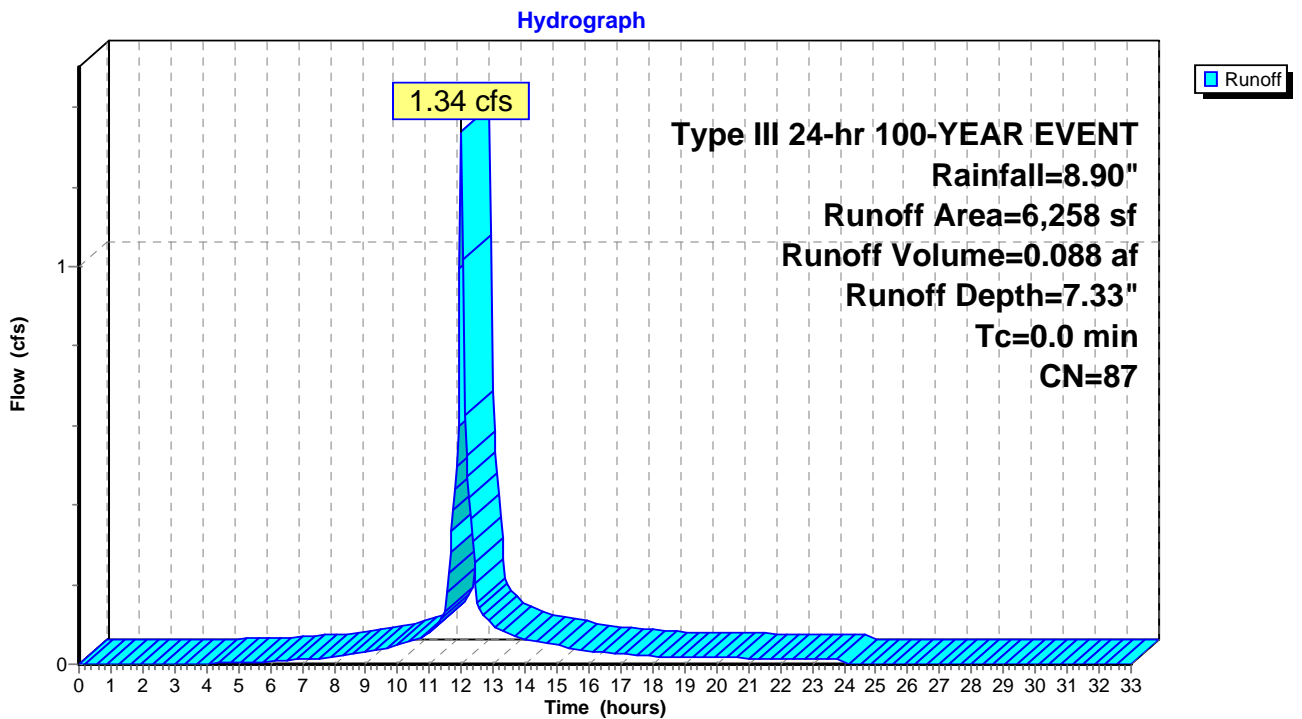
Summary for Subcatchment 8S: New Lower Parking Lot

Runoff = 1.34 cfs @ 12.00 hrs, Volume= 0.088 af, Depth= 7.33"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-YEAR EVENT Rainfall=8.90"

Area (sf)	CN	Description
* 770	68	Grass cover
* 440	39	Grass Cover
* 388	39	Grass Cover
* 4,660	98	Parking Lot
6,258	87	Weighted Average
1,598		Pervious Area
4,660		Impervious Area

Subcatchment 8S: New Lower Parking Lot



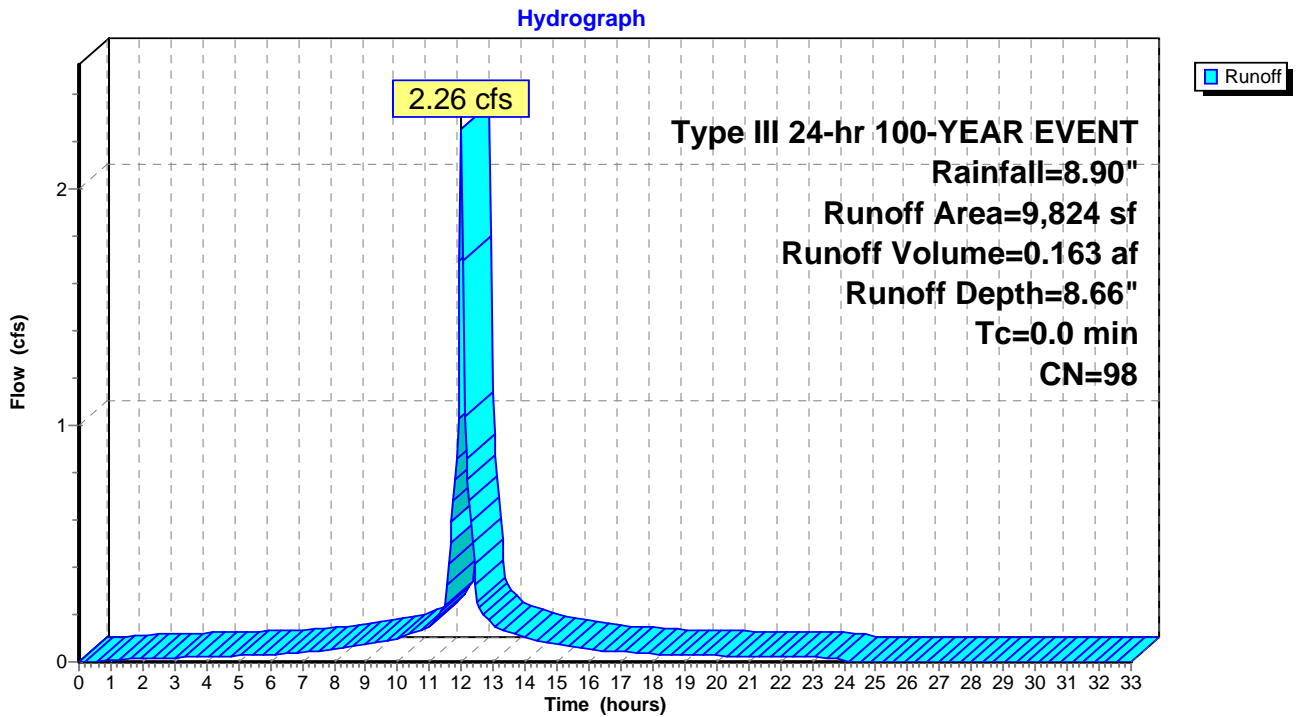
Summary for Subcatchment 11S: Building Roof

Runoff = 2.26 cfs @ 12.00 hrs, Volume= 0.163 af, Depth= 8.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-YEAR EVENT Rainfall=8.90"

	Area (sf)	CN	Description
*	6,744	98	Existing roof Building
*	3,080	98	Existing Walkway & Stairs
	9,824	98	Weighted Average
	9,824		Impervious Area

Subcatchment 11S: Building Roof



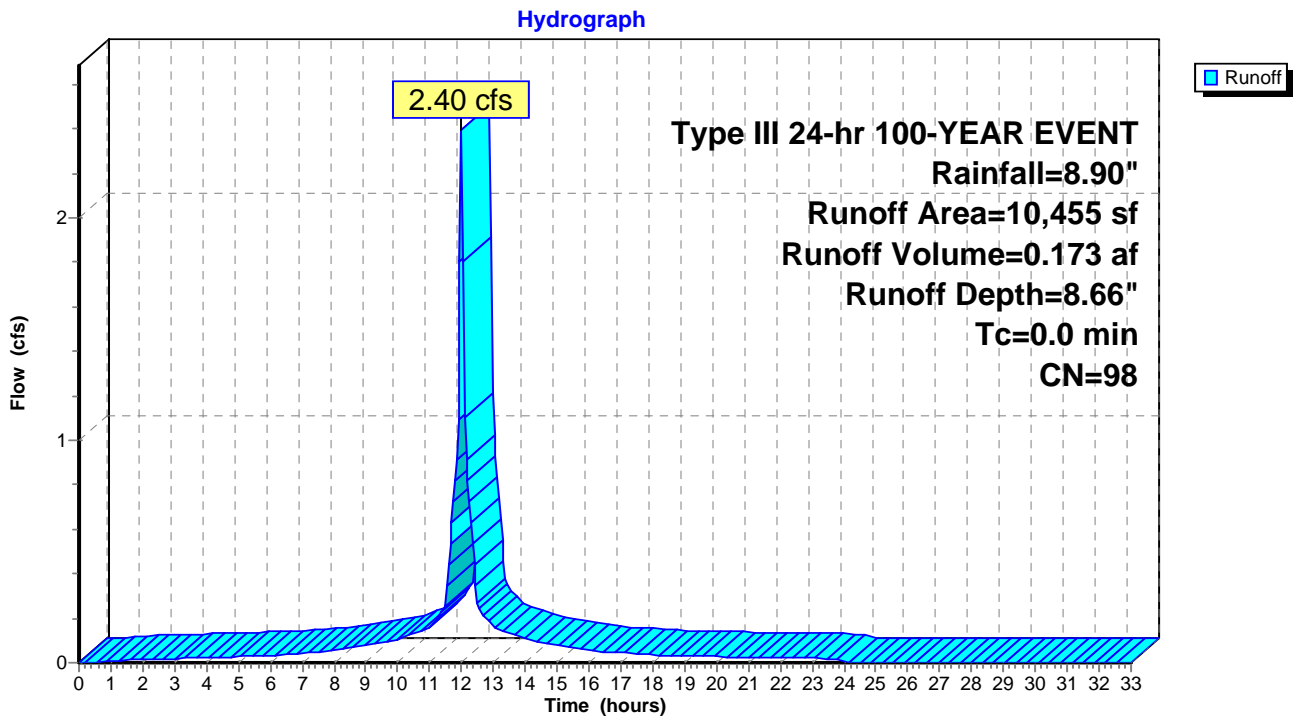
Summary for Subcatchment 22S: Existing Parking lot-Upper

Runoff = 2.40 cfs @ 12.00 hrs, Volume= 0.173 af, Depth= 8.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-YEAR EVENT Rainfall=8.90"

Area (sf)	CN	Description
* 10,455	98	Existing Paved Parking lot
10,455		Impervious Area

Subcatchment 22S: Existing Parking lot-Upper



Summary for Pond 5P: Cultec Recharge150 XL W/outlet-Lower Parking

Inflow Area = 0.144 ac, 74.46% Impervious, Inflow Depth = 7.33" for 100-YEAR EVENT event
 Inflow = 1.34 cfs @ 12.00 hrs, Volume= 0.088 af
 Outflow = 0.54 cfs @ 12.15 hrs, Volume= 0.074 af, Atten= 60%, Lag= 8.8 min
 Primary = 0.54 cfs @ 12.15 hrs, Volume= 0.074 af

Routing by Stor-Ind method, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
 Peak Elev= 509.16' @ 12.15 hrs Surf.Area= 1,588 sf Storage= 1,622 cf

Plug-Flow detention time= 262.9 min calculated for 0.074 af (85% of inflow)
 Center-of-Mass det. time= 198.1 min (974.1 - 776.0)

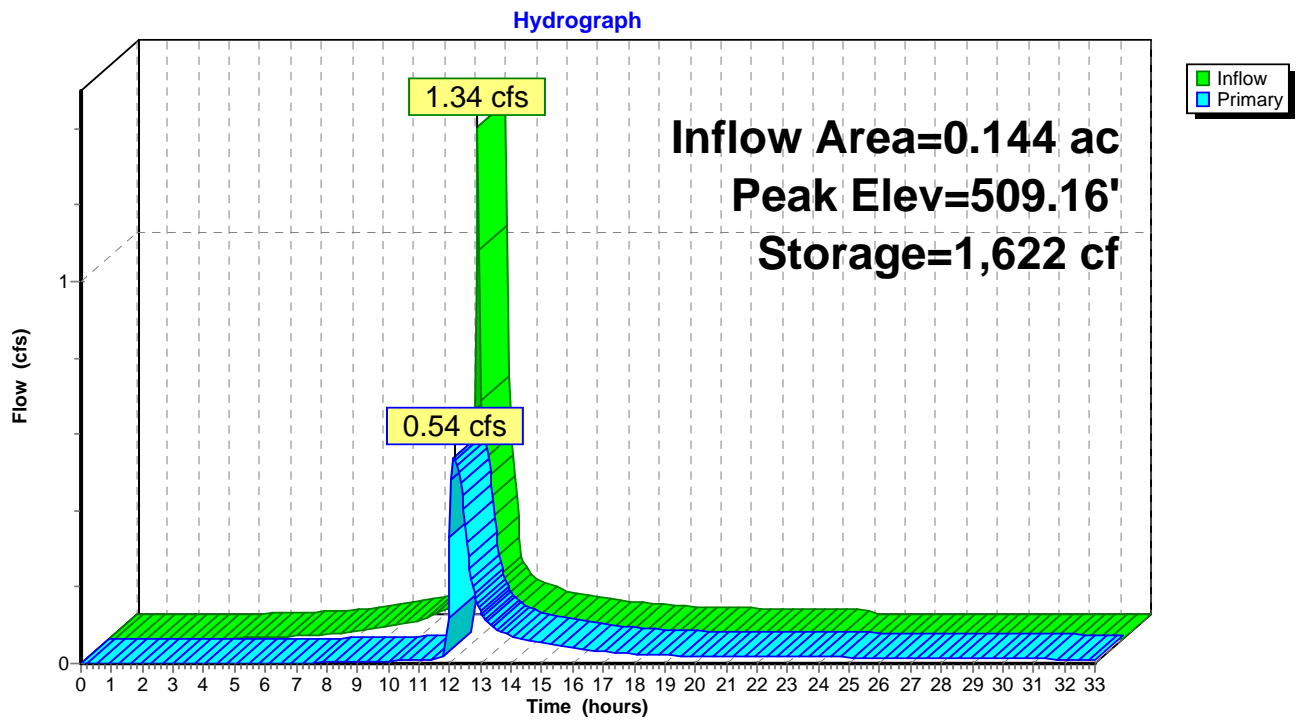
Volume	Invert	Avail.Storage	Storage Description
#1	507.05'	2,188 cf	46.00'W x 24.00'L x 4.00'H Prismatic Z=1.5 6,288 cf Overall - 817 cf Embedded = 5,471 cf x 40.0% Voids
#2	507.55'	817 cf	29.8"W x 19.0"H x 11.00'L Cultec R-150x 28 Inside #1
		3,005 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	507.05'	2.410 in/hr Exfiltration over Horizontal area above invert Excluded Horizontal area = 1,104 sf
#2	Primary	508.44'	6.0" x 44.0' long Culvert CMP, projecting, no headwall, Ke= 0.900 Outlet Invert= 502.00' S= 0.1464 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean

Primary OutFlow Max=0.54 cfs @ 12.15 hrs HW=509.16' (Free Discharge)

- 1=Exfiltration (Exfiltration Controls 0.03 cfs)
- 2=Culvert (Inlet Controls 0.51 cfs @ 2.61 fps)

Pond 5P: Cultec Recharge150 XL W/outlet-Lower Parking



Summary for Pond 13P: Cultec Recharge 150 XL W/outlet-Upper Parking

Inflow Area = 0.100 ac, 100.00% Impervious, Inflow Depth = 8.66" for 100-YEAR EVENT event
 Inflow = 0.88 cfs @ 12.07 hrs, Volume= 0.072 af
 Outflow = 0.47 cfs @ 12.20 hrs, Volume= 0.058 af, Atten= 47%, Lag= 7.8 min
 Primary = 0.47 cfs @ 12.20 hrs, Volume= 0.058 af

Routing by Stor-Ind method, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
 Peak Elev= 527.64' @ 12.20 hrs Surf.Area= 1,459 sf Storage= 1,236 cf

Plug-Flow detention time= 203.6 min calculated for 0.058 af (81% of inflow)
 Center-of-Mass det. time= 127.3 min (866.3 - 739.0)

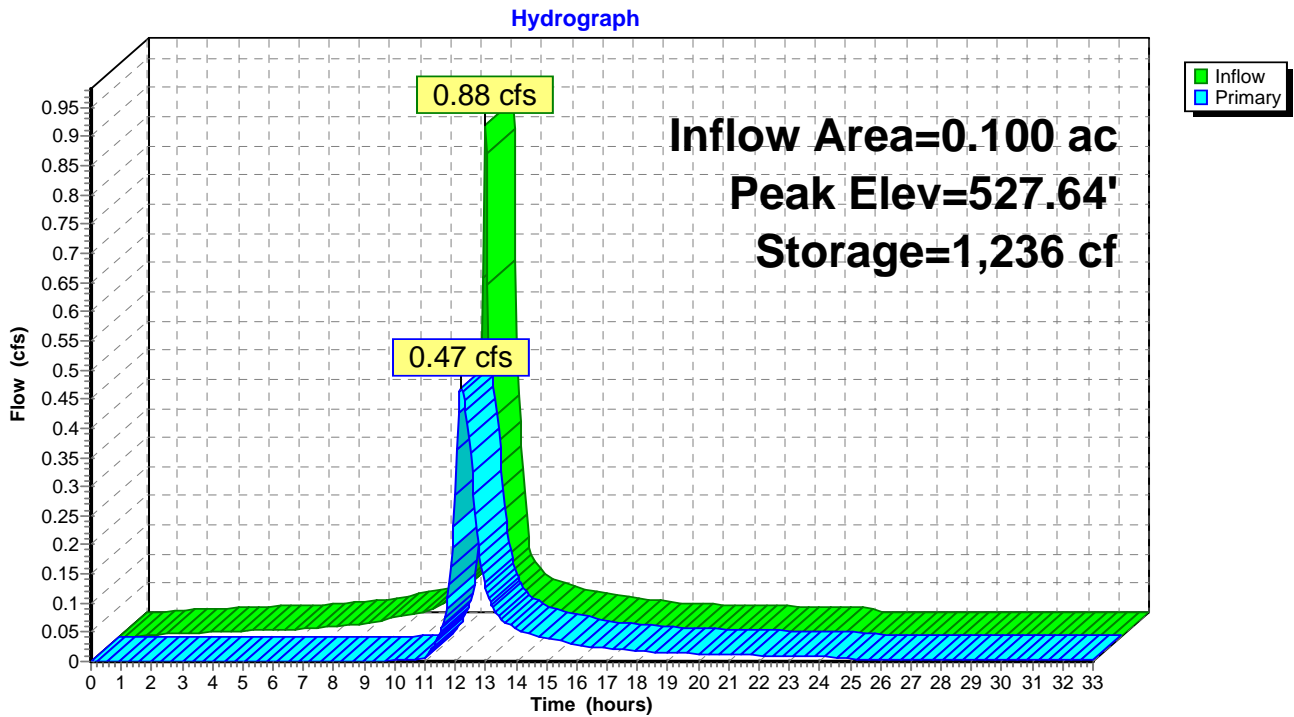
Volume	Invert	Avail.Storage	Storage Description
#1	526.05'	2,188 cf	46.00'W x 24.00'L x 4.00'H Prismatic Z=1.5 6,288 cf Overall - 817 cf Embedded = 5,471 cf x 40.0% Voids
#2	526.55'	817 cf	29.8"W x 19.0"H x 11.00'L Cultec R-150x 28 Inside #1
		3,005 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	526.55'	1.020 in/hr Exfiltration over Horizontal area above invert Excluded Horizontal area = 1,211 sf
#2	Primary	527.00'	6.0" x 181.0' long Culvert CMP, projecting, no headwall, Ke= 0.900 Outlet Invert= 502.00' S= 0.1381 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean

Primary OutFlow Max=0.47 cfs @ 12.20 hrs HW=527.63' (Free Discharge)

- 1=Exfiltration (Exfiltration Controls 0.01 cfs)
- 2=Culvert (Inlet Controls 0.46 cfs @ 2.36 fps)

Pond 13P: Cultec Recharge 150 XL W/outlet-Upper Parking



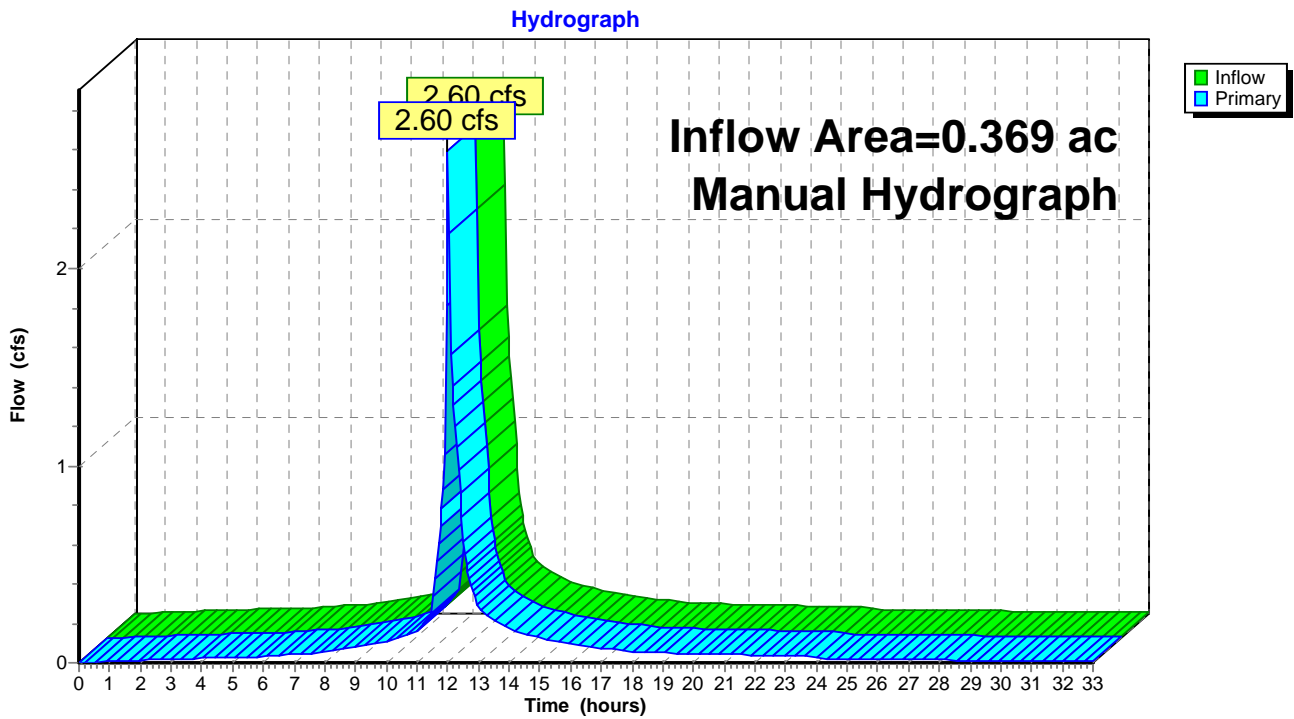
Summary for Link 7L: POA-1-Lower Parking Lot

Inflow Area = 0.369 ac, 90.06% Impervious, Inflow Depth > 7.70" for 100-YEAR EVENT event
Inflow = 2.60 cfs @ 12.01 hrs, Volume= 0.237 af
Primary = 2.60 cfs @ 12.01 hrs, Volume= 0.237 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs

Constant Inflow= 0.00 cfs

Link 7L: POA-1-Lower Parking Lot



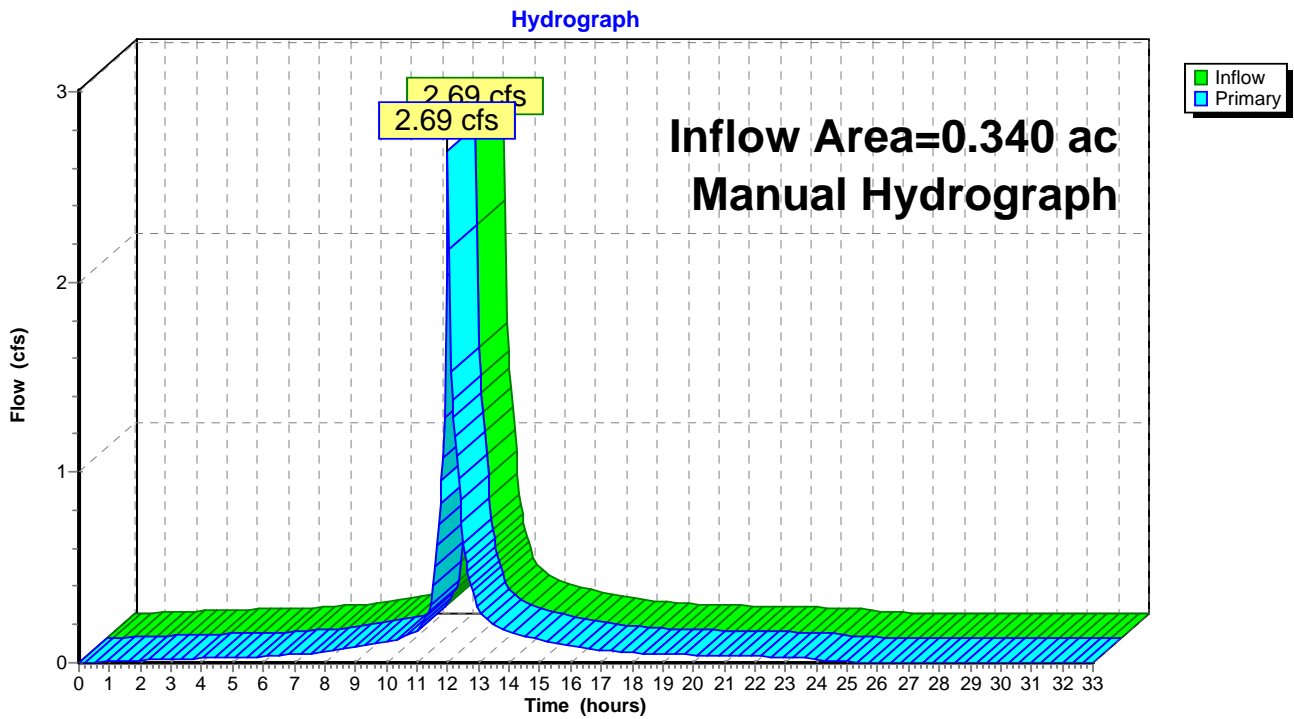
Summary for Link 8L: POA-2 Upper Parking Lot

Inflow Area = 0.340 ac, 100.00% Impervious, Inflow Depth > 8.17" for 100-YEAR EVENT event
Inflow = 2.69 cfs @ 12.00 hrs, Volume= 0.231 af
Primary = 2.69 cfs @ 12.00 hrs, Volume= 0.231 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs

Constant Inflow= 0.00 cfs

Link 8L: POA-2 Upper Parking Lot

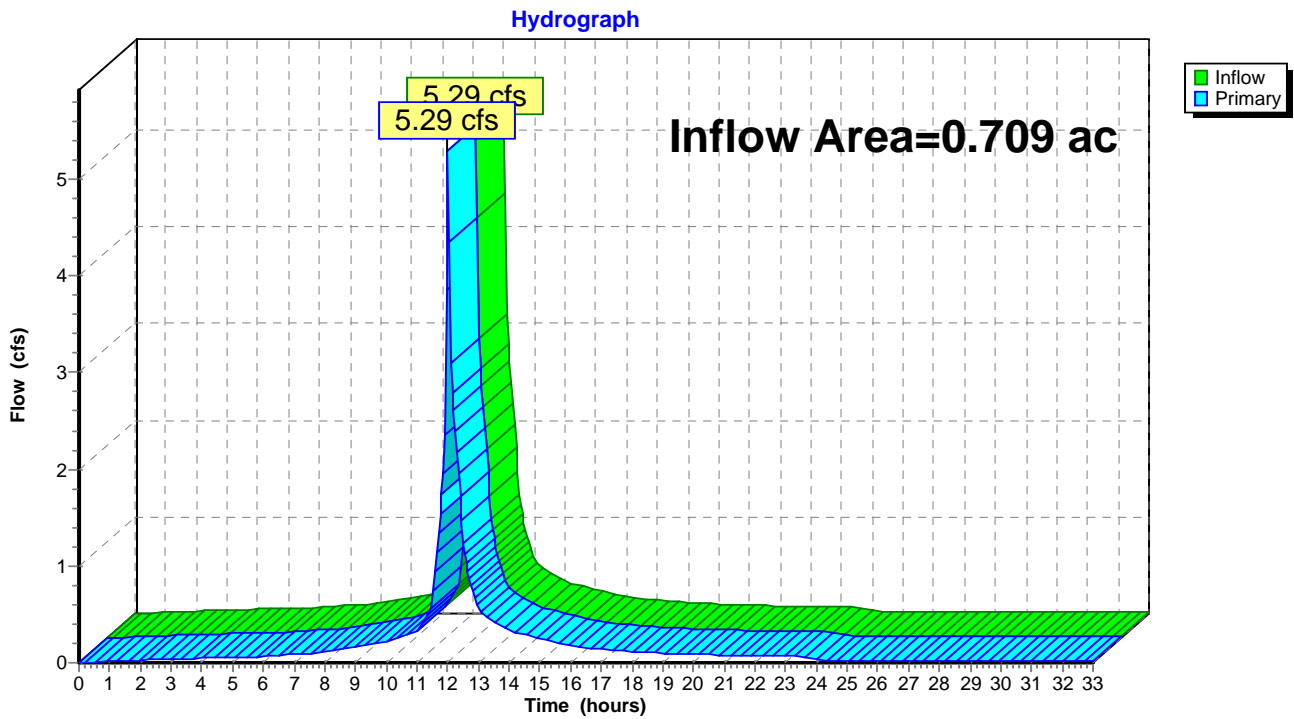


Summary for Link 10L: POA-1&POA-2

Inflow Area = 0.709 ac, 94.83% Impervious, Inflow Depth > 7.92" for 100-YEAR EVENT event
Inflow = 5.29 cfs @ 12.01 hrs, Volume= 0.468 af
Primary = 5.29 cfs @ 12.01 hrs, Volume= 0.468 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs

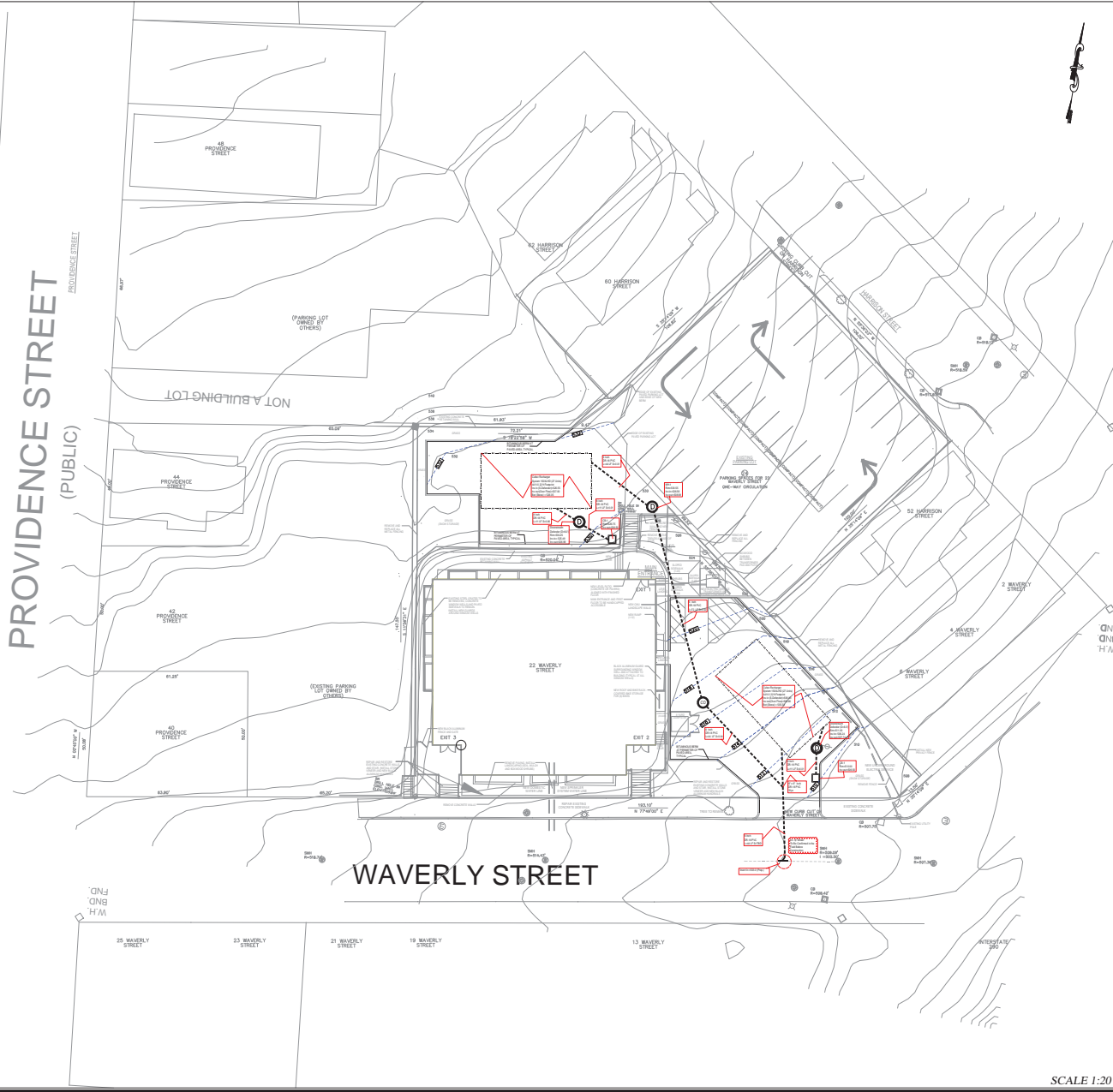
Link 10L: POA-1&POA-2



6- Site plan

NOTES:
 1-HIGH WATER TABLE & SOIL TYPE AT THE LOCATION OF THE INFILTRATION SYSTEM SHALL BE ESTABLISHED USING THE SERVICES OF A CERTIFIED SOIL EVALUATOR TO CONFIRM THE ADEQUACY OF THE RECHARGE SYSTEM DESIGN SHOWN. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO COORDINATE THE INSTALLATION OF THE SYSTEM WITH THE ENGINEER FOR TESTING AND INSPECTION IN ORDER TO BE CERTIFIED FOR CONFORMANCE WITH DESIGN PLANS.
 2-ALL SITE DESIGN INFORMATION ARE PENDING CONFIRMATION OF EXISTING DRAINAGE SYSTEM AND INVERT ELEVATION IN THE STREET AT PROPOSED CONNECTION POINTS.

NOTE:
 EXISTING CONDITION PLAN INFORMATION IS BASED ON A PLAN BY JARVIS LAND SURVEY INC. DATED 3/29/24.
 CONTRACTOR SHALL CONFIRM ALL INFORMATION AND REPORT ANY DISCREPANCIES BEFORE START OF CONSTRUCTION TO THE ENGINEER IN WRITING FOR DESIGN REEVALUATION.



DRAINAGE PLAN

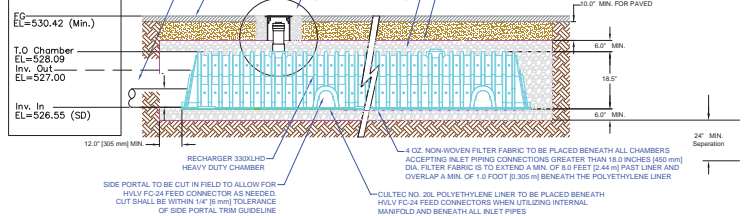
22 WAVERLY STREET
 WORCESTER, MA

PREPARED BY:
 A.S. ENGINEERING
 SHREWSBURY, MA
 (978)-377-5084
 moeazi1100@yahoo.com

DATE: 9/20/24	SHEET 1 OF 1
REVISION NO.	DATE
1	7/23/24
2	9/22/24

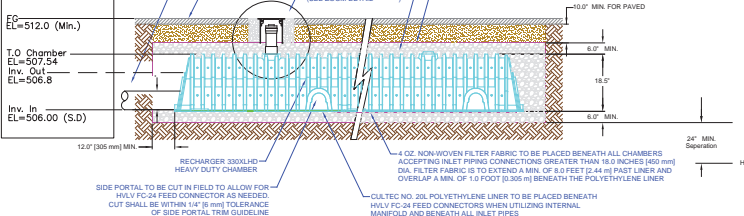
SCALE 1:20

SCHEDULE OF ELEVATIONS



UPPER PARKING LOT

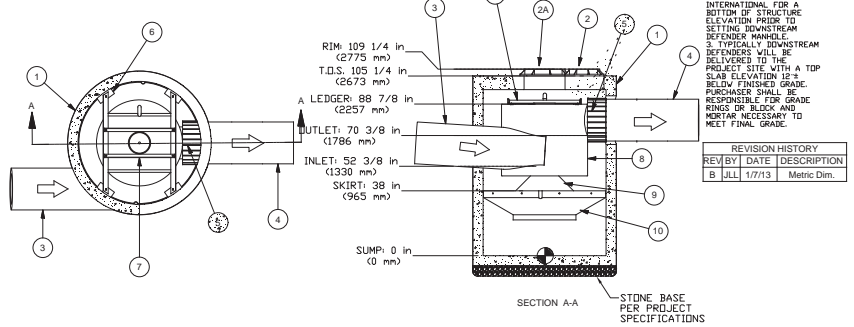
SCHEDULE OF ELEVATIONS



LOWER PARKING LOT

Cultec Recharger System 150XLHD- (H-20 LOADING)

NOT FOR CONSTRUCTION - CONTACT HYDRO INTERNATIONAL FOR SITE SPECIFIC DRAWINGS



1. MANHOLE WALL AND SLAB THICKNESSES ARE NOT TO SCALE.
2. CONTACT HYDRO INTERNATIONAL FOR A BOTTOM OF STRUCTURE ELEVATION PRIOR TO SETTING DOWNSTREAM DEFENDER MANHOLE.
3. TYPICALLY DOWNSTREAM DEFENDER MANHOLE WILL BE DELIVERED TO THE PROJECT SITE WITH A TOP SLAB ELEVATION 12" BELOW FINISHED GRADE. PURCHASER SHALL BE RESPONSIBLE FOR GRADE RINGS OR BLOCK AND MORTAR NECESSARY TO MEET FINAL GRADE.

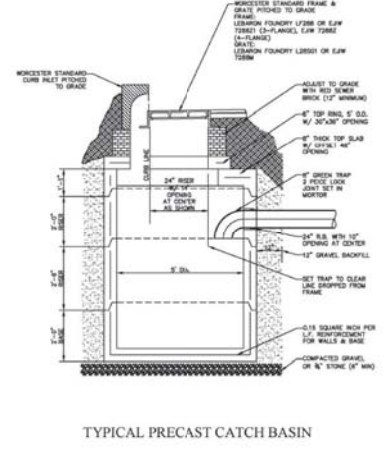
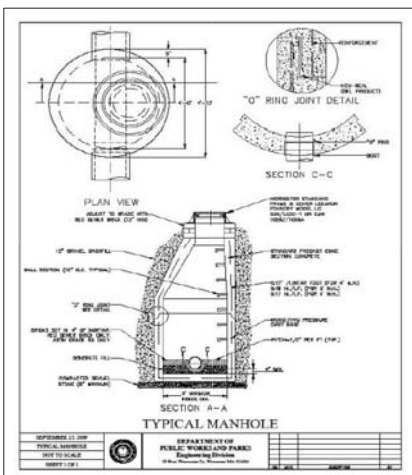
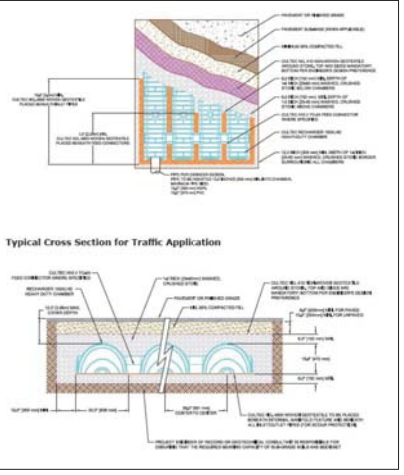
REVISION HISTORY		
REV BY	DATE	DESCRIPTION
B	JUL 1/7/13	Metric Dim.

Parts List		
ITEM	DESCRIPTION	SIZE
1	PRECAST MANHOLE (BY HYDRO VIA PRECASTER)	72 in
2	FRAME AND COVER	18 in
2A	FRAME AND COVER	24 in
3	INLET PIPE (BY OTHERS) †	18 in
4	OUTLET PIPE (BY OTHERS) †	18 in
5	PIPE COUPLING (BY OTHERS) †	18 in
6	LEDGER ANGLE	
7	SUPPORT FRAME	
9	CENTER SHAFT AND CONE	
10	BENCHING SKIRT	

CAPACITIES:
1. Peak treatment flow 80 cfs (227 l/s)
2. Sediment storage capacity 210 Cu. yd (161 cu. m.)
3. Oil storage capacity 210 Gal. (808 liters)

ADDITIONAL DESIGN INFORMATION:
1. The outlet pipe stub (not shown) is a roto-molded product with an ID of 18 in. that cannot be modified. To avoid the use of a reducer or expander on the outlet on 18 in. outlet pipe should be used if possible. The orientation of the outlet pipe can be adjusted to suit site conditions.
2. Multiple pipe size is 18 in. The inlet pipe invert should be placed one inlet pipe diameter below the outlet pipe invert. The ID of the inlet pipe should be placed tangent to the ID of the manhole. The orientation of the inlet pipe can be adjusted to suit site conditions. Headloss at 80 cfs with an 18 in. inlet 12 in. CDS run. Headloss will increase with smaller inlet pipes.
3. Sediment shall be stored in a zone that is isolated from the main flow path and protected from re-entrainment by the benching skirt.
4. Dimensions are general and intended for guidance only.

DOWNSTREAM DEFENDER DETAIL



DRAINAGE PLAN DETAIL

22 WAVERLY STREET WORCESTER, MA	
PREPARED BY: A.S. ENGINEERING SHREWSBURY, MA (978)-377-5084 moezai100@yahoo.com	
DATED: 8/25	SHEET 1 OF 1
REVISION NO.	DATE
1	8/22/24

N.T.S.