

May 8, 2015

## **STORMWATER REPORT**

For

**2 WELLS AVENUE**  
Newton, Massachusetts

Prepared for:

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Nitsch Project #10444

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## **1.0 INTRODUCTION**

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Nitsch Engineering has prepared this Stormwater Report for review by the City of Newton Engineering Division to support permitting applications for the proposed redevelopment project at 2 Wells Avenue in Newton, Massachusetts. The Project consists of the demolition of a portion of a 1-story existing building, renovation of the remaining portion of the 1-story existing building, and construction of a new 3-story office building. The new 3-story office building will connect to the remaining portion of the 1-story building. Exterior site improvements include installation of building services, enlargement and reconfiguration of the existing parking lots, enhanced landscaping, a new stormwater management system providing water quality treatment and groundwater recharge, and a retaining wall along the northwest site boundary. The stormwater management system has been designed to meet and exceed the requirements of the City of Newton Engineering Division and the Massachusetts Department of Environmental Protection (DEP) Stormwater Management Standards.

## **2.0 EXISTING CONDITIONS**

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The site is located at 2 Wells Avenue in Newton, Massachusetts (Figure 1). The site is bounded by Wells Avenue to the south and west, wooded residential areas to the north, and wetlands to the east.

The existing development consists of a 68,740± square-foot commercial building and associated driveways, parking, and building utilities. Access to the building is provided by two curbs cuts off of Wells Avenue, on the east and west sides of the building. Existing sewer, water, and gas services connect to the building from the mains located within Wells Avenue.

### **2.1 Existing Topography and Drainage Infrastructure**

The topography in the eastern portion of the site slopes towards an existing wetland system. Existing stormwater runoff for the driveway and parking spaces located north of the existing building flows into a swale that wraps around the parking lot to the east and discharges into the wetland. The swale also collects drainage from the parking lot on the eastern side of the existing building prior to discharging into the wetland over a riprap spillway.

West of the existing building, topography generally slopes down from the northern and southern property lines towards the center of the site. Ledge outcroppings are apparent in the northwest corner of the site that slopes steeply to the south. Wells Avenue is at a higher elevation than the site and the northern portion of the roadway and associated shoulder also slope towards the site. An existing drainage swale crosses the southern portion of the site from west to east and flows into a headwall located near the western driveway. A small portion of the site flows north and offsite. Stormwater runoff from the existing western parking lot flows overland into this swale. The swale is connected to the closed drainage system in Wells Avenue by a 12-inch reinforced concrete pipe and controlled by a headwall and catch basin inlets.

Two catch basins, located south of the existing building, appear to collect rooftop runoff and runoff from the adjacent grass area. These catch basins also appear to connect to the closed drainage system in Wells Avenue. The existing stormwater management system was constructed prior to the 2008 MassDEP Stormwater Management Standards, and the site provides minimal peak flow attenuation, water quality treatment, and groundwater recharge. The existing site does not comply with the current guidelines.

### **2.2 NRSC Soil Designations**

The Soil Classification Summary (Table 1) outlines the Natural Resources Conservation Services (NRCS) designation of the soil series at the site. The majority of soils are classified as Udorthents-

Urban Land Complex. The soils in the northwestern corner of the site are classified as Charlton-Hollis Rock Outcrop Complex, 3-8% slope with a hydrologic soil group (HSG) rating of B, indicating that the soils have a moderate infiltrative capacity (Figure 7). The Freetown muck series are located on the eastern portion of the site in the wetland and are HSG A/D (minimal infiltration).

**Table 1. NRCS Soil Classification Summary**

Soil Unit	Soil Series	Hydrologic Soil Group
52A	Freetown Muck, 0-1% slopes	A/D
103B	Charlton Hollis Rock outcrop complex, 3-8% slopes	B
656	Udorthents-Urban Land complex	---

### 2.3 On-Site Soil Investigations

Sixteen (16) test pits were performed on the Project site by Nitsch Engineering on August 26 and 27, 2014. The soil evaluation was performed by a Register Professional Engineer and Certified Soil Evaluator to obtain the seasonal high groundwater elevation and rate of percolation

The results of the test pits were consistent throughout the Site and indicated sandy loam or loamy sand, which are classified as HSG B and A, respectively. Ledge outcrops were observed west of the existing parking lot and ledge was encountered in the test pits located in the northern and western portions of the site. Indicators of estimated seasonal high groundwater were observed in several of the test pits ranging between three (3) and seven (7) feet below grade. In the vicinity of the proposed subsurface infiltration system, seasonal high groundwater was estimated to be at elevation 96.8 feet.

As required by the City of Newton, a percolation test was performed at Test Pit #5. The percolation rate in this test hole was determined to be 6.40 minutes per inch.

The test pit logs and percolation test results are provided in Appendix E and included in the site plan set.

### 2.4 Wetland Resource Areas

On August 15, 2014 Environmental Consulting & Restoration LLC delineated the leeward limits of Bordering Vegetated Wetlands (BVW) and the Inland Bank of a Perennial Stream located east of the Project site. The 200-foot Riverfront Area associated with the perennial stream and 100-foot Buffer Zone associated with Bank and BVW encroach on the eastern edge of the existing parking lot. There is no proposed work within any of the jurisdictional wetland resource areas.

### 2.5 100-Year Floodplain

As determined from the City of Newton Zoning Ordinance, Section 22-22 Floodplain/Watershed Protection Provisions, the 100-year floodplain for the Nahanton Street Swamp is at elevation 102.2 feet, and extends onto the easternmost portion of the existing parking lot. There is no proposed above grade work within the floodplain.

### 2.6 Total Maximum Daily Load (TMDL)

The Project site is located within the middle Charles River watershed and is subject to the Total Maximum Daily Load for Nutrients in the Upper/Middle Charles River, Massachusetts, dated May

2011, and the Final Pathogen TMDL for the Charles River Watershed, dated January 2007. To meet the intent of the TMDLs, the Project has been designed to significantly improve the stormwater quality over the existing condition and uses biofiltration and infiltration to target pathogen and nutrient pollutants.

### 3.0 PROPOSED CONDITIONS

#### 3.1 Project Description

The Project consists of the demolition of a portion of a 1-story existing building, renovation of the remaining portion of the 1-story existing building, and construction of a new 3-story office building. The new 3-story office building will connect to the remaining portion of the 1-story building. There is a decrease in the building footprint of 0.09 acres. The two existing vehicular access driveways off of Wells Avenue will be maintained.

Exterior site improvements include installation of building services, enlargement and reconfiguration of the existing western parking lot, construction of a new parking area in the northeast portion of the site in place of a portion of the demolished building, and the construction of a small 18-space parking area near the eastern access driveway. A retaining wall will be constructed in the northwest corner of the site to allow for the expansion of the western parking lot.

The existing sewer and roof drain services will be maintained for the portion of renovated existing building. However, the new 3-story building will have new drain, water, sewer, gas, and telecommunication services. A new stormwater management system is proposed to provide mitigation of stormwater quantity through recharge and detention and significantly improve the quality of water being discharged off-site.

The Project is anticipated to increase the overall impervious area (site pavement) by approximately 0.35 acres. Refer to Table 2 for a comparison of the existing and proposed land use for the Site.

**Table 2. Proposed land cover for 2 Wells Avenue (in acres)**

Land Use	Existing Site (acres)	Proposed Site (acres)	Change
<b>Buildings</b>	1.58	1.49	-0.09
<b>Site Pavement</b>	2.67	3.11	+ 0.44
<b>Grass/Landscaping</b>	1.93	2.56	+ 0.63
<b>Woods</b>	2.05	1.07	- 0.98
<b>Total</b>	8.23	8.23	---

#### 3.2 Stormwater Management System

The proposed work includes the installation of a stormwater management system that is being designed to meet and exceed the MassDEP Stormwater Management Standards and the City of Newton Engineering Division requirements to the greatest extent practicable. Although the vast majority of the project is a redevelopment, the increase in impervious area resulting from the parking lot expansion is classified as “new development” work under the MassDEP Stormwater Management

Standards. Therefore, the Project will provide peak flow and volume mitigation consistent with City of Newton requirements and provide water quality treatment and groundwater recharge.

The Project has been designed using environmentally-sensitive site design and low impact development (LID) techniques. This design prevents the generation of stormwater and non-point source pollution by disconnecting flow paths, treating and infiltrating stormwater at its source, and protecting natural processes. Stormwater systems have been designed to model natural hydrologic features, including the use of a tree box filter, biofilter swales, an infiltration trench, and subsurface infiltration. Deep sump, hooded catch basins and proprietary water quality structures will provide treatment where LID measures are not feasible due to site constraints. Refer to the TSS Removal spreadsheets in Appendix A for TSS removal summaries for each treatment train implemented at the site.

As required by the City of Newton, runoff from the new impervious parking areas will be infiltrated on-site, and there will be no increase in stormwater volumes discharged from the site for the 100-year, 6.5-inch depth storm. In the western parking lot, runoff is collected and infiltrated in the proposed subsurface infiltration system. In the new small parking lot located east of the building, runoff is collected and infiltrated in a tree box filter. There is no increase in stormwater runoff volume or flow rate to abutting properties.

#### Biofilter Swales

Five (5) biofilter swales are proposed to collect, treat, and convey stormwater runoff generated by the parking lot, including new and existing impervious areas. Biofilter swales treat stormwater through sedimentation and gravity separation. Pretreatment for the biofilter swales will be provided by either linear peastone sediment traps (for parking areas without curbing) or riprap sediment sumps located at curb breaks. The biofilter swales will overflow into area drains that contain a four-foot sump for additional treatment.

#### Tree Box Filters

One (1) tree box filter is proposed to provide water quality treatment and groundwater recharge for stormwater runoff generated by the new eastern parking area. The tree box filter design includes a deep sump and hooded catch basin that overflows to an open bottom tree pit. Water quality treatment within the tree pit is facilitated by filtration through the soil media and nutrient uptake by the tree. Overflow from the tree box filters will discharge into an existing connection to the Wells Avenue closed drainage system.

#### Subsurface Infiltration System

Stormwater from a significant portion of the northeastern and western parking lot and 2,500 square feet of the new 3-story roof will be collected and infiltrated using a subsurface infiltration system. Site impervious area that is tributary to these systems will be pretreated using biofilter swales and area drains with sumps.

The system consists of StormTech SC-740 chambers configured as shown on the design plans. The chambers will be enveloped within a crushed stone base that extends 6 inches above and below the chambers and 12 inches around the perimeter of the chambers. The subsurface infiltration system is designed to infiltrate the 1-inch storm event and the required recharge volume under the MassDEP Stormwater Management Standards and significantly reduces the peak rate and runoff volumes in the 2-, 10-, 25- and 100-year design storms. The system is set at elevation 98.8, which is a minimum of two feet above the seasonal high groundwater elevation estimated in the nearby test pits.

As required by the City of Newton, there are details of the subsurface infiltration system provided in the plan set. These details outline the elevation of the bottom of the stone (98.8 feet), bottom of the chambers (99.3 feet), and the depth of the groundwater table (96.8 feet). The stone envelope surrounding the subsurface infiltration system shall be constructed with crushed washed stone. Additionally, the system will be covered with a layer of filter fabric plus a 3-inch layer of peastone on top of the system, and then covered over with filter fabric.

#### Deep Sump and Hooded Catch Basins

Deep sump and hooded catch basins are proposed to provide pretreatment in the portions of the parking lot and access driveway that do not drain to the proposed biofilter swales. As required by the City of Newton Engineering Division, the catch basins will contain the Neenah R-3705 gas trap to provide additional water quality protection.

#### Stormceptor® STC 900 Water Quality Structures

Two Stormceptor® STC water quality structures and two Stormceptor® STI water quality inlets are proposed for water quality pretreatment in areas of the site where stormwater cannot be routed to the infiltration system due to site elevations, or where there was not space for pretreatment prior to the infiltration system. These STCs have been designed to remove greater than 80% TSS in conjunction with their associated deep sump and hooded catch basins.

#### Infiltration Trench

A portion of the proposed new parking area in the northeastern portion of the site will sheet flow into a crushed stone infiltration trench. The infiltration trench was sized to infiltrate the 1-inch storm. The trench is 114.5 linear feet of 12-inch perforated pipe with 1.5 feet of crushed stone below and on either side and 1 foot of crushed stone above, brought to grade in a 2-foot wide trench.

### **3.3 Stormwater Management During Construction**

The Site Contractor will be responsible for stormwater management of the active construction site and is required to adhere to the conditions of the 2012 Construction General Permit under the Environmental Protection Agency. Erosion and Sediment Control Plans and Details are included in the plan set and provide recommended locations for the perimeter erosion control barrier, inlet protection for existing and proposed drainage structures, steep slope protection, and stabilized construction entrances. A draft Stormwater Pollution Prevention Plan (SWPPP) document will be prepared in accordance with the MassDEP Stormwater Management Standards and the 2012 Construction General Permit and submitted prior to the start of construction.

## **4.0 STORMWATER MANAGEMENT ANALYSIS**

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### **4.1 Methodology**

Nitsch Engineering completed a hydrologic analysis of the existing project site utilizing Soil Conservation Service (SCS) Runoff Curve Number (CN) methodology. The SCS method calculates the rate at which the runoff reaches the design point considering several factors: the slope and flow lengths of the subcatchment area, the soil type of the subcatchment area, and the type of surface cover in the subcatchment area. HydroCAD Version 10.00 computer modeling software was used in conjunction with the SCS method to determine the peak runoff rates and runoff volumes for the 2-, 10-, 25-, and 100-year, 24-hour storm events. The proposed project site is being analyzed with the same methodology.



The Site was divided into multiple drainage areas, or subcatchments, which drain to the design points along the property boundary and within the site. For each subcatchment area, SCS Runoff Curve Numbers (CNs) were selected by using the cover type and hydrologic soil group of each area. The peak runoff rates and runoff volumes for the 2-, 10-, 25- and 100-year 24-hour storm events were then determined by inputting the drainage areas, CNs, and time of concentration ( $T_c$ ) paths into the HydroCAD model.

#### 4.2 HydroCAD Version 10.00

The HydroCAD computer program uses SCS and TR-20 methods to model drainage systems. TR-20 (Technical Release 20) was developed by the Soil Conservation Service to estimate runoff and peak discharges in small watersheds. TR-20 is generally accepted by engineers and reviewing authorities as the standard method for estimating runoff and peak discharges.

HydroCAD Version 10.00 uses up to four types of components to analyze the hydrology of a given site: subcatchments, reaches, basins, and links. Subcatchments are areas of land that produce surface runoff. The area, weighted CN, and  $T_c$  characterize each individual subcatchment area. Reaches are generally uniform streams, channels, or pipes that convey water from one point to another. A basin is any impoundment that fills with water from one or more sources and empties via an outlet structure. Links are used to introduce hydrographs into a project from another source or to provide a junction for more than one hydrograph within a project. The time span for the model was set for 0-48 hours in order to prevent truncation of the hydrograph.

#### 4.3 Precipitation Data

Nitsch Engineering, Inc. used Technical Paper 40 by the National Weather Service to estimate the rainfall for the 2-year, 10-year, 25-year 24-hour storms in Middlesex County. The City of Newton Engineering Division requires the use of 6.5 inches of rainfall for the 100-year, 24-hour storm event.

The rainfall values used in the HydroCAD analysis are as follows:

Storm Event	24-hour Rainfall
2-year	3.2 in.
10-year	4.6 in.
25-year	5.5 in.
100-year	6.5 in.

#### 4.4 Existing Hydrologic Conditions

As summarized in Table 4, Nitsch Engineering delineated the project site into five (5) on-site subcatchment (watershed) areas discharging to three (3) design points utilizing an existing conditions survey and on-site observations (See Figure 1). Table 4 summarizes the design point, location and area of each watershed. The design points (DP) are defined as the northwest property boundary (DP-1), the Wells Avenue closed drainage system (DP-2), and the eastern wetland (DP-3). The HydroCAD model for existing conditions is provided in Appendix B.

Table 4. Existing Drainage Area Summary

Design Point	Watershed	Area (sf)	Description
1	1S-Sub1	10,968	Woods
	2S-Sub2	147,391	Paved parking and adjacent woods and grass – Flows to headwall along Wells Avenue
2	3S-Sub3	47,383	Building roof and adjacent grass- Flows to ex. CB that discharges into Wells Avenue
	4S-Sub4	38,880	Building roof and adjacent grass- Flows to ex. CB that discharges into Wells Avenue
3	5S-Sub5	113,982	Paved parking and adjacent woods and grass – Flows to eastern wetland system
<b>Total Area</b>		<b>358,604</b>	

#### 4.5 Proposed Hydrologic Conditions

The proposed project has been designed to mitigate the change in stormwater runoff at each of the design points as required by the DEP Stormwater Management Standards and the City of Newton Engineering Division requirements. The existing watershed areas were modified to reflect the proposed topography, storm drainage structures and BMPs, and roof areas. (See Figure 2 and Table 5). The proposed subsurface infiltration system and infiltrations trench were included as a ponds in the HydroCAD model.

Table 5. Proposed Drainage Area Summary

Design Point	Watershed	Area (sf)	Description	Proposed Treatment BMP(s)
1	1S-Sub1	6,521	Woods and grass	Sheet flow (maintain existing)
	2S-Sub2A	28,661	Parking and grass	Biofilter Swale to AD to Subsurface Infiltration
	3S-Sub2B	18,034	Parking and grass	Biofilter Swale to AD to Subsurface Infiltration
	4S-Sub2C	25,380	Parking, woods, and grass	Biofilter Swale to AD to Subsurface Infiltration
	5S-Sub2D	12,647	Parking and grass	Biofilter Swale to AD
2	6S-Sub2E	10,382	Parking, woods, and grass	Biofilter Swale to AD
	7S-Sub2F	17,153	Parking, woods, and grass	Biofilter Swale to AD
	14S-Sub2G	15,595	Roof and grass	Maintain connection to ex. CB
	20S-Sub3B	16,912	Parking and grass	Subsurface Infiltration System

	21S	8,198	Parking and grass	Subsurface Infiltration System
	15S	2,500	Roof	Subsurface Infiltration System
	16s	39,556	Roof	-
	8S	14,967	Patio and grass	Area Drains with sumps
	9S-Sub4	37,456	Parking, roof, and grass	Tree Box Filters to ex. CB
<b>3</b>	10S-Sub5	93,190	Parking and adjacent woods and grass	Maintain existing drainage swale to eastern wetland system
	13S	9,052	Parking, landscaped islands	Infiltration Trench
<b>Total Area</b>		<b>358,604</b>		

**4.6 Peak Flow Rates**

The proposed stormwater management system is expected to reduce the proposed peak runoff rates and runoff volumes to at or below the existing rates for Design Points DP-1, DP-2, and DP-3. Tables 6 through 8 below summarize the existing and proposed hydrologic analyses for the site at each design point.

**Table 6 – Peak Rates of Runoff for Design Point DP-1**

<b>Storm Event</b>	<b>2-year</b>	<b>10-year</b>	<b>25-year</b>	<b>100-year</b>
Existing Peak Rate (cfs)	0.03	0.17	0.31	0.51
Proposed Peak Rate (cfs)	0.02	0.13	0.21	0.34
Existing Volume (cf)	229	720	1,133	1,713
Proposed Volume (cf)	168	488	750	1,115

**Table 7 – Peak Rates of Runoff for Design Point DP-2**

<b>Storm Event</b>	<b>2-year</b>	<b>10-year</b>	<b>25-year</b>	<b>100-year</b>
Existing Peak Rate (cfs)	9.17	16.02	20.59	26.26
Proposed Peak Rate (cfs)	7.54	12.28	18.35	22.61
Existing Volume (cf)	31,011	53,826	69,346	88,872
Proposed Volume (cf)	27,526	51,756	68,171	88,862

**Table 8 – Peak Rates of Runoff for Design Point DP-3**

<b>Storm Event</b>	<b>2-year</b>	<b>10-year</b>	<b>25-year</b>	<b>100-year</b>
Existing Peak Rate (cfs)	2.33	4.85	6.62	8.87
Proposed Peak Rate (cfs)	1.01	2.69	3.96	5.66
Existing Volume (cf)	9,855	19,468	26,303	35,102
Proposed Volume (cf)	5,000	11,512	16,488	23,154

**5.0 MassDEP Stormwater Management Standards**

The Project is not located within a jurisdictional water resource area of buffer zone and does not fall under the jurisdiction of the Newton Conservation Commission. Therefore, the MassDEP Stormwater Management Standards are not applicable. However, the Project has been designed to meet and exceed these Standards to the maximum extent practicable as summarized below. This design reflects a significant improvement over the existing condition.

**Standard 1: No New Untreated Discharges**

The Project will not discharge any untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth. Stormwater from the site will be collected and treated in accordance with the City of Newton requirements and the MassDEP Stormwater Management Standards. The proposed parking areas will provide an increased level of treatment over what currently existing on-site, incorporating substantial low impact development techniques.

**Standard 2: Peak Rate Attenuation**

The proposed stormwater management system will be designed so that the post-development peak discharge rates do not exceed pre-development peak discharge rates. To prevent storm damage and downstream flooding, the proposed stormwater management practices will mitigate peak runoff rates for the 2-, 10-, 25- and 100-year, 24 hour storm events.

In addition to peak rate attenuation, the City of Newton Engineering Division requires that the peak volume of stormwater runoff leaving the post-development site will not exceed the peak volume leaving the pre-development site for the 2-, 10-, 25-, and 100-year storm events. The proposed stormwater management system is expected to reduce or maintain the post-development volumes of runoff to at or below the pre-development volumes. Therefore, the proposed system will exceed the DEP Stormwater Management Standards.

**Standard 3: Groundwater Recharge**

The site was designed using environmentally-sensitive site design, low impact development techniques, and stormwater BMP treatment trains to minimize the loss of annual recharge to groundwater. The annual recharge from the post-development site will approximate the annual recharge from pre-development conditions based on soil type using the guidelines provided in the MassDEP Stormwater Management Handbook.

New Impervious Area = 0.35 acres  
 Rv (Recharge Volume) = 0.35 in. / (12 inches/ft) x 0.35 acres x 43,560 sf/acre  
 = 445 cubic feet

The subsurface infiltration system was designed to maximize the amount of groundwater recharge provided by the Project. The volume provided below the outlet in the subsurface infiltration system is **8,394 cubic feet**, which exceeds the recharge volume required under the MassDEP Stormwater Management Standards. The proposed tree box filter and infiltration trench will provide additional groundwater recharge.

The HydroCAD reports provided in Appendix C indicate that the subsurface infiltration system will drain within 48 hours for the 2-, 10-, 25-, and 100-year storm events, exceeding the 72-hour MassDEP drawdown requirement.

#### **Standard 4: Water Quality Treatment**

The proposed stormwater management system will be designed to remove greater than 80% of the average annual post-construction load of Total Suspended Solids (TSS) to the maximum extent practicable. Structural stormwater BMPs including biofilter swales, tree box filters, deep sump and hooded catch basins, and Stormceptor® water quality units are sized to capture the required water quality volume (1 inch over the project site) and remove a minimum of 80% of total suspended solids. TSS removal calculation spreadsheets, Stormceptor® sizing calculations, and dry well sizing calculations are provided in Appendix A.

Source control and pollution prevention measures, such as vacuum cleaning, street sweeping, proper snow management, and stabilization of eroded surfaces, are included in the Long-Term Pollution Prevention Plan and Operation and Maintenance Plan (Appendix D).

#### **Standard 5: Land Uses with Higher Potential Pollutant Loads**

The Project is anticipated to be classified as a Land Use with Higher Potential Pollutant Loads (LUHPPLs) as defined by MassDEP. The parking areas of the project are classified as a LUHPPL based on the anticipated average daily vehicle trips to be generated by the proposed Project (greater than 1,000 vehicle trips per day). As previously noted, through the incorporation of several LID techniques, the proposed stormwater management system will provide a significant improvement to the water quality being discharged off of the Project site. The proposed BMPs, including biofilter swales, deep sump and hooded catch basins and area drains, and tree box filter provide a high level of sediment and oil and grease removal. Therefore, the Project complies with this Standard.

#### **Standard 6: Critical Areas**

The Project is not located within any critical areas. Therefore, this standard is not applicable.

#### **Standard 7: Redevelopments**

The Project is a mix of redevelopment and new development under the MassDEP Stormwater Management Standards. Where the new development proposes expansion of impervious cover, the standards for new development are met. In areas of redevelopment, the standards will be met to the greatest extent practicable.

#### **Standard 8: Construction Period Pollution Prevention and Sedimentation Control**

A plan to control construction-related impacts, including erosion, sedimentation, and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) will be developed prior to the start of construction.

Since the Project will disturb more than one (1) acre of land, a Notice of Intent will be submitted to the Environmental Protection Agency (EPA) for coverage under the National Pollution Discharge Elimination System (NPDES) Construction General Permit. As part of this application the Applicant

is required to prepare a Stormwater Pollution Prevention Plan (SWPPP) and implement the measures in the SWPPP. The SWPPP, which is to be kept on site, includes erosion and sediment controls (stabilization practices and structural practices), temporary and permanent stormwater management measures, Contractor inspection schedules and reporting of all SWPPP features, materials management, waste disposal, off-site vehicle tracking, spill prevention and response, sanitation, and non-stormwater discharges. A draft SWPPP will be provided prior to the start of construction.

#### **Standard 9: Operation and Maintenance Plan**

A post-construction operation and maintenance plan has been prepared and will be implemented to ensure that stormwater management systems function as designed. Source control and stormwater BMP operation requirements for the academic campus are summarized in the Long-Term Pollution Prevention Plan and Operation and Maintenance Plan provided in Appendix D.

#### **Standard 10: Prohibition of Illicit Discharges**

There will be no illicit discharges to the stormwater management system associated with the Project. An Illicit Discharge Compliance Statement is provided in Appendix A.

### **6.0 CLOSED DRAINAGE SYSTEM DESIGN**

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The proposed closed drainage system consists of deep sump and hooded catch basins, drainage manholes, infiltration structures, and proprietary water quality treatment units connected with corrugated polyethylene pipe. The closed drainage system was designed to convey the 10-year storm event using the Rational method. The pipe connection out of the subsurface infiltration system outlet control structure was designed to convey the 100-year storm outflow to prevent any backup into the system.

### **7.0 CONCLUSION**

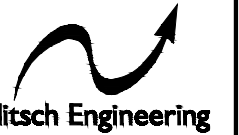
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In conclusion, the existing site does not meet current MassDEP Stormwater Standards. The Project's proposed stormwater management system will reduce or maintain peak runoff rates and volumes through the widespread use of infiltration BMPs and improve the water quality of stormwater being discharged from the Site. Environmentally sensitive site design and low impact development techniques will be implemented throughout the Site, and no work is proposed within the site's sensitive areas. The Project is being designed to meet and exceed the MassDEP Stormwater Management Standards and the City of Newton Engineering Division requirements to the maximum extent practicable. The proposed Project incorporates a significant improvement over the existing condition with regards to stormwater management.

**FIGURES**

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- Figure 1 Existing Watershed Areas
- Figure 2 Proposed Watershed Areas



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Boston, MA 02108  
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- ▶ Civil Engineering
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- ▶ Transportation Engineering
- ▶ Sustainable Site Consulting
- ▶ Planning
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**EXISTING WATERSHED AREAS**

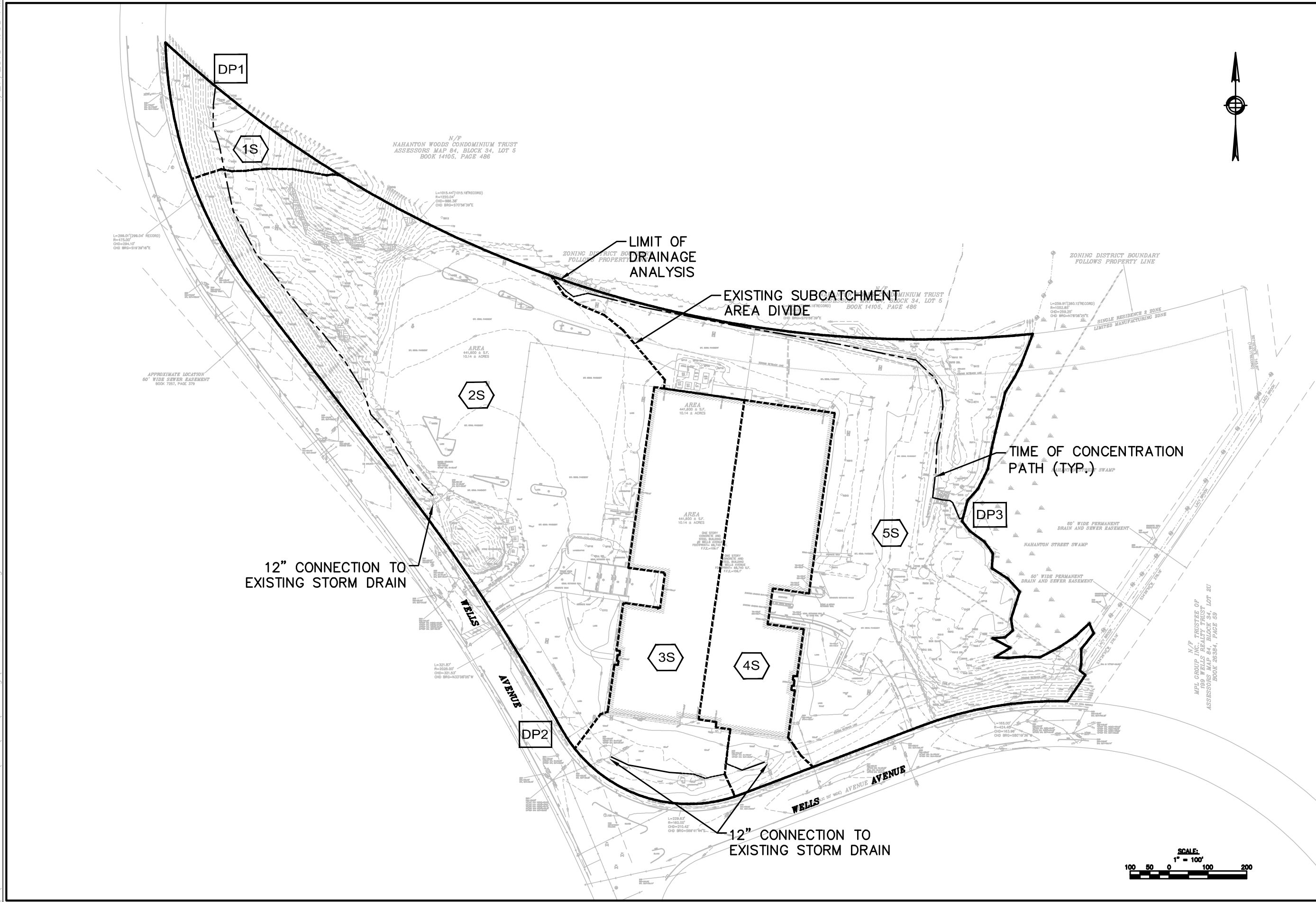
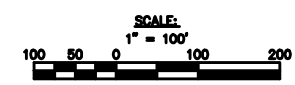
2 WELLS AVENUE  
NEWTON, MA 02459

PREPARED FOR:  
**TWO WELLS AVENUE LLC C/O BAL MANAGEMENT LLC**  
145 ROSEMARY STREET, NEEDHAM, MA 02494

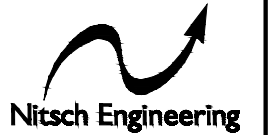
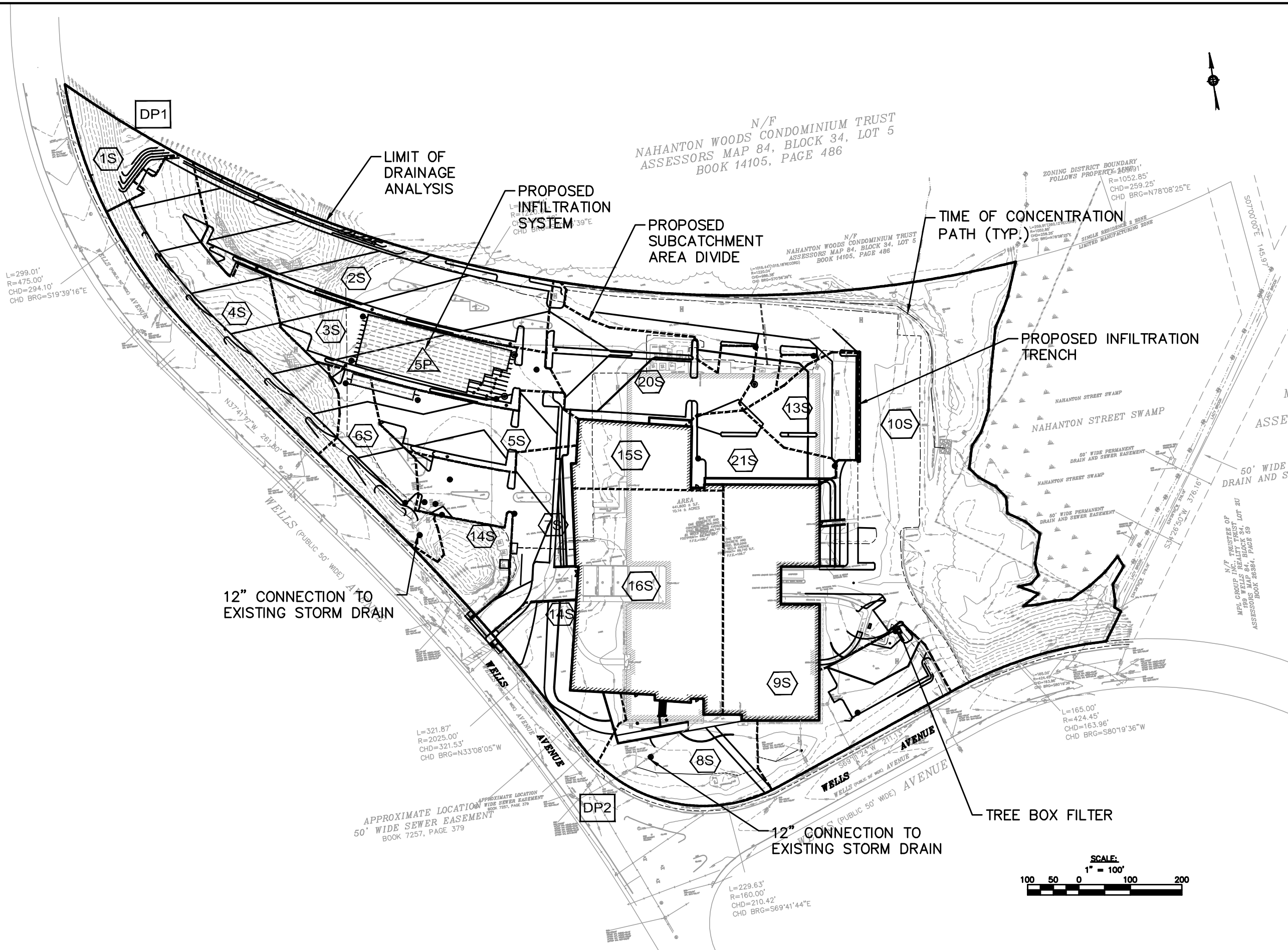
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FILE:	10444.CEX.DWG
SCALE:	1"=100'
DATE:	04/30/15
PROJECT MGR:	SDT
SURVEYOR:	METROWEST
DRAFTED BY:	MLD
CHECKED BY:	DMD

SHEET:

**FIGURE-1**







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**PROPOSED WATERSHED AREAS**  
 2 WELLS AVENUE  
 NEWTON, MA 02459

PREPARED FOR:  
**TWO WELLS AVENUE LLC C/O BAL MANAGEMENT LLC**  
 145 ROSEMARY STREET, NEEDHAM, MA 02494

PROJECT #	10444
FILE	10444CPR.DWG
SCALE	1"=100'
DATE	05/08/15
PROJECT MGR	SDT
SURVEYOR	METROWEST
DRAFTED BY	MLD
CHECKED BY	DMD

SHEET:

**FIGURE-2**

## **APPENDIX A**

---

### **Stormwater Management Standards Documentation**

Standard 4: TSS Removal Calculations  
Standard 4: Proprietary Water Quality Structure Design  
Standard 4: Infiltration Trench Sizing for Water Quality Storm  
Standard 10: Illicit Discharge Compliance Statement



## **2 WELLS AVENUE, NEWTON MASSACHUSETTS WATER QUALITY TREATMENT SUMMARY**

---

Nitsch Engineering has prepared this Water Quality Treatment Summary for the proposed Project located at 2 Wells Avenue in Newton, Massachusetts. In compliance with MassDEP Stormwater Management Standard #4, the proposed stormwater management system is designed to remove at least 80% of the average annual post-construction load of Total Suspended Solids (TSS).

A summary of treatment trains proposed to provide water quantity control and water quality improvement at the proposed project site is provided below.

### **Treatment Train 1**

Biofilter Swale → Area Drain with Deep Sump → Subsurface Infiltration System

### **Treatment Train 2**

Biofilter Swale → Area Drain with Deep Sump → Proprietary Water Quality Structure

### **Treatment Train 3**

Deep Sump and Hooded Catch Basins → Tree Box Filter

### **Treatment Train 4**

Deep Sump and Hooded Catch Basins → Proprietary Water Quality Structure

### **Treatment Train 5**

Infiltration Trench

**Treatment Train 1**

Biofilter Swale → Area Drain with Deep Sump → Subsurface Infiltration System

**Treatment Spreadsheet**

<b>B</b> BMP	<b>C</b> TSS Removal Rate	<b>D</b> Starting TSS Load	<b>E</b> Amount Removed (C*D)	<b>F</b> Remaining Load (D-E)
Subsurface Infiltration System with Pretreatment*	0.80	1.00	0.80	0.20

Total TSS Removal =

80%
-----

**Meets 80% TSS  
removal requirement**

\*Pretreatment provided by biofilter swale and area drain with sump.

**Treatment Train 2**

Biofilter Swale → Area Drain with Deep Sump → Proprietary Water Quality Structure

**Treatment Spreadsheet**

<b>B</b> BMP	<b>C</b> TSS Removal Rate <sup>1</sup>	<b>D</b> Starting TSS Load*	<b>E</b> Amount Removed (C*D)	<b>F</b> Remaining Load (D-E)
<b>Biofilter Swale</b>	<b>0.50</b>	<b>1.00</b>	<b>0.50</b>	<b>0.50</b>
<b>Area Drain w/ Sump</b>	<b>0.25</b>	<b>.50</b>	<b>.125</b>	<b>0.375</b>
<b>Proprietary WQS</b>	<b>0.80</b>	<b>0.375</b>	<b>0.30</b>	<b>0.075</b>

**Total TSS Removal =**

**92.5%**

**Meets and exceeds  
80% TSS removal  
requirement**

Refer to attached sizing documentation for proprietary treatment structures.

**Treatment Train 3**

Deep Sump and Hooded Catch Basin → Tree Box Filter

**Treatment Spreadsheet**

B BMP	C TSS Removal Rate <sup>1</sup>	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Tree Box Filter with Pretreatment *	80	1.00	.80	.20

Total TSS Removal =

80%

**Meets 80% TSS  
removal requirement**

\*Pretreatment provided by deep sump and hooded catch basin

**Treatment Train 4**

Deep Sump and Hooded Catch Basins → Proprietary Water Quality Structure

**Treatment Spreadsheet**

B BMP	C TSS Removal Rate	D Starting TSS Load	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Proprietary WQS	0.80	0.75	0.60	0.15

Total TSS Removal =

85%

**Meets and exceeds  
80% TSS removal  
requirement**

Refer to attached sizing documentation for proprietary treatment structures.

**Treatment Train 5**

Infiltration Trench

**Treatment Spreadsheet**

<b>B</b> BMP	<b>C</b> TSS Removal Rate	<b>D</b> Starting TSS Load	<b>E</b> Amount Removed (C*D)	<b>F</b> Remaining Load (D-E)
Infiltration Trench	0.55	1.00	0.55	0.45

Total TSS Removal =

55%





Nitsch Job # 10444  
 Calc: MLD  
 Date: 8-May-15

## 1" Calculation Sheet

This spreadsheet should be used to convert water quality volume to an equivalent water quality peak flow rate as outlined in the new MA DEP guidelines that take effect on October 15, 2013.

### Glossary

Water Quality Flow Rate = WQF  
 Water Quality Volume = WQV\*  
 unit peak discharge (csm/in) = qu\*\*  
 Impervious Area in watershed (square miles) = Ai

\*WQV is expressed in watershed inches (you must use 1.0-inches in all cases with this method and not 0.5-inches)

\*\* calculate the qu based on the time of concentration (see 1" - qu Table)

### Compute Water Quality Flow with the following Equation

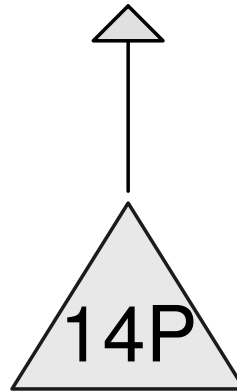
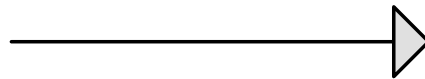
$$WQF = (qu)(A)(WQV)$$

### Input Information (in colored cells only)

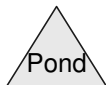
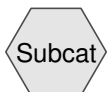
Site Plan Callout	Enter qu (from 1" - qu Table)	Enter Impervious Area (SF)	Ai (sq/mi)	WQV	WQF	
WQU-500 =	774	16029	0.000575	1	=	0.45 cfs
WQU-208 =	774	9073	0.000325	1	=	0.25 cfs
STC-100 =	774	7657	0.000275	1	=	0.21 cfs
STC-102 =	774	7024	0.000252	1	=	0.20 cfs
=			0.000000	1	=	0.00 cfs
=			0.000000	1	=	0.00 cfs
=			0.000000	1	=	0.00 cfs
=			0.000000	1	=	0.00 cfs
=			0.000000	1	=	0.00 cfs
=			0.000000	1	=	0.00 cfs



SUB3B



Infiltration Trench



**Proposed HydroCAD**

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Page 2

**Area Listing (selected nodes)**

Area (sq-ft)	CN	Description (subcatchment-numbers)
109	61	>75% Grass cover, Good, HSG B (13S)
8,943	98	Roofs, HSG B (13S)
<b>9,052</b>	<b>98</b>	<b>TOTAL AREA</b>

**Proposed HydroCAD**

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Page 3

**Soil Listing (selected nodes)**

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
9,052	HSG B	13S
0	HSG C	
0	HSG D	
0	Other	
<b>9,052</b>		<b>TOTAL AREA</b>

**Proposed HydroCAD**

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**Ground Covers (selected nodes)**

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover
0	109	0	0	0	109	>75% Grass cover, Good
0	8,943	0	0	0	8,943	Roofs
<b>0</b>	<b>9,052</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>9,052</b>	<b>TOTAL AREA</b>

**Proposed HydroCAD**

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Infiltration Trench Sizing for Water Quality Storm

Type III 24-hr 1-inch storm Rainfall=1.00"

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Page 5

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

**Subcatchment 13S: SUB3B**

Runoff Area=9,052 sf 98.80% Impervious Runoff Depth=0.79"  
Tc=6.0 min CN=98 Runoff=0.18 cfs 597 cf

**Pond 14P: Infiltration Trench**

Peak Elev=100.97' Storage=269 cf Inflow=0.18 cfs 597 cf  
Discarded=0.01 cfs 597 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 597 cf

**Total Runoff Area = 9,052 sf Runoff Volume = 597 cf Average Runoff Depth = 0.79"**  
**1.20% Pervious = 109 sf 98.80% Impervious = 8,943 sf**

# Proposed HydroCAD

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Infiltration Trench Sizing for Water Quality Storm

Type III 24-hr 1-inch storm Rainfall=1.00"

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Page 6

## Summary for Subcatchment 13S: SUB3B

Runoff = 0.18 cfs @ 12.08 hrs, Volume= 597 cf, Depth= 0.79"

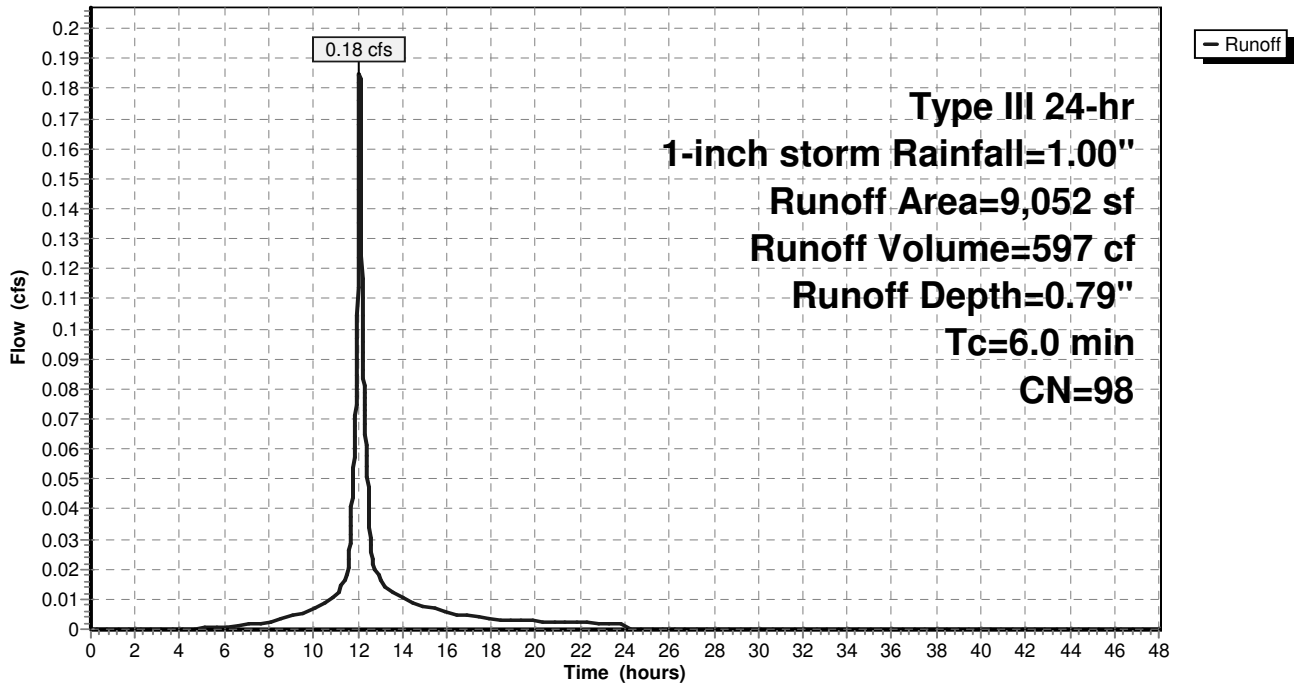
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 1-inch storm Rainfall=1.00"

Area (sf)	CN	Description
8,943	98	Roofs, HSG B
109	61	>75% Grass cover, Good, HSG B
9,052	98	Weighted Average
109		1.20% Pervious Area
8,943		98.80% Impervious Area

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

## Subcatchment 13S: SUB3B

Hydrograph



**Proposed HydroCAD**

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Page 7

**Summary for Pond 14P: Infiltration Trench**

Inflow Area = 9,052 sf, 98.80% Impervious, Inflow Depth = 0.79" for 1-inch storm event  
 Inflow = 0.18 cfs @ 12.08 hrs, Volume= 597 cf  
 Outflow = 0.01 cfs @ 11.11 hrs, Volume= 597 cf, Atten= 94%, Lag= 0.0 min  
 Discarded = 0.01 cfs @ 11.11 hrs, Volume= 597 cf  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
 Peak Elev= 100.97' @ 13.88 hrs Surf.Area= 458 sf Storage= 269 cf

Plug-Flow detention time= 218.7 min calculated for 596 cf (100% of inflow)  
 Center-of-Mass det. time= 218.7 min ( 1,006.5 - 787.9 )

Volume	Invert	Avail.Storage	Storage Description
#1	99.50'	605 cf	<b>Stone (Prismatic)</b> Listed below (Recalc) 1,603 cf Overall - 90 cf Embedded = 1,513 cf x 40.0% Voids
#2	101.00'	90 cf	<b>12.0" Round Pipe Storage</b> Inside #1 L= 114.5'
		695 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
99.50	458	0	0
103.00	458	1,603	1,603

Device	Routing	Invert	Outlet Devices
#1	Primary	101.00'	<b>12.0" Round Culvert</b> L= 52.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 101.00' / 100.20' S= 0.0154 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	99.50'	<b>1.020 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.01 cfs @ 11.11 hrs HW=99.54' (Free Discharge)  
 ↑**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=99.50' (Free Discharge)  
 ↑**1=Culvert** ( Controls 0.00 cfs)



**Proposed HydroCAD**

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Infiltration Trench Sizing for Water Quality Storm

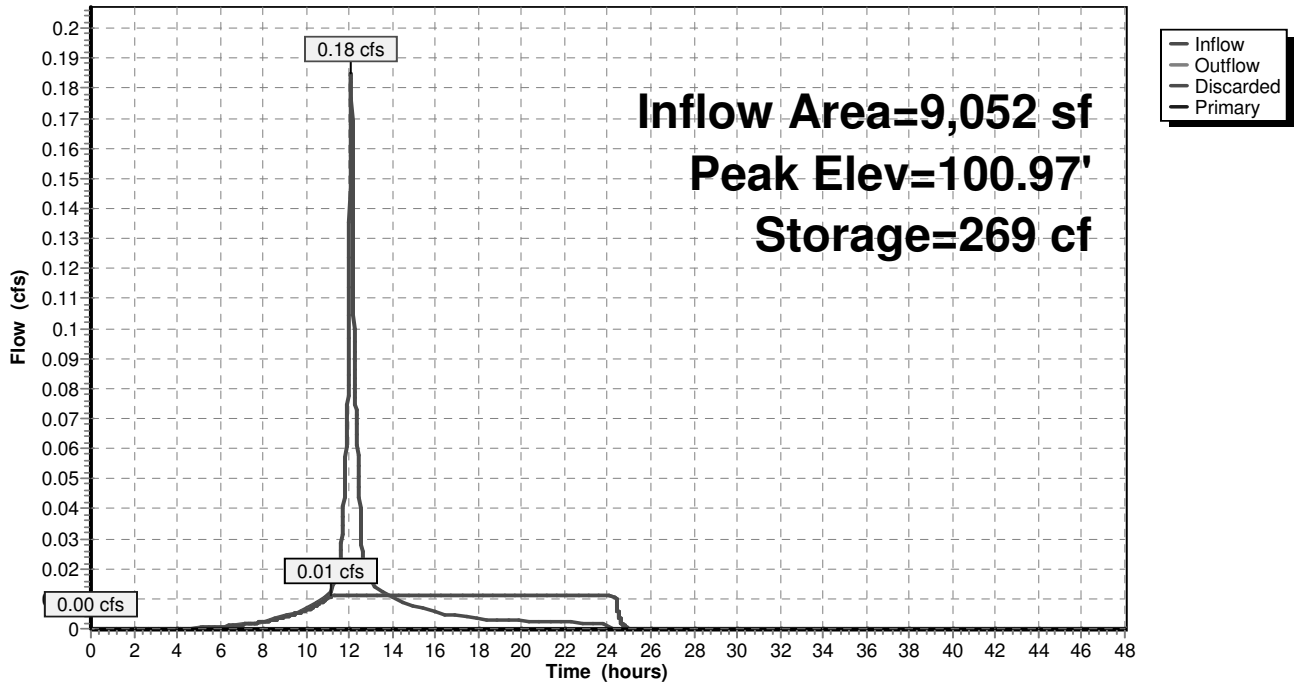
Type III 24-hr 1-inch storm Rainfall=1.00"

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Page 8

**Pond 14P: Infiltration Trench**

Hydrograph



May 8, 2015

2 WELLS AVENUE  
Newton, Massachusetts

**STANDARD 10: Illicit Discharge Compliance Statement**

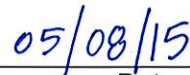
**Standard 10 states: All illicit discharges to the stormwater management system are prohibited.**

This is to verify:

1. Based on the information available there are no known or suspected illicit discharges to the stormwater management system at the TWO WELLS AVENUE site as defined in the MassDEP Stormwater Handbook.
2. The design of the stormwater system includes no proposed illicit discharges.



Deborah Danik, PE

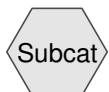
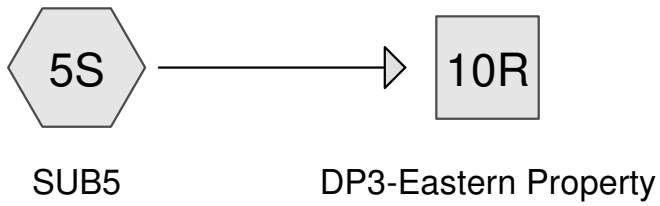
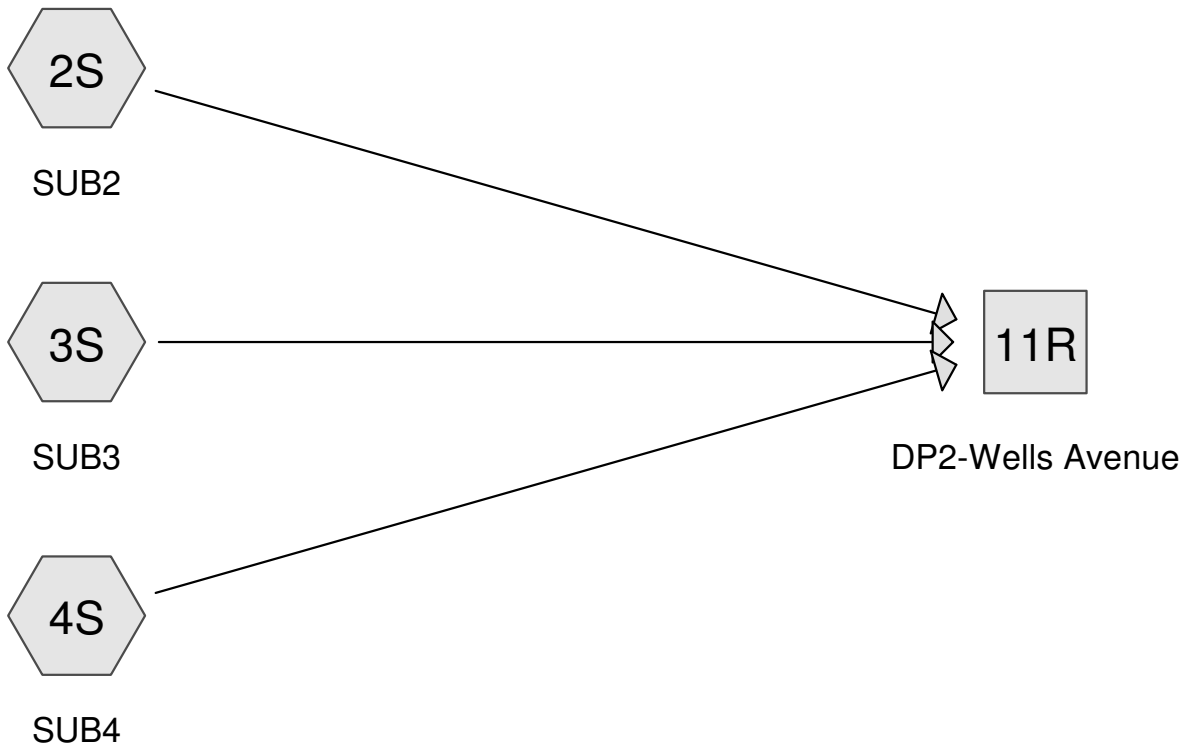
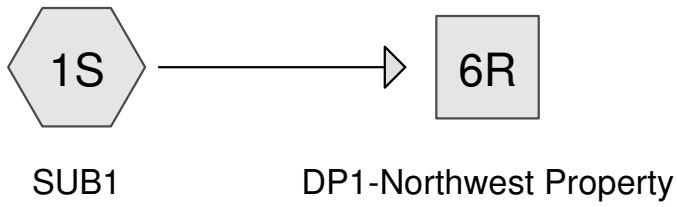


Date

**APPENDIX B**

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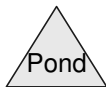
**Existing Conditions – HydroCAD Calculations**



Subcat



Reach



Pond



Link

**Existing HydroCAD**

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Page 2

**Area Listing (selected nodes)**

Area (sq-ft)	CN	Description (subcatchment-numbers)
84,043	61	>75% Grass cover, Good, HSG B (2S, 3S, 4S, 5S)
116,224	98	Paved parking (2S, 3S, 4S, 5S)
68,708	98	Roofs (3S, 4S)
89,629	55	Woods, Good, HSG B (1S, 2S, 5S)
<b>358,604</b>	<b>79</b>	<b>TOTAL AREA</b>

**Existing HydroCAD**

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Page 3

**Soil Listing (selected nodes)**

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
173,672	HSG B	1S, 2S, 3S, 4S, 5S
0	HSG C	
0	HSG D	
184,932	Other	2S, 3S, 4S, 5S
<b>358,604</b>		<b>TOTAL AREA</b>

**Existing HydroCAD**

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Page 4

**Ground Covers (selected nodes)**

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover
0	84,043	0	0	0	84,043	>75% Grass cover, Good
0	0	0	0	116,224	116,224	Paved parking
0	0	0	0	68,708	68,708	Roofs
0	89,629	0	0	0	89,629	Woods, Good
<b>0</b>	<b>173,672</b>	<b>0</b>	<b>0</b>	<b>184,932</b>	<b>358,604</b>	<b>TOTAL AREA</b>

# Existing HydroCAD

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Existing Conditions  
Type III 24-hr 2-yr Rainfall=3.20"

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Page 5

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

**Subcatchment 1S: SUB1** Runoff Area=10,968 sf 0.00% Impervious Runoff Depth=0.25"  
Flow Length=220' Tc=6.0 min CN=55 Runoff=0.03 cfs 229 cf

**Subcatchment 2S: SUB2** Runoff Area=147,391 sf 48.22% Impervious Runoff Depth=1.21"  
Flow Length=559' Tc=7.5 min CN=77 Runoff=4.44 cfs 14,884 cf

**Subcatchment 3S: SUB3** Runoff Area=47,383 sf 73.87% Impervious Runoff Depth=2.00"  
Flow Length=128' Tc=8.7 min CN=88 Runoff=2.31 cfs 7,885 cf

**Subcatchment 4S: SUB4** Runoff Area=38,880 sf 89.06% Impervious Runoff Depth=2.54"  
Flow Length=83' Tc=6.0 min CN=94 Runoff=2.55 cfs 8,242 cf

**Subcatchment 5S: SUB5** Runoff Area=113,982 sf 38.80% Impervious Runoff Depth=1.04"  
Flow Length=627' Tc=13.8 min CN=74 Runoff=2.33 cfs 9,855 cf

**Reach 6R: DP1-Northwest Property** Inflow=0.03 cfs 229 cf  
Outflow=0.03 cfs 229 cf

**Reach 10R: DP3-Eastern Property** Inflow=2.33 cfs 9,855 cf  
Outflow=2.33 cfs 9,855 cf

**Reach 11R: DP2-Wells Avenue** Inflow=9.17 cfs 31,011 cf  
Outflow=9.17 cfs 31,011 cf

**Total Runoff Area = 358,604 sf Runoff Volume = 41,096 cf Average Runoff Depth = 1.38"**  
**48.43% Pervious = 173,672 sf 51.57% Impervious = 184,932 sf**



# Existing HydroCAD

Prepared by Nitsch Engineering

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Existing Conditions  
Type III 24-hr 2-yr Rainfall=3.20"

Printed 4/22/2015

Page 6

## Summary for Subcatchment 1S: SUB1

Runoff = 0.03 cfs @ 12.33 hrs, Volume= 229 cf, Depth= 0.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-yr Rainfall=3.20"

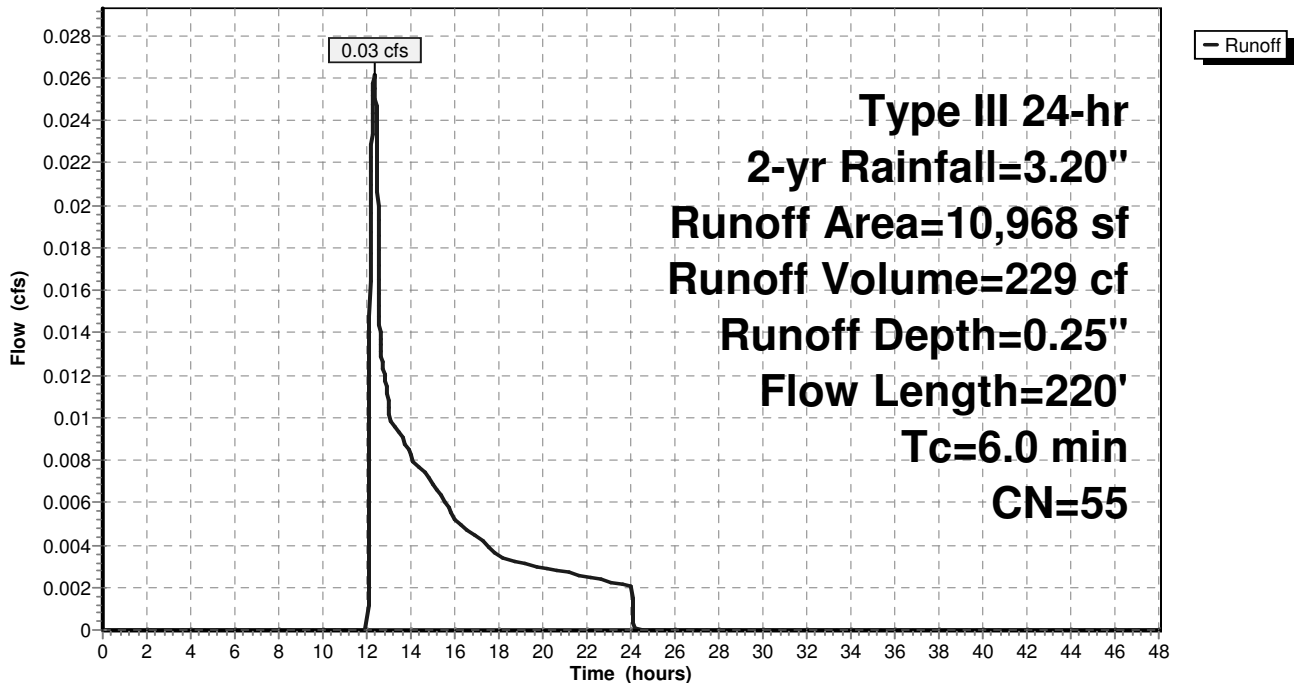
Area (sf)	CN	Description
10,968	55	Woods, Good, HSG B
10,968	55	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	50	0.2200	0.18		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.20"
0.6	170	0.0820	4.61		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
5.3	220	Total, Increased to minimum Tc = 6.0 min			

## Subcatchment 1S: SUB1

Hydrograph



**Existing HydroCAD**

Prepared by Nitsch Engineering

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Existing Conditions  
Type III 24-hr 2-yr Rainfall=3.20"

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Page 7

**Summary for Subcatchment 2S: SUB2**

Runoff = 4.44 cfs @ 12.11 hrs, Volume= 14,884 cf, Depth= 1.21"

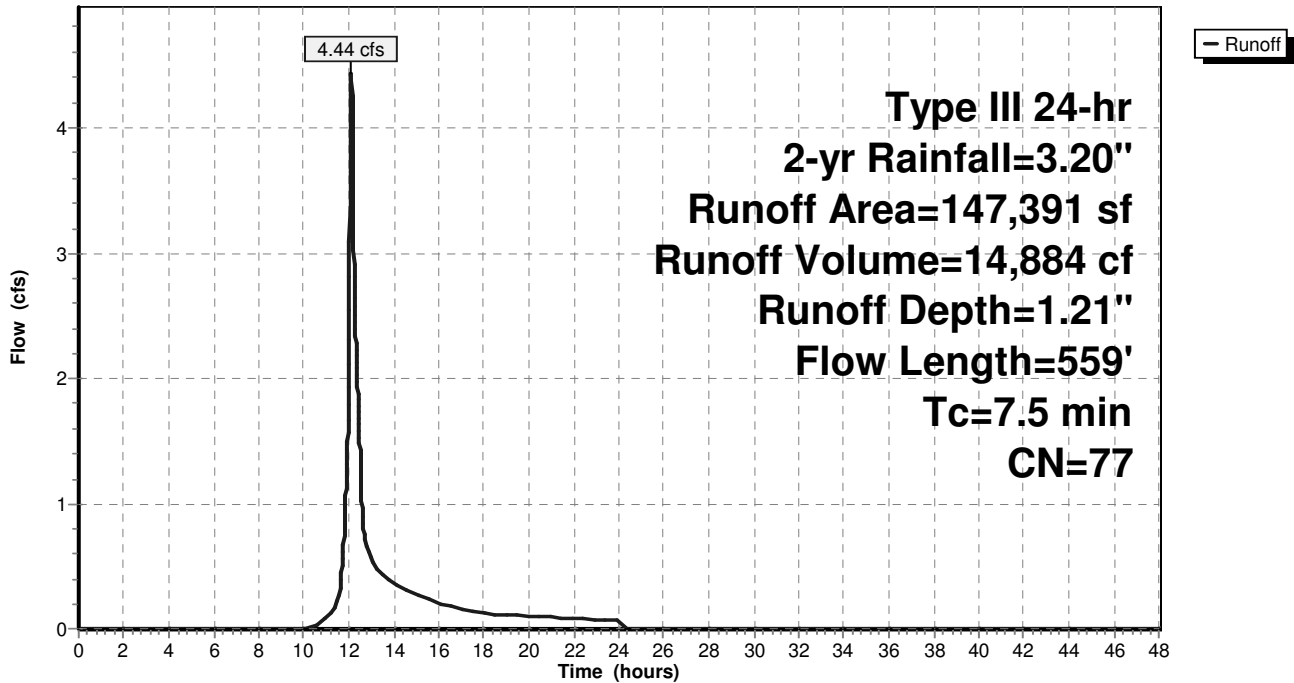
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-yr Rainfall=3.20"

	Area (sf)	CN	Description
*	71,077	98	Paved parking
	29,455	61	>75% Grass cover, Good, HSG B
	46,859	55	Woods, Good, HSG B
	147,391	77	Weighted Average
	76,314	57	51.78% Pervious Area
	71,077	98	48.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	50	0.2200	0.18		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.20"
2.8	509	0.0350	3.01		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
7.5	559	Total			

**Subcatchment 2S: SUB2**

Hydrograph



**Existing HydroCAD**

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Existing Conditions  
Type III 24-hr 2-yr Rainfall=3.20"

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**Summary for Subcatchment 3S: SUB3**

Runoff = 2.31 cfs @ 12.12 hrs, Volume= 7,885 cf, Depth= 2.00"

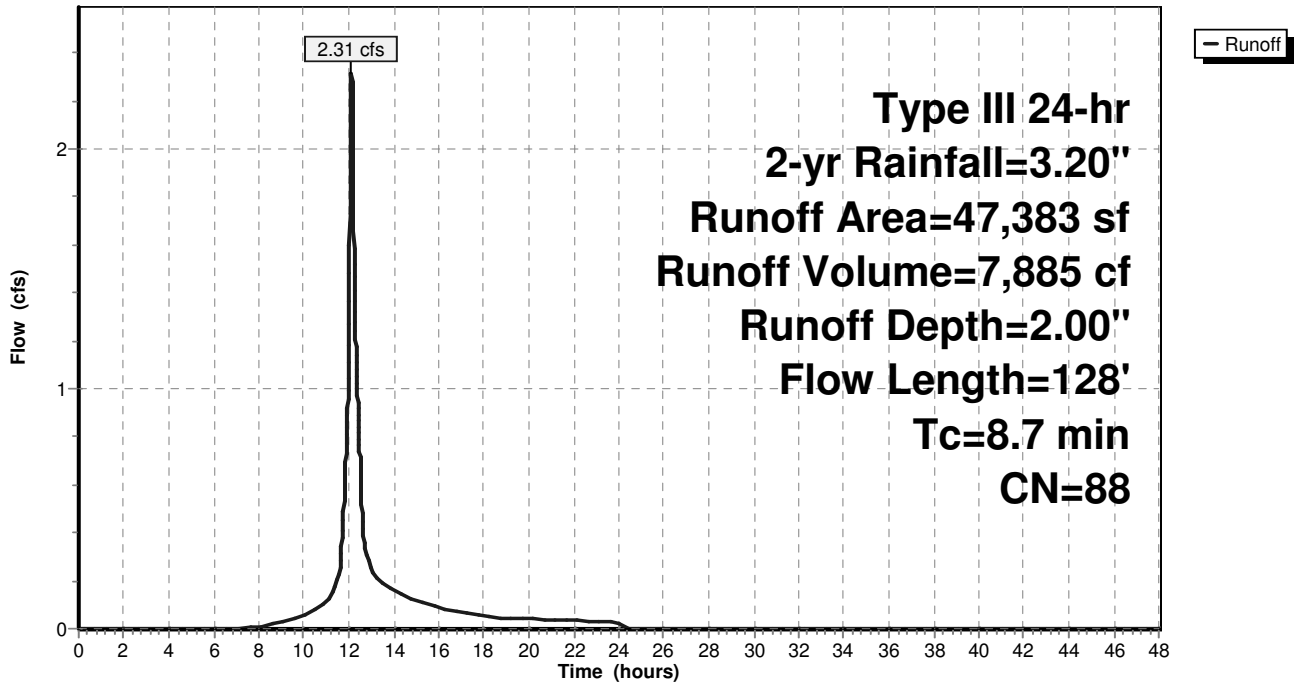
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-yr Rainfall=3.20"

Area (sf)	CN	Description
* 686	98	Paved parking
* 34,315	98	Roofs
12,382	61	>75% Grass cover, Good, HSG B
47,383	88	Weighted Average
12,382	61	26.13% Pervious Area
35,001	98	73.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	50	0.0080	0.10		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
0.6	78	0.0200	2.28		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
8.7	128	Total			

**Subcatchment 3S: SUB3**

Hydrograph



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Existing Conditions  
Type III 24-hr 2-yr Rainfall=3.20"

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**Summary for Subcatchment 4S: SUB4**

Runoff = 2.55 cfs @ 12.08 hrs, Volume= 8,242 cf, Depth= 2.54"

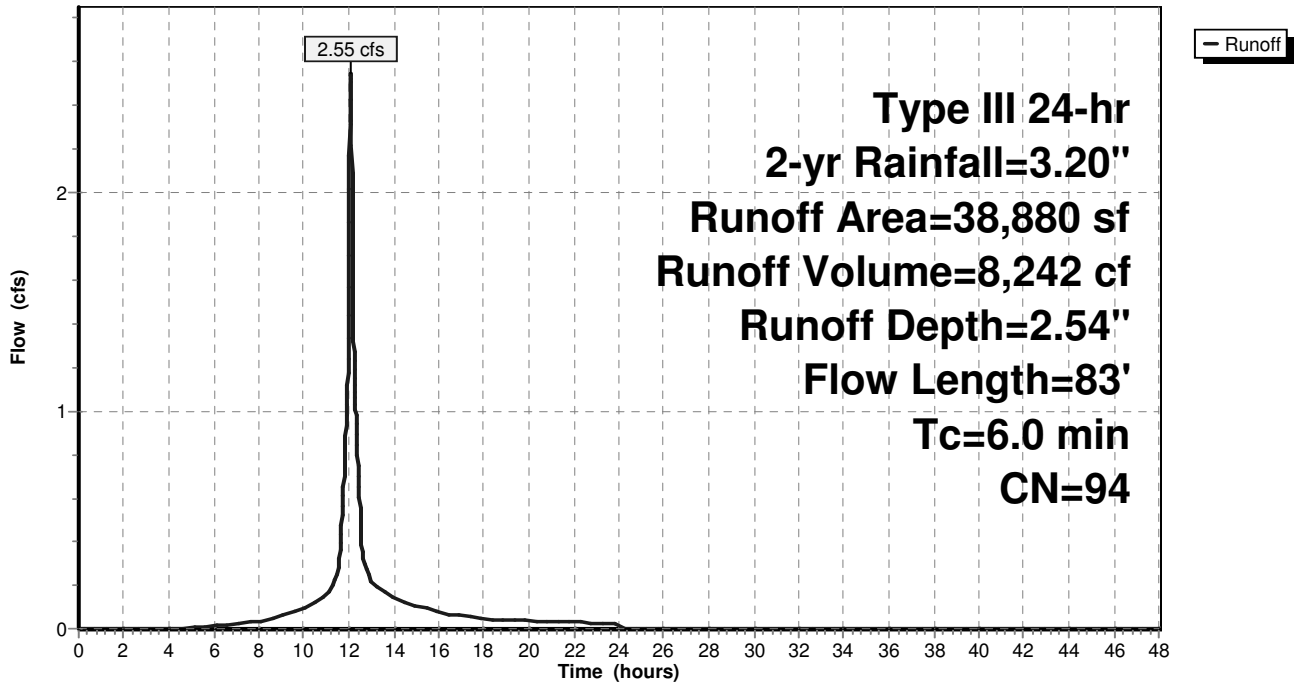
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-yr Rainfall=3.20"

Area (sf)	CN	Description
* 234	98	Paved parking
* 34,393	98	Roofs
4,253	61	>75% Grass cover, Good, HSG B
38,880	94	Weighted Average
4,253	61	10.94% Pervious Area
34,627	98	89.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	50	0.0360	0.19		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
0.2	33	0.0240	2.49		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
4.6	83	Total, Increased to minimum Tc = 6.0 min			

**Subcatchment 4S: SUB4**

Hydrograph



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Existing Conditions  
Type III 24-hr 2-yr Rainfall=3.20"

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**Summary for Subcatchment 5S: SUB5**

Runoff = 2.33 cfs @ 12.20 hrs, Volume= 9,855 cf, Depth= 1.04"

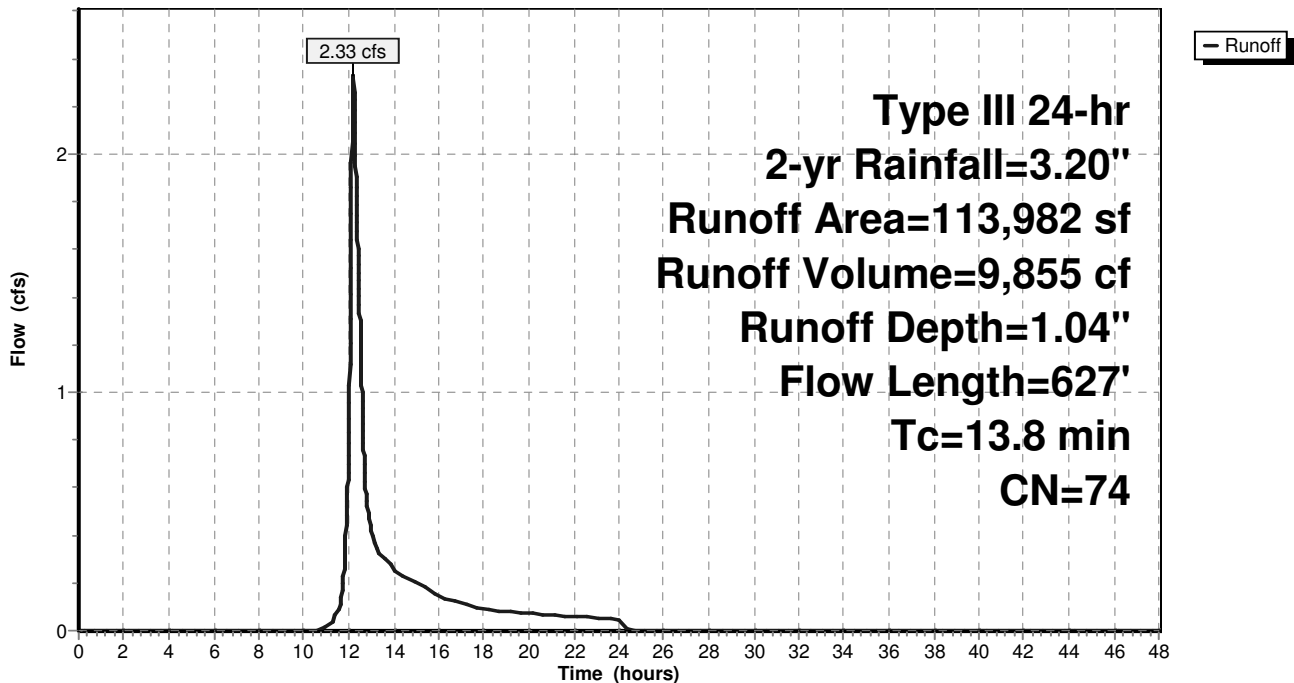
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-yr Rainfall=3.20"

Area (sf)	CN	Description
* 44,227	98	Paved parking
37,953	61	>75% Grass cover, Good, HSG B
31,802	55	Woods, Good, HSG B
113,982	74	Weighted Average
69,755	58	61.20% Pervious Area
44,227	98	38.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.0140	0.13		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
7.2	542	0.0060	1.25		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
0.1	35	0.0860	4.72		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
13.8	627	Total			

**Subcatchment 5S: SUB5**

Hydrograph



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Existing Conditions  
Type III 24-hr 2-yr Rainfall=3.20"

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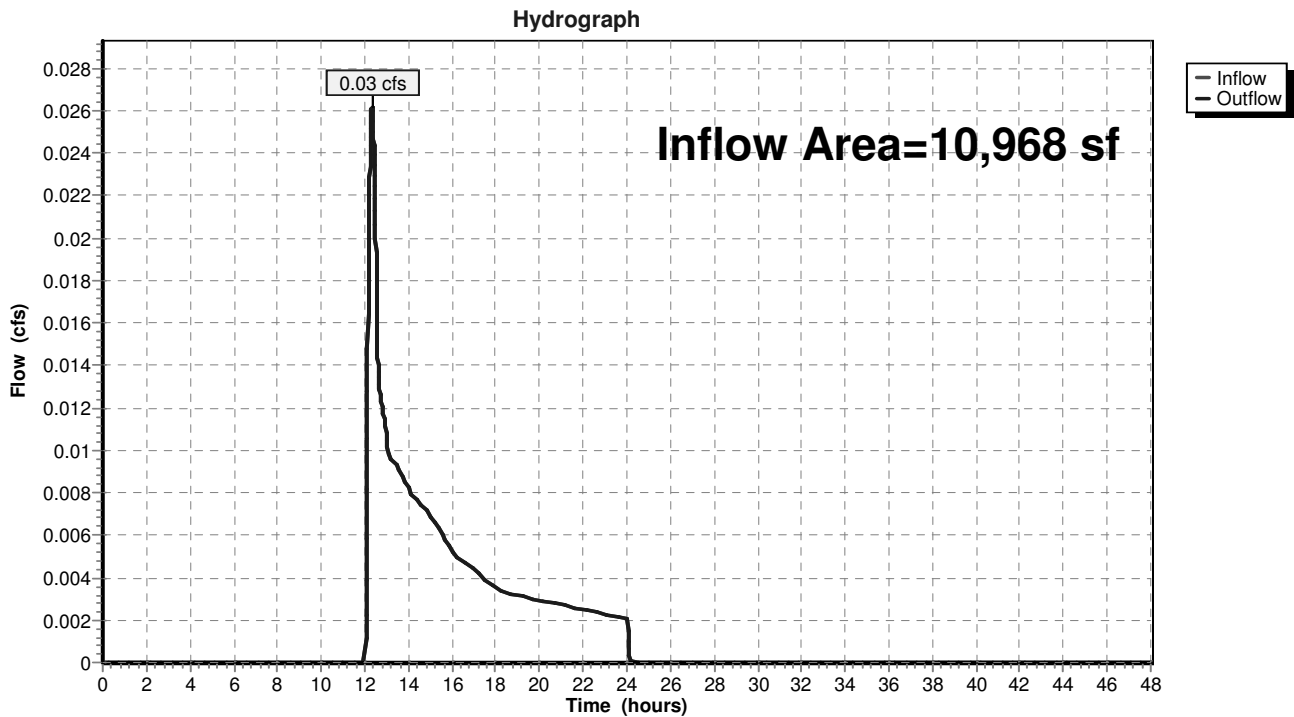
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**Summary for Reach 6R: DP1-Northwest Property**

Inflow Area = 10,968 sf, 0.00% Impervious, Inflow Depth = 0.25" for 2-yr event  
Inflow = 0.03 cfs @ 12.33 hrs, Volume= 229 cf  
Outflow = 0.03 cfs @ 12.33 hrs, Volume= 229 cf, Atten= 0%, Lag= 0.0 min

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

**Reach 6R: DP1-Northwest Property**



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Existing Conditions  
Type III 24-hr 2-yr Rainfall=3.20"

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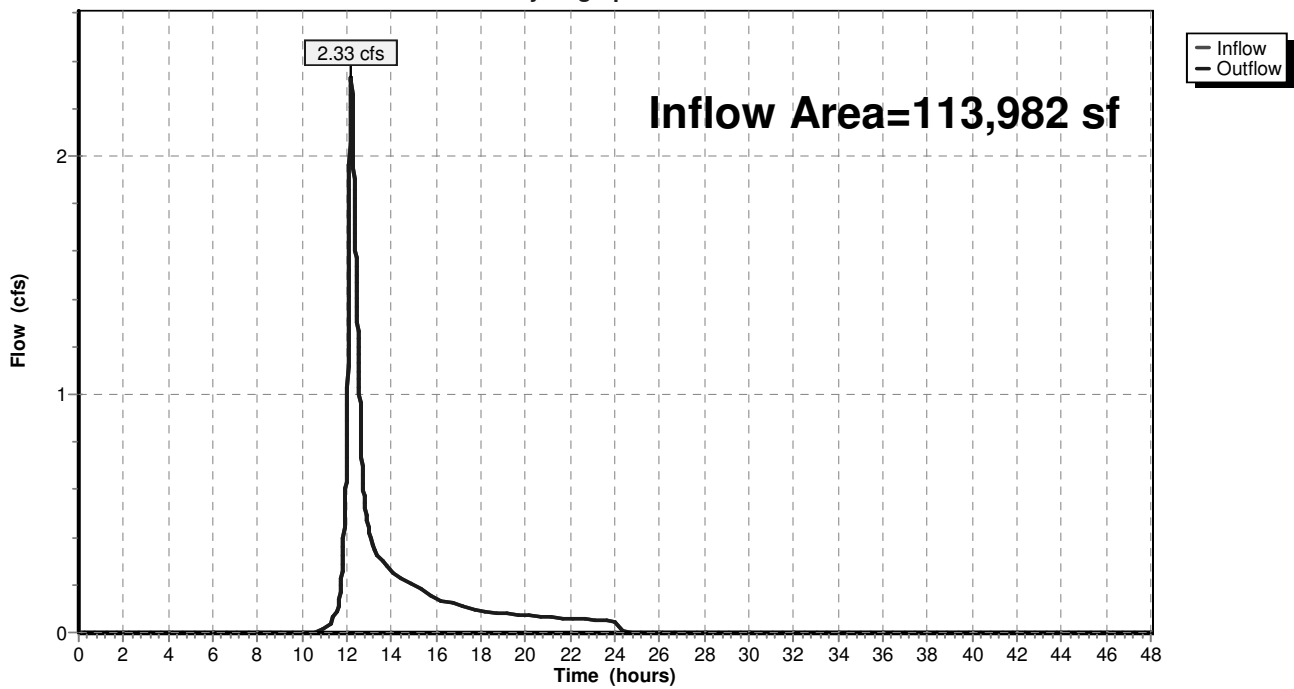
**Summary for Reach 10R: DP3-Eastern Property**

Inflow Area = 113,982 sf, 38.80% Impervious, Inflow Depth = 1.04" for 2-yr event  
Inflow = 2.33 cfs @ 12.20 hrs, Volume= 9,855 cf  
Outflow = 2.33 cfs @ 12.20 hrs, Volume= 9,855 cf, Atten= 0%, Lag= 0.0 min

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

**Reach 10R: DP3-Eastern Property**

Hydrograph



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Existing Conditions  
Type III 24-hr 2-yr Rainfall=3.20"

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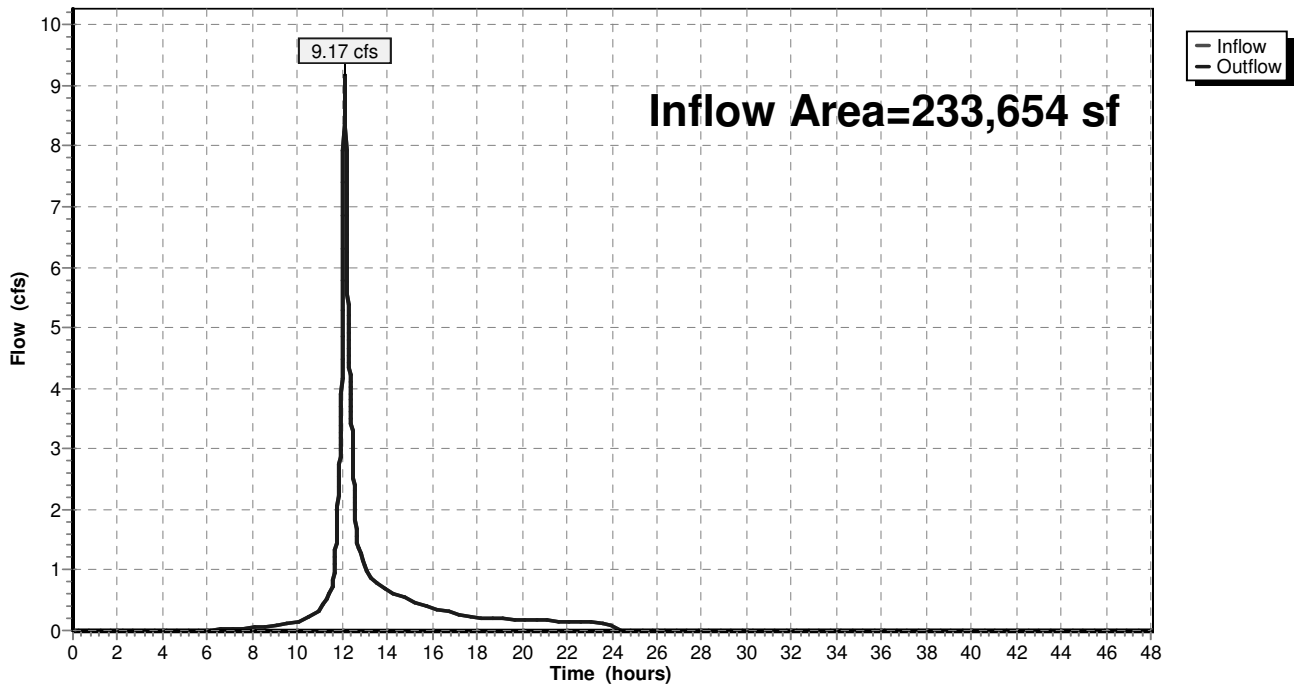
**Summary for Reach 11R: DP2-Wells Avenue**

Inflow Area = 233,654 sf, 60.22% Impervious, Inflow Depth = 1.59" for 2-yr event  
Inflow = 9.17 cfs @ 12.11 hrs, Volume= 31,011 cf  
Outflow = 9.17 cfs @ 12.11 hrs, Volume= 31,011 cf, Atten= 0%, Lag= 0.0 min

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

**Reach 11R: DP2-Wells Avenue**

Hydrograph





## Existing HydroCAD

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Existing Conditions  
Type III 24-hr 10-yr Rainfall=4.60"

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

**Subcatchment 1S: SUB1** Runoff Area=10,968 sf 0.00% Impervious Runoff Depth=0.79"  
Flow Length=220' Tc=6.0 min CN=55 Runoff=0.17 cfs 720 cf

**Subcatchment 2S: SUB2** Runoff Area=147,391 sf 48.22% Impervious Runoff Depth=2.29"  
Flow Length=559' Tc=7.5 min CN=77 Runoff=8.61 cfs 28,153 cf

**Subcatchment 3S: SUB3** Runoff Area=47,383 sf 73.87% Impervious Runoff Depth=3.29"  
Flow Length=128' Tc=8.7 min CN=88 Runoff=3.76 cfs 12,992 cf

**Subcatchment 4S: SUB4** Runoff Area=38,880 sf 89.06% Impervious Runoff Depth=3.91"  
Flow Length=83' Tc=6.0 min CN=94 Runoff=3.83 cfs 12,681 cf

**Subcatchment 5S: SUB5** Runoff Area=113,982 sf 38.80% Impervious Runoff Depth=2.05"  
Flow Length=627' Tc=13.8 min CN=74 Runoff=4.85 cfs 19,468 cf

**Reach 6R: DP1-Northwest Property** Inflow=0.17 cfs 720 cf  
Outflow=0.17 cfs 720 cf

**Reach 10R: DP3-Eastern Property** Inflow=4.85 cfs 19,468 cf  
Outflow=4.85 cfs 19,468 cf

**Reach 11R: DP2-Wells Avenue** Inflow=16.02 cfs 53,826 cf  
Outflow=16.02 cfs 53,826 cf

**Total Runoff Area = 358,604 sf Runoff Volume = 74,014 cf Average Runoff Depth = 2.48"**  
**48.43% Pervious = 173,672 sf 51.57% Impervious = 184,932 sf**

**Existing HydroCAD**

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Existing Conditions  
Type III 24-hr 10-yr Rainfall=4.60"

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**Summary for Subcatchment 1S: SUB1**

Runoff = 0.17 cfs @ 12.11 hrs, Volume= 720 cf, Depth= 0.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-yr Rainfall=4.60"

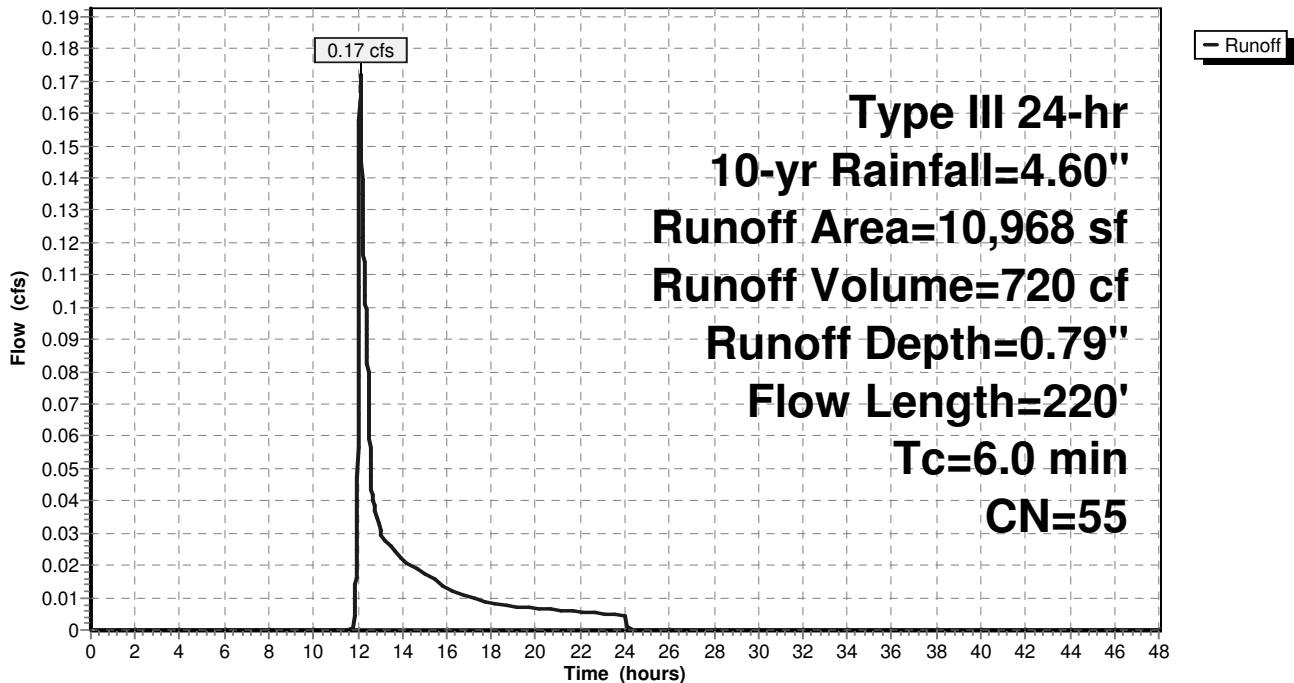
Area (sf)	CN	Description
10,968	55	Woods, Good, HSG B
10,968	55	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	50	0.2200	0.18		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.20"
0.6	170	0.0820	4.61		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
5.3	220	Total, Increased to minimum Tc = 6.0 min			

**Subcatchment 1S: SUB1**

Hydrograph



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Existing Conditions  
Type III 24-hr 10-yr Rainfall=4.60"

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**Summary for Subcatchment 2S: SUB2**

Runoff = 8.61 cfs @ 12.11 hrs, Volume= 28,153 cf, Depth= 2.29"

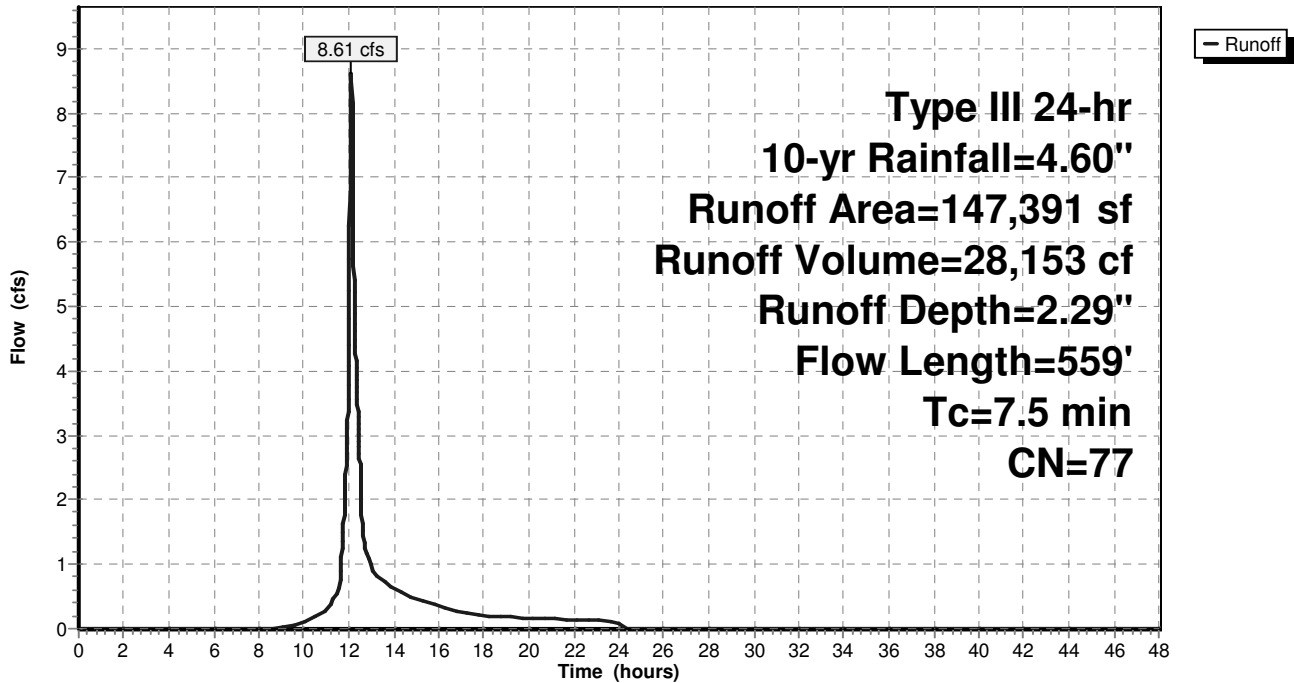
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-yr Rainfall=4.60"

	Area (sf)	CN	Description
*	71,077	98	Paved parking
	29,455	61	>75% Grass cover, Good, HSG B
	46,859	55	Woods, Good, HSG B
	147,391	77	Weighted Average
	76,314	57	51.78% Pervious Area
	71,077	98	48.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	50	0.2200	0.18		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.20"
2.8	509	0.0350	3.01		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
7.5	559	Total			

**Subcatchment 2S: SUB2**

Hydrograph



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Existing Conditions  
Type III 24-hr 10-yr Rainfall=4.60"

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**Summary for Subcatchment 3S: SUB3**

Runoff = 3.76 cfs @ 12.12 hrs, Volume= 12,992 cf, Depth= 3.29"

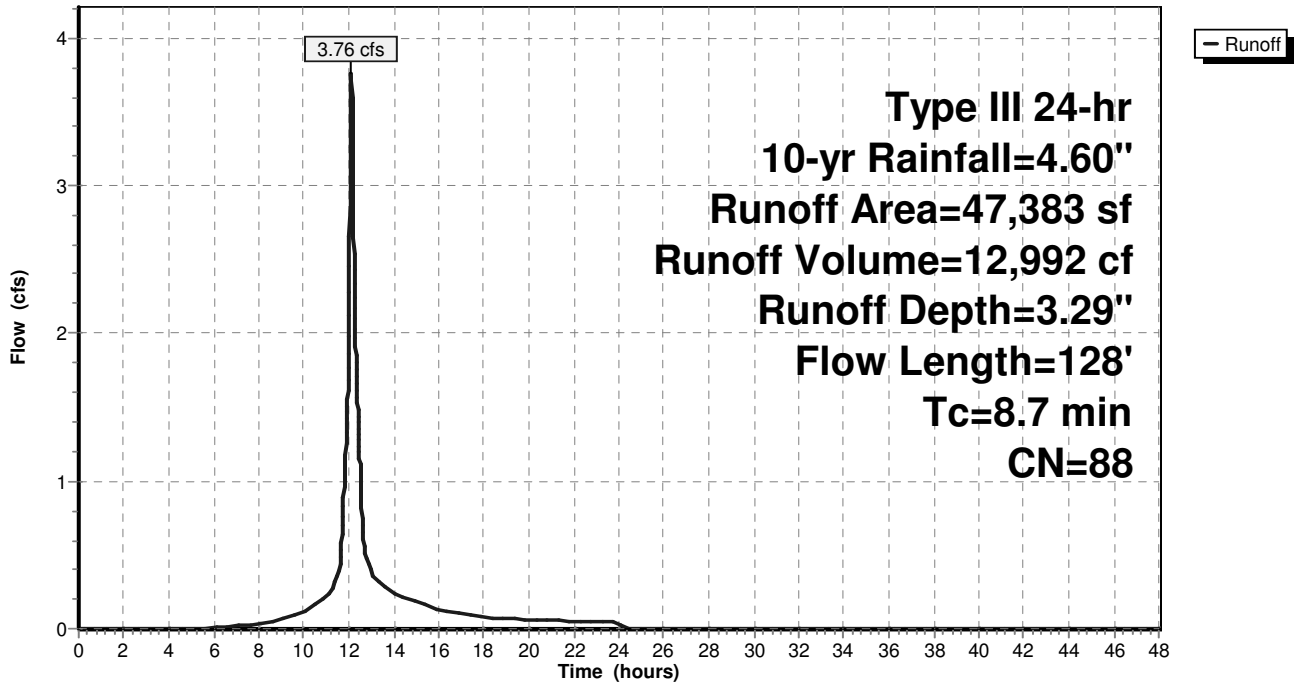
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-yr Rainfall=4.60"

Area (sf)	CN	Description
* 686	98	Paved parking
* 34,315	98	Roofs
12,382	61	>75% Grass cover, Good, HSG B
47,383	88	Weighted Average
12,382	61	26.13% Pervious Area
35,001	98	73.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	50	0.0080	0.10		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
0.6	78	0.0200	2.28		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
8.7	128	Total			

**Subcatchment 3S: SUB3**

Hydrograph



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Existing Conditions  
Type III 24-hr 10-yr Rainfall=4.60"

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**Summary for Subcatchment 4S: SUB4**

Runoff = 3.83 cfs @ 12.08 hrs, Volume= 12,681 cf, Depth= 3.91"

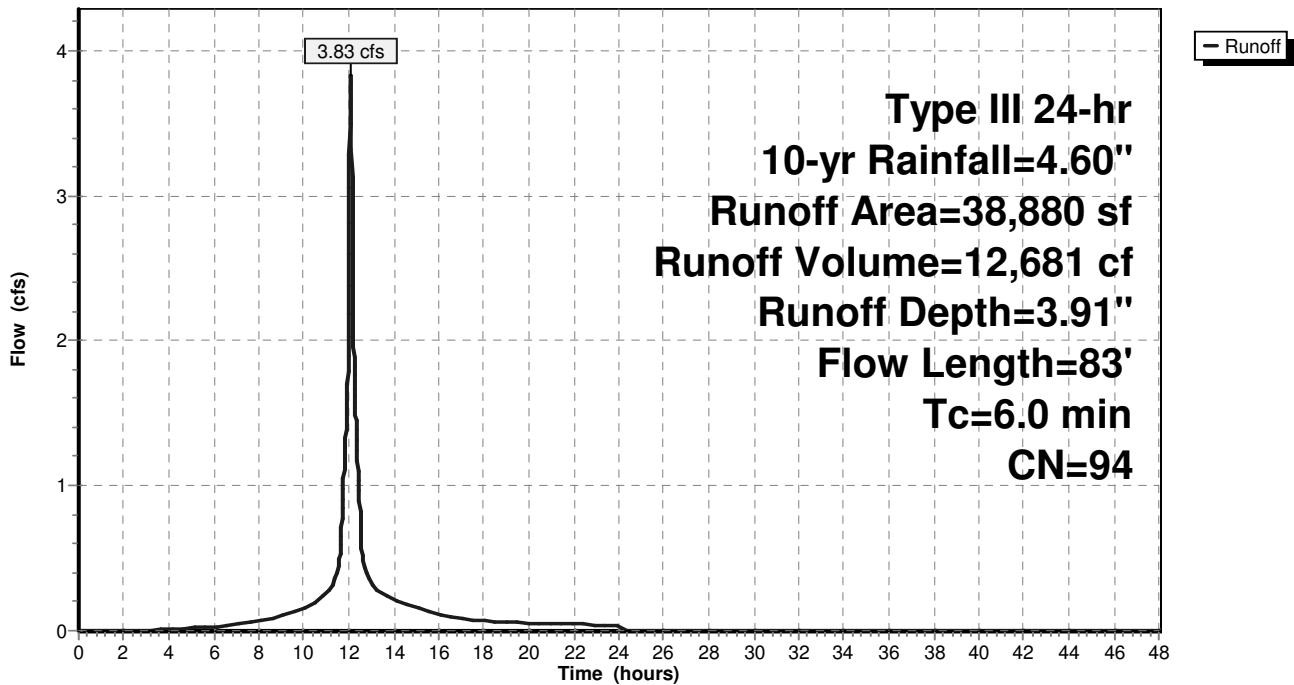
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-yr Rainfall=4.60"

Area (sf)	CN	Description
* 234	98	Paved parking
* 34,393	98	Roofs
4,253	61	>75% Grass cover, Good, HSG B
38,880	94	Weighted Average
4,253	61	10.94% Pervious Area
34,627	98	89.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	50	0.0360	0.19		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
0.2	33	0.0240	2.49		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
4.6	83	Total, Increased to minimum Tc = 6.0 min			

**Subcatchment 4S: SUB4**

Hydrograph



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Type III 24-hr 10-yr Rainfall=4.60"

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**Summary for Subcatchment 5S: SUB5**

Runoff = 4.85 cfs @ 12.19 hrs, Volume= 19,468 cf, Depth= 2.05"

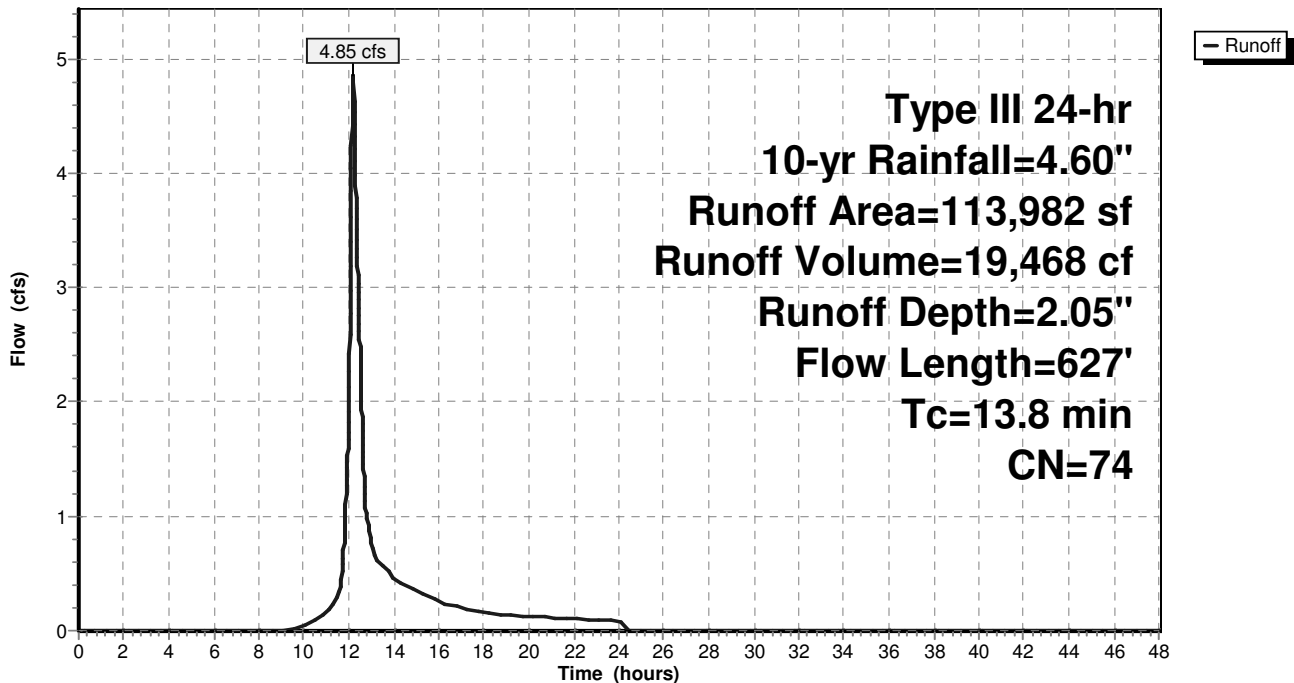
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-yr Rainfall=4.60"

	Area (sf)	CN	Description
*	44,227	98	Paved parking
	37,953	61	>75% Grass cover, Good, HSG B
	31,802	55	Woods, Good, HSG B
	113,982	74	Weighted Average
	69,755	58	61.20% Pervious Area
	44,227	98	38.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.0140	0.13		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
7.2	542	0.0060	1.25		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
0.1	35	0.0860	4.72		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
13.8	627	Total			

**Subcatchment 5S: SUB5**

Hydrograph



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Existing Conditions  
Type III 24-hr 10-yr Rainfall=4.60"

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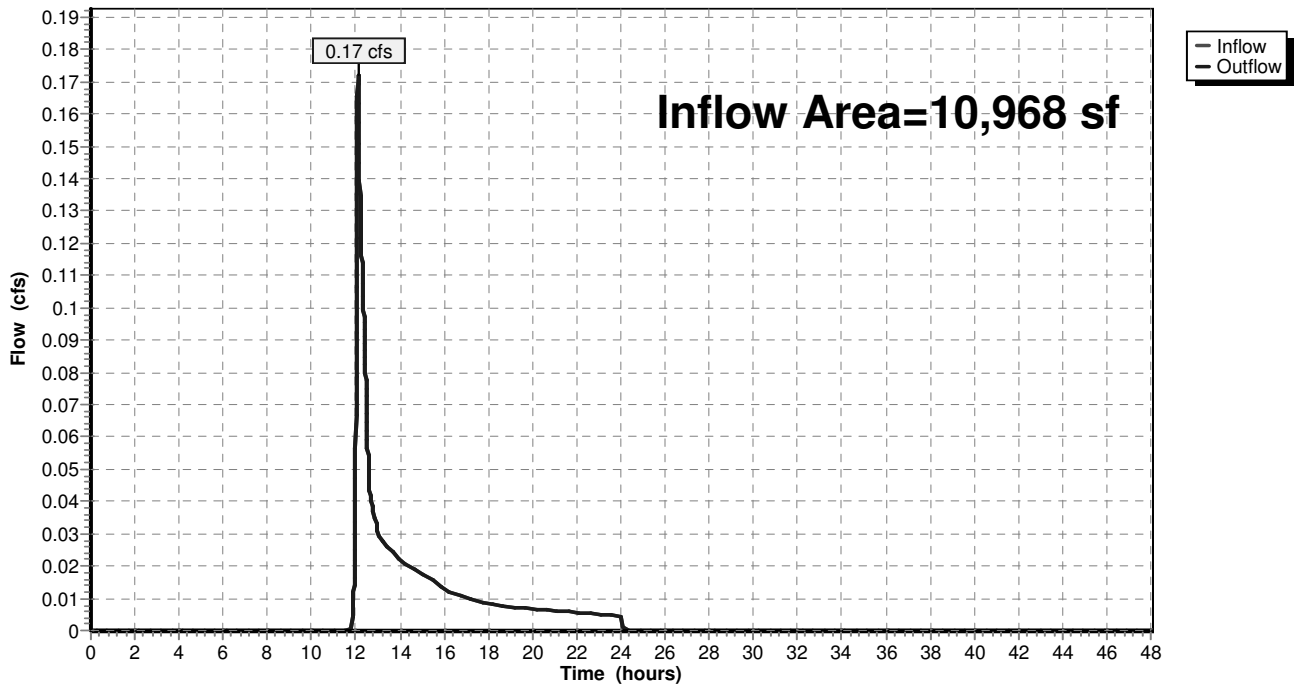
**Summary for Reach 6R: DP1-Northwest Property**

Inflow Area = 10,968 sf, 0.00% Impervious, Inflow Depth = 0.79" for 10-yr event  
Inflow = 0.17 cfs @ 12.11 hrs, Volume= 720 cf  
Outflow = 0.17 cfs @ 12.11 hrs, Volume= 720 cf, Atten= 0%, Lag= 0.0 min

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

**Reach 6R: DP1-Northwest Property**

Hydrograph



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Existing Conditions  
Type III 24-hr 10-yr Rainfall=4.60"

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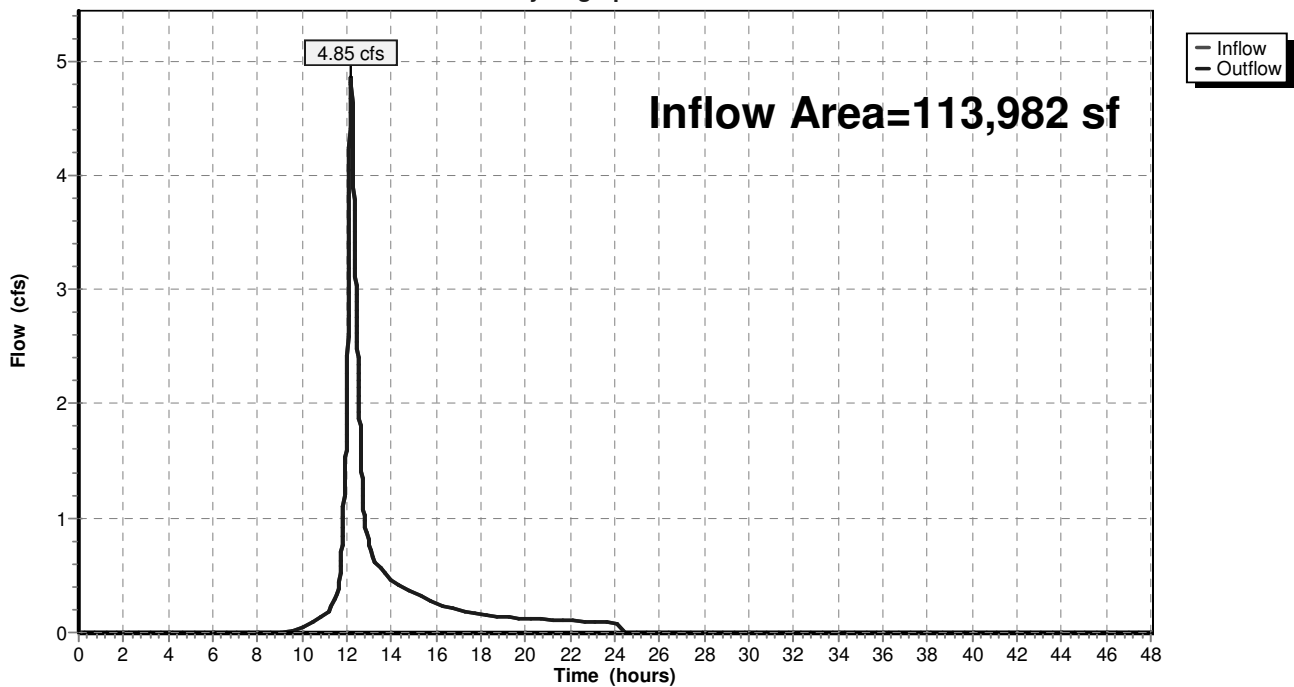
**Summary for Reach 10R: DP3-Eastern Property**

Inflow Area = 113,982 sf, 38.80% Impervious, Inflow Depth = 2.05" for 10-yr event  
Inflow = 4.85 cfs @ 12.19 hrs, Volume= 19,468 cf  
Outflow = 4.85 cfs @ 12.19 hrs, Volume= 19,468 cf, Atten= 0%, Lag= 0.0 min

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

**Reach 10R: DP3-Eastern Property**

Hydrograph





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Existing Conditions  
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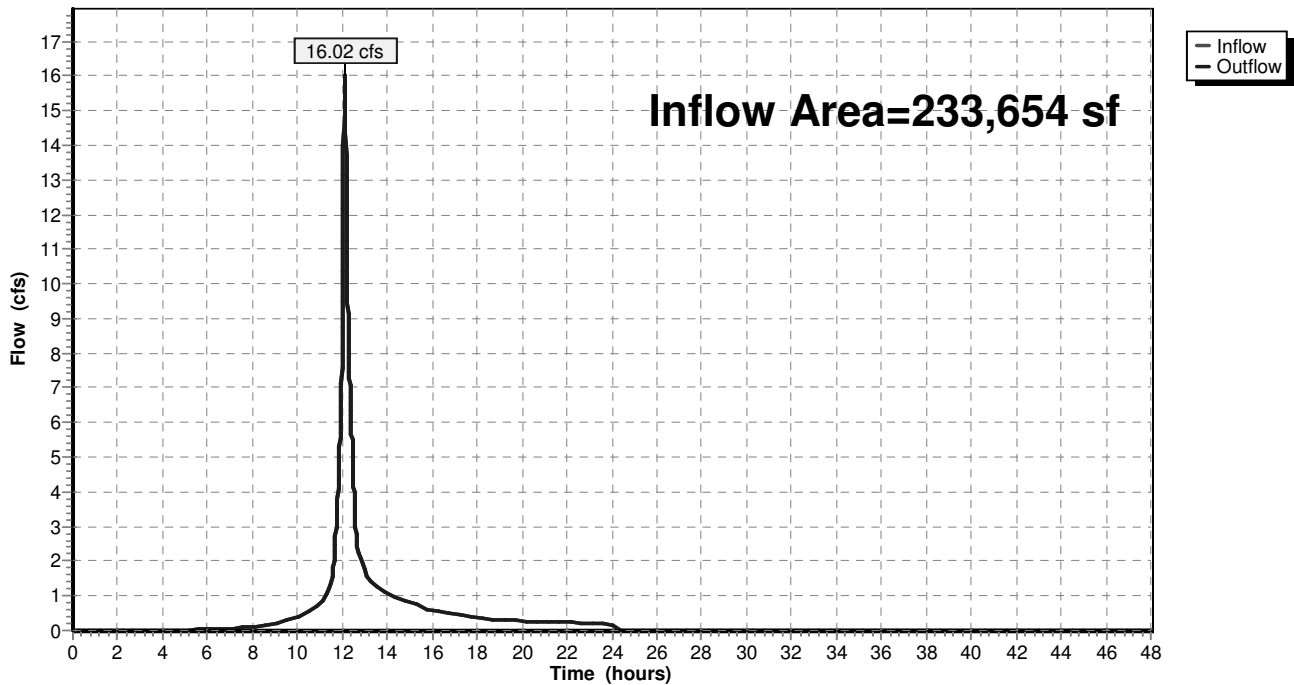
**Summary for Reach 11R: DP2-Wells Avenue**

Inflow Area = 233,654 sf, 60.22% Impervious, Inflow Depth = 2.76" for 10-yr event  
Inflow = 16.02 cfs @ 12.11 hrs, Volume= 53,826 cf  
Outflow = 16.02 cfs @ 12.11 hrs, Volume= 53,826 cf, Atten= 0%, Lag= 0.0 min

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

**Reach 11R: DP2-Wells Avenue**

Hydrograph



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

**Subcatchment 1S: SUB1** Runoff Area=10,968 sf 0.00% Impervious Runoff Depth=1.24"  
Flow Length=220' Tc=6.0 min CN=55 Runoff=0.31 cfs 1,133 cf

**Subcatchment 2S: SUB2** Runoff Area=147,391 sf 48.22% Impervious Runoff Depth=3.05"  
Flow Length=559' Tc=7.5 min CN=77 Runoff=11.48 cfs 37,419 cf

**Subcatchment 3S: SUB3** Runoff Area=47,383 sf 73.87% Impervious Runoff Depth=4.15"  
Flow Length=128' Tc=8.7 min CN=88 Runoff=4.69 cfs 16,370 cf

**Subcatchment 4S: SUB4** Runoff Area=38,880 sf 89.06% Impervious Runoff Depth=4.80"  
Flow Length=83' Tc=6.0 min CN=94 Runoff=4.64 cfs 15,558 cf

**Subcatchment 5S: SUB5** Runoff Area=113,982 sf 38.80% Impervious Runoff Depth=2.77"  
Flow Length=627' Tc=13.8 min CN=74 Runoff=6.62 cfs 26,303 cf

**Reach 6R: DP1-Northwest Property** Inflow=0.31 cfs 1,133 cf  
Outflow=0.31 cfs 1,133 cf

**Reach 10R: DP3-Eastern Property** Inflow=6.62 cfs 26,303 cf  
Outflow=6.62 cfs 26,303 cf

**Reach 11R: DP2-Wells Avenue** Inflow=20.59 cfs 69,346 cf  
Outflow=20.59 cfs 69,346 cf

**Total Runoff Area = 358,604 sf Runoff Volume = 96,782 cf Average Runoff Depth = 3.24"**  
**48.43% Pervious = 173,672 sf 51.57% Impervious = 184,932 sf**

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Existing Conditions  
Type III 24-hr 25-yr Rainfall=5.50"

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**Summary for Subcatchment 1S: SUB1**

Runoff = 0.31 cfs @ 12.10 hrs, Volume= 1,133 cf, Depth= 1.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-yr Rainfall=5.50"

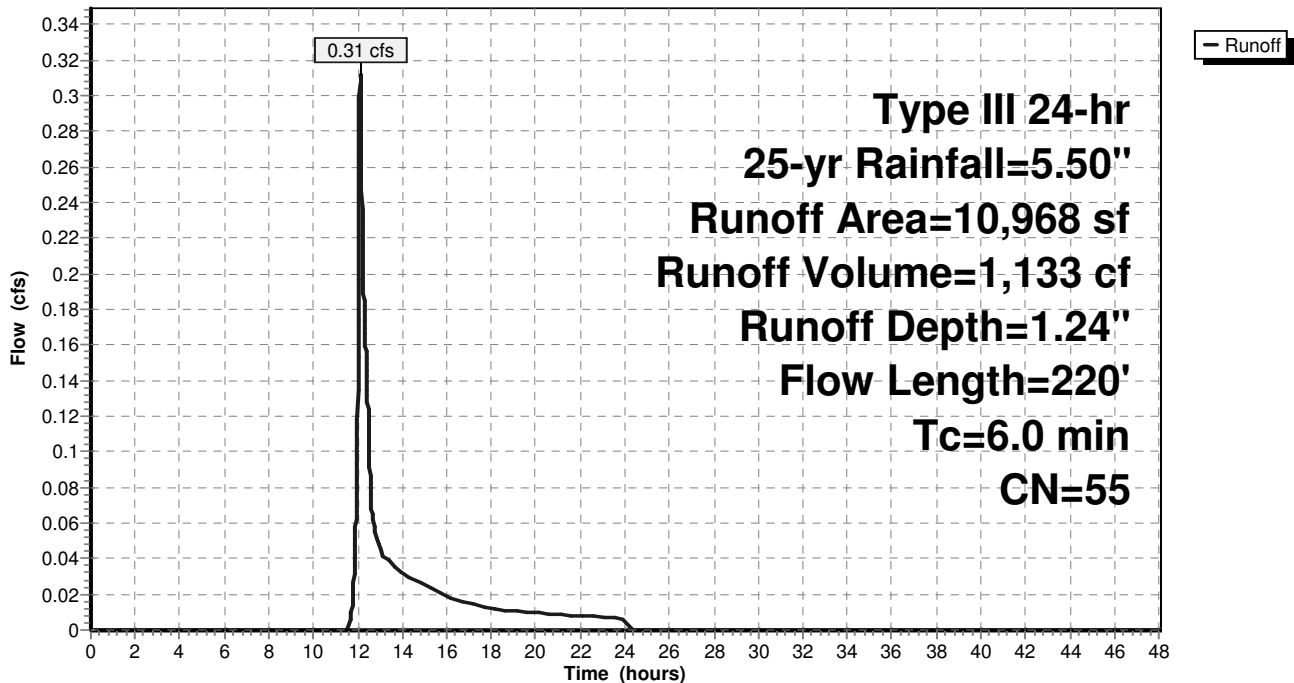
Area (sf)	CN	Description
10,968	55	Woods, Good, HSG B
10,968	55	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	50	0.2200	0.18		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.20"
0.6	170	0.0820	4.61		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
5.3	220	Total, Increased to minimum Tc = 6.0 min			

**Subcatchment 1S: SUB1**

Hydrograph



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Type III 24-hr 25-yr Rainfall=5.50"

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## Summary for Subcatchment 2S: SUB2

Runoff = 11.48 cfs @ 12.11 hrs, Volume= 37,419 cf, Depth= 3.05"

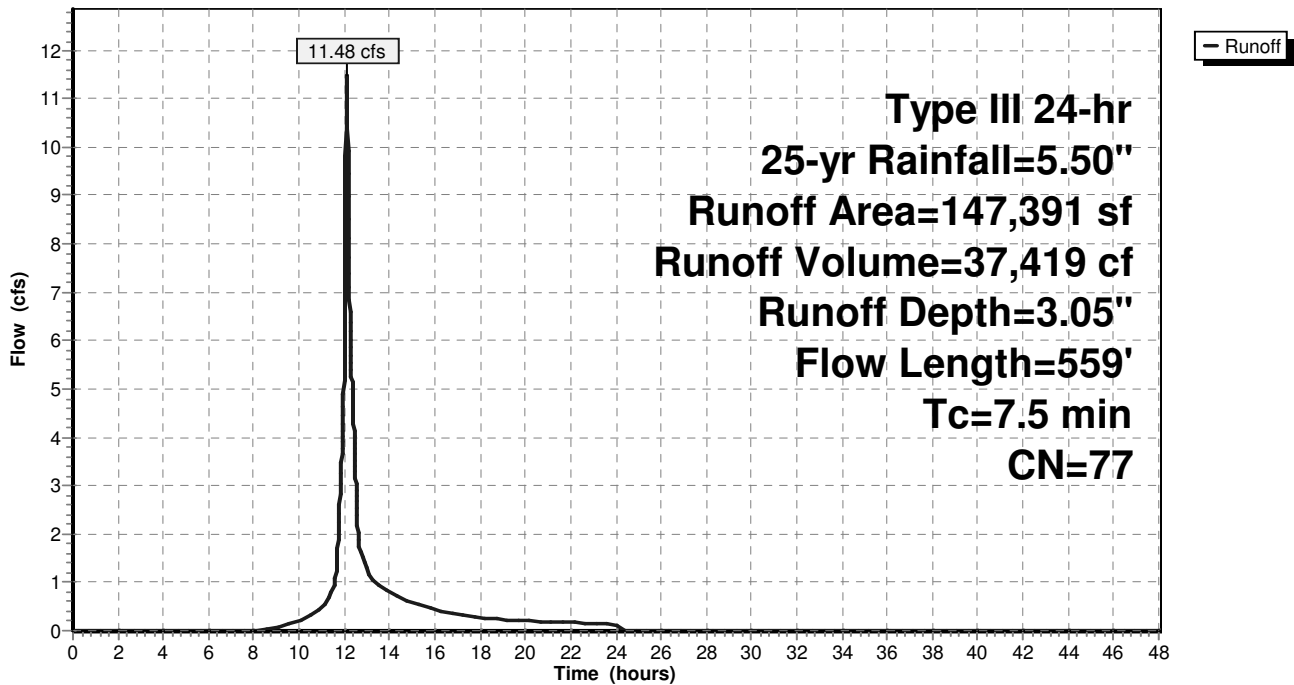
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-yr Rainfall=5.50"

	Area (sf)	CN	Description
*	71,077	98	Paved parking
	29,455	61	>75% Grass cover, Good, HSG B
	46,859	55	Woods, Good, HSG B
	147,391	77	Weighted Average
	76,314	57	51.78% Pervious Area
	71,077	98	48.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	50	0.2200	0.18		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.20"
2.8	509	0.0350	3.01		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
7.5	559	Total			

## Subcatchment 2S: SUB2

Hydrograph



**Existing HydroCAD**

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Existing Conditions  
Type III 24-hr 25-yr Rainfall=5.50"

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**Summary for Subcatchment 3S: SUB3**

Runoff = 4.69 cfs @ 12.12 hrs, Volume= 16,370 cf, Depth= 4.15"

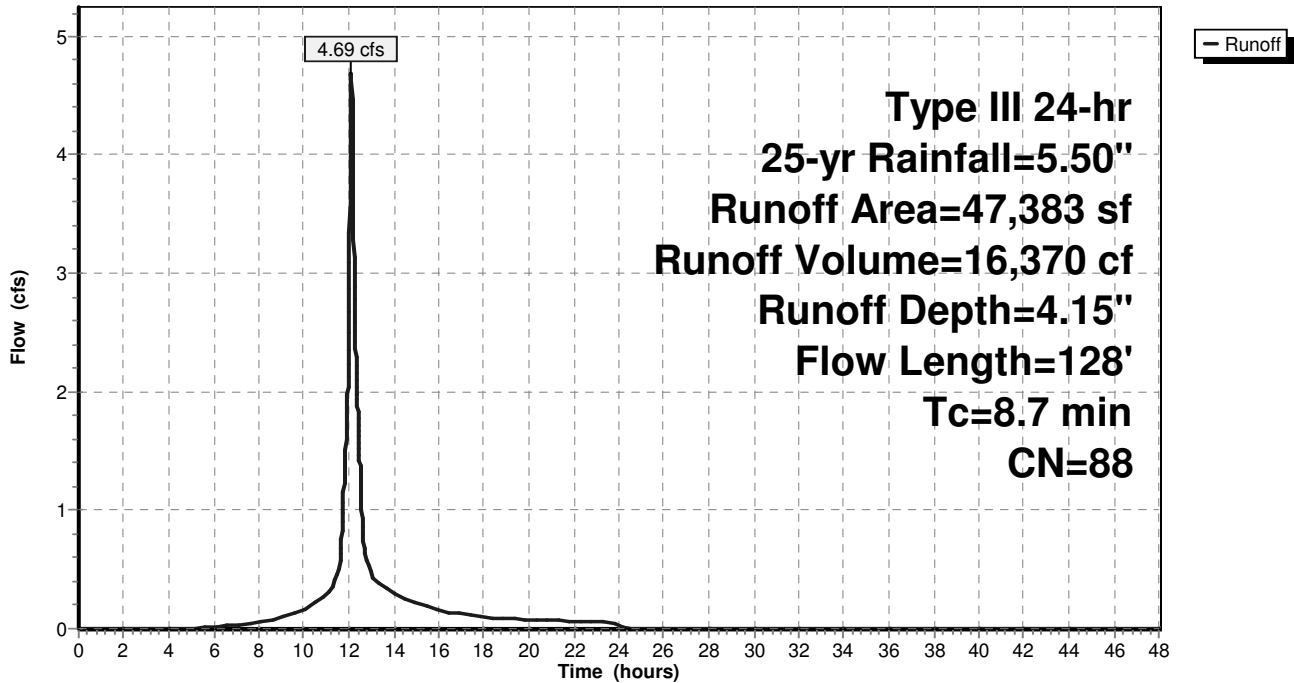
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-yr Rainfall=5.50"

Area (sf)	CN	Description
* 686	98	Paved parking
* 34,315	98	Roofs
12,382	61	>75% Grass cover, Good, HSG B
47,383	88	Weighted Average
12,382	61	26.13% Pervious Area
35,001	98	73.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	50	0.0080	0.10		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
0.6	78	0.0200	2.28		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
8.7	128	Total			

**Subcatchment 3S: SUB3**

Hydrograph



# Existing HydroCAD

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Existing Conditions  
Type III 24-hr 25-yr Rainfall=5.50"

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## Summary for Subcatchment 4S: SUB4

Runoff = 4.64 cfs @ 12.08 hrs, Volume= 15,558 cf, Depth= 4.80"

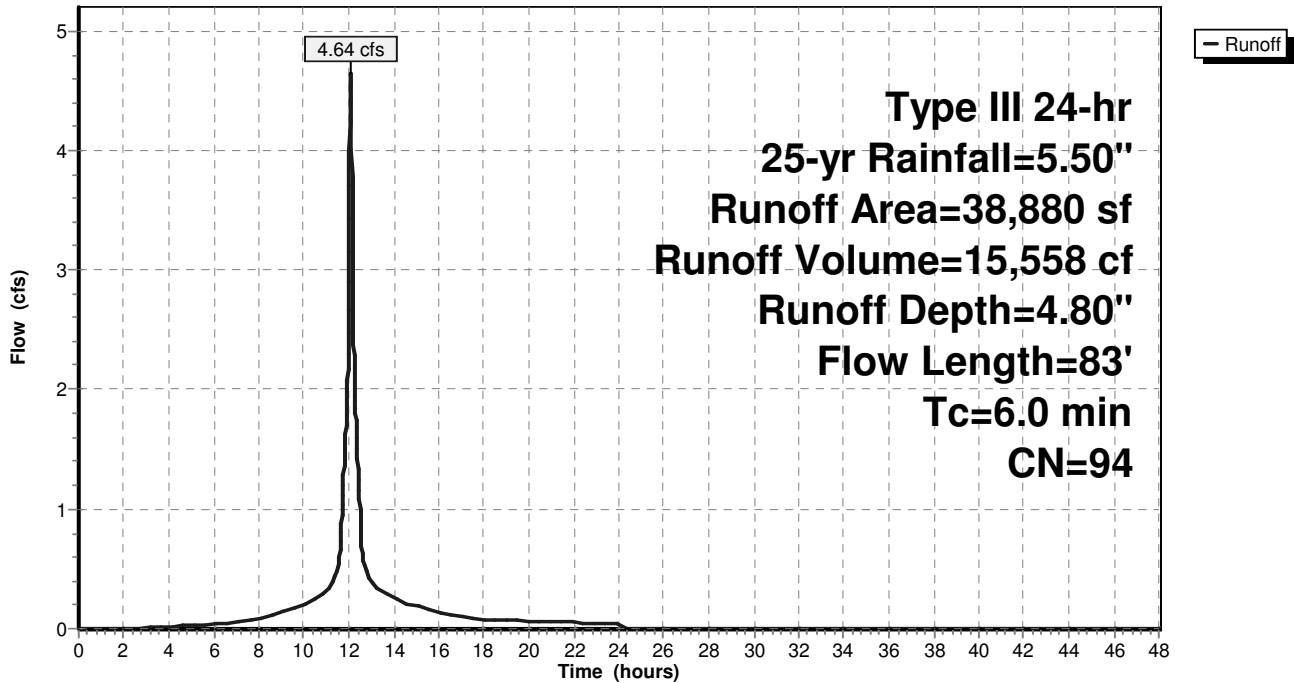
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-yr Rainfall=5.50"

Area (sf)	CN	Description
* 234	98	Paved parking
* 34,393	98	Roofs
4,253	61	>75% Grass cover, Good, HSG B
38,880	94	Weighted Average
4,253	61	10.94% Pervious Area
34,627	98	89.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	50	0.0360	0.19		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
0.2	33	0.0240	2.49		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
4.6	83	Total, Increased to minimum Tc = 6.0 min			

## Subcatchment 4S: SUB4

Hydrograph



**Existing HydroCAD**

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Existing Conditions  
Type III 24-hr 25-yr Rainfall=5.50"

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**Summary for Subcatchment 5S: SUB5**

Runoff = 6.62 cfs @ 12.19 hrs, Volume= 26,303 cf, Depth= 2.77"

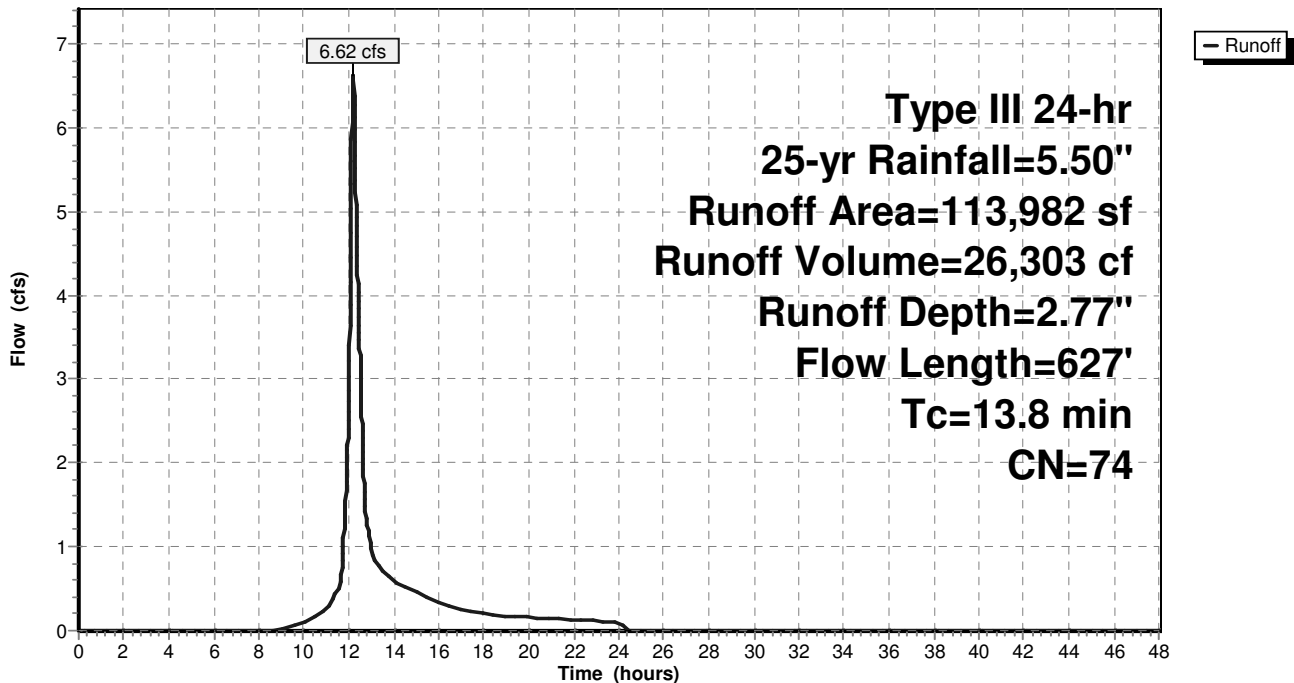
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-yr Rainfall=5.50"

Area (sf)	CN	Description
* 44,227	98	Paved parking
37,953	61	>75% Grass cover, Good, HSG B
31,802	55	Woods, Good, HSG B
113,982	74	Weighted Average
69,755	58	61.20% Pervious Area
44,227	98	38.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.0140	0.13		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
7.2	542	0.0060	1.25		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
0.1	35	0.0860	4.72		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
13.8	627	Total			

**Subcatchment 5S: SUB5**

Hydrograph



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Existing Conditions  
Type III 24-hr 25-yr Rainfall=5.50"

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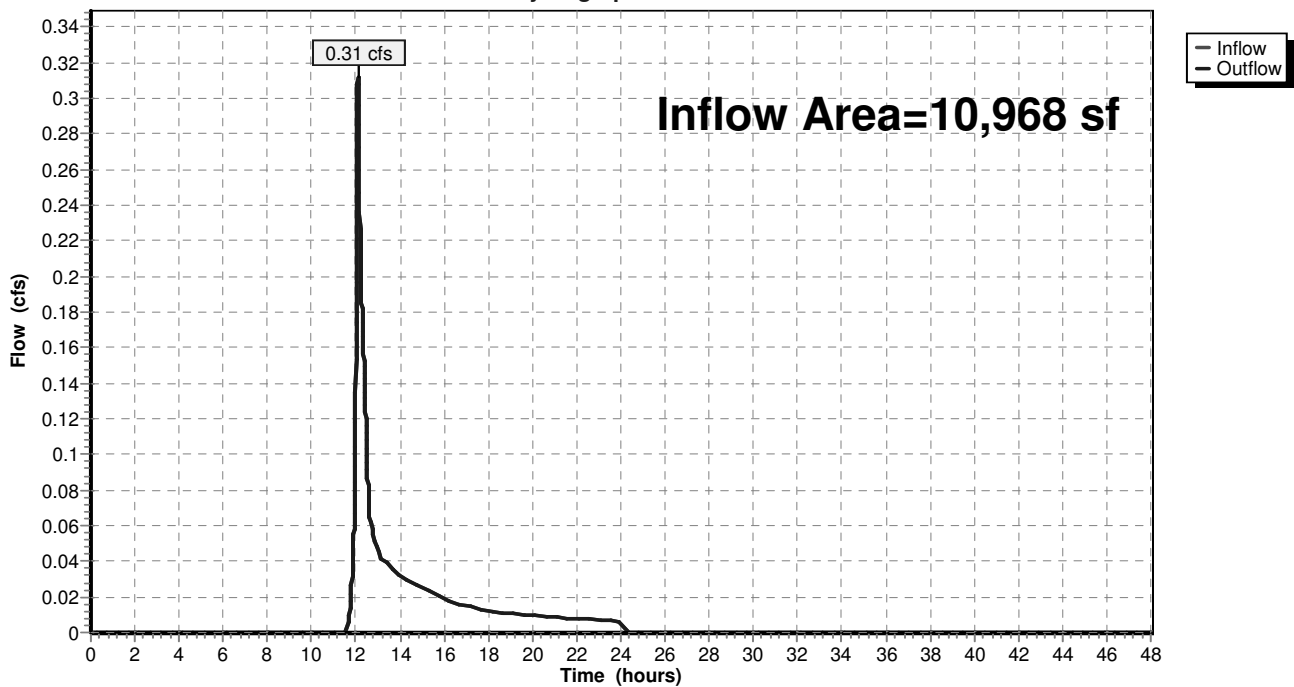
**Summary for Reach 6R: DP1-Northwest Property**

Inflow Area = 10,968 sf, 0.00% Impervious, Inflow Depth = 1.24" for 25-yr event  
Inflow = 0.31 cfs @ 12.10 hrs, Volume= 1,133 cf  
Outflow = 0.31 cfs @ 12.10 hrs, Volume= 1,133 cf, Atten= 0%, Lag= 0.0 min

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

**Reach 6R: DP1-Northwest Property**

Hydrograph





# Existing HydroCAD

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Existing Conditions  
Type III 24-hr 25-yr Rainfall=5.50"

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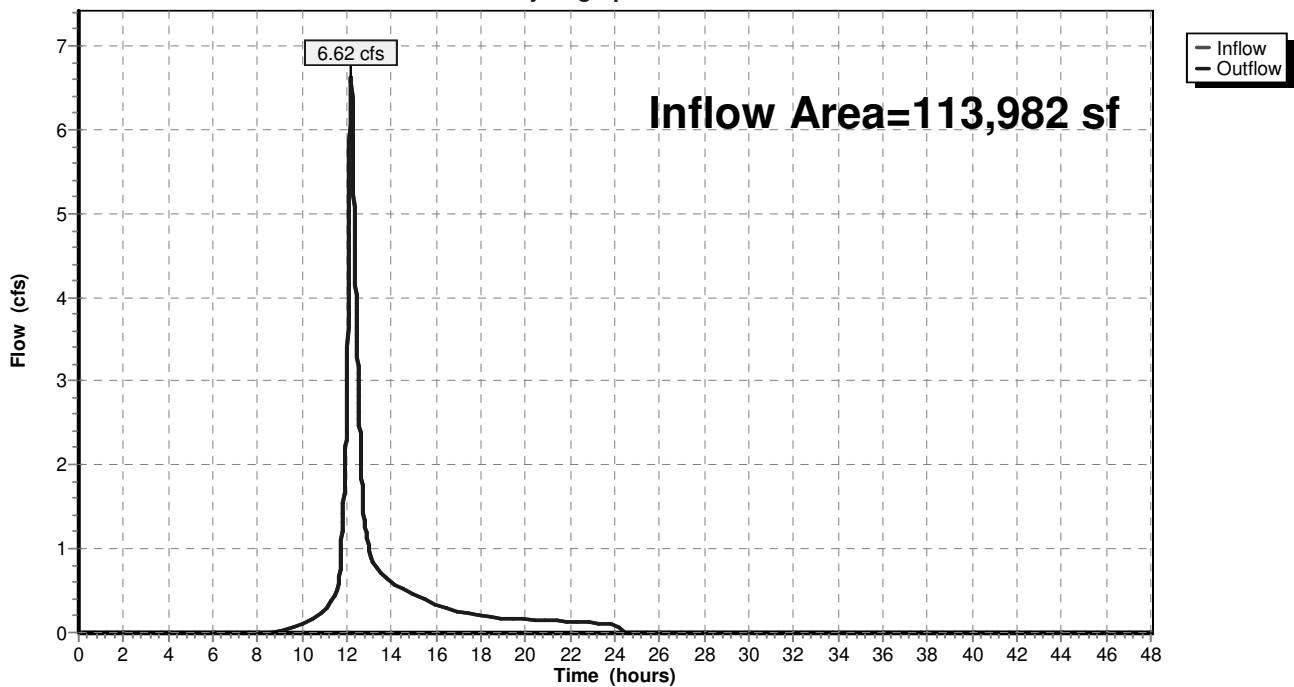
## Summary for Reach 10R: DP3-Eastern Property

Inflow Area = 113,982 sf, 38.80% Impervious, Inflow Depth = 2.77" for 25-yr event  
Inflow = 6.62 cfs @ 12.19 hrs, Volume= 26,303 cf  
Outflow = 6.62 cfs @ 12.19 hrs, Volume= 26,303 cf, Atten= 0%, Lag= 0.0 min

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

## Reach 10R: DP3-Eastern Property

Hydrograph



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Existing Conditions  
Type III 24-hr 25-yr Rainfall=5.50"

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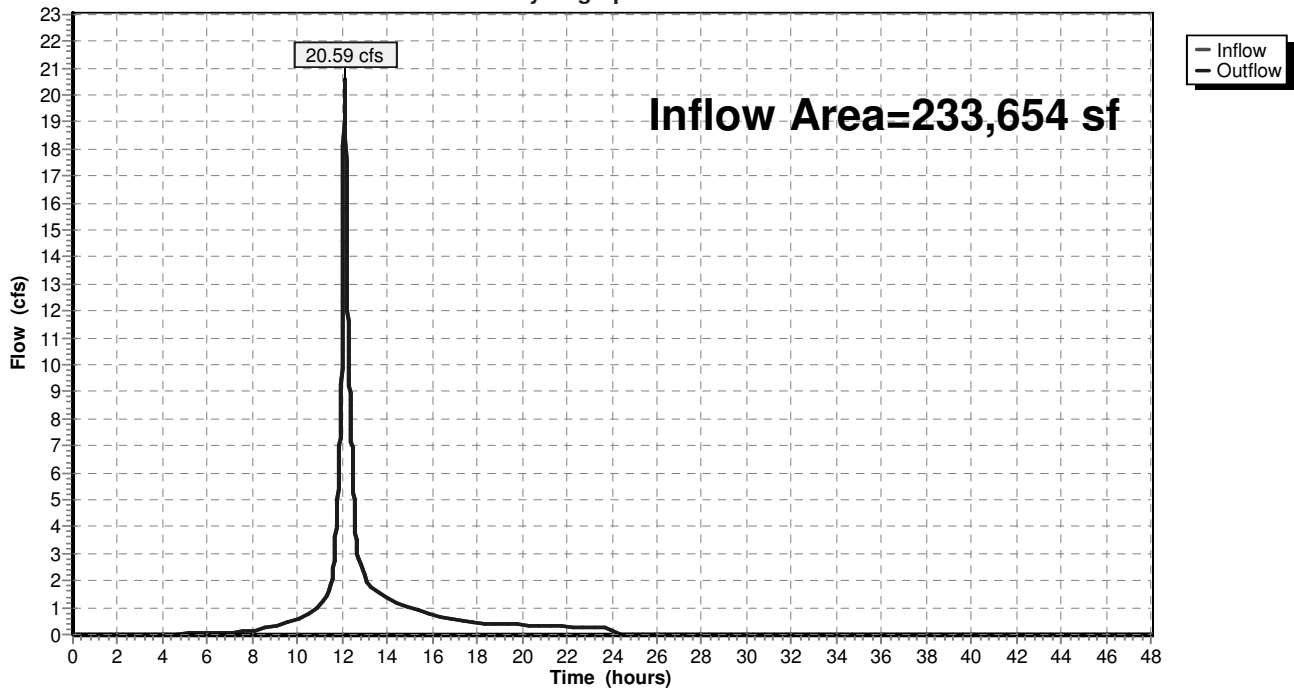
**Summary for Reach 11R: DP2-Wells Avenue**

Inflow Area = 233,654 sf, 60.22% Impervious, Inflow Depth = 3.56" for 25-yr event  
Inflow = 20.59 cfs @ 12.10 hrs, Volume= 69,346 cf  
Outflow = 20.59 cfs @ 12.10 hrs, Volume= 69,346 cf, Atten= 0%, Lag= 0.0 min

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

**Reach 11R: DP2-Wells Avenue**

Hydrograph



## Existing HydroCAD

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Existing Conditions  
Type III 24-hr 100-yr Rainfall=6.60"

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

**Subcatchment 1S: SUB1**                      Runoff Area=10,968 sf 0.00% Impervious    Runoff Depth=1.87"  
Flow Length=220'    Tc=6.0 min    CN=55    Runoff=0.51 cfs    1,713 cf

**Subcatchment 2S: SUB2**                      Runoff Area=147,391 sf 48.22% Impervious    Runoff Depth=4.01"  
Flow Length=559'    Tc=7.5 min    CN=77    Runoff=15.07 cfs    49,230 cf

**Subcatchment 3S: SUB3**                      Runoff Area=47,383 sf 73.87% Impervious    Runoff Depth=5.21"  
Flow Length=128'    Tc=8.7 min    CN=88    Runoff=5.82 cfs    20,554 cf

**Subcatchment 4S: SUB4**                      Runoff Area=38,880 sf 89.06% Impervious    Runoff Depth=5.89"  
Flow Length=83'    Tc=6.0 min    CN=94    Runoff=5.63 cfs    19,088 cf

**Subcatchment 5S: SUB5**                      Runoff Area=113,982 sf 38.80% Impervious    Runoff Depth=3.70"  
Flow Length=627'    Tc=13.8 min    CN=74    Runoff=8.87 cfs    35,102 cf

**Reach 6R: DP1-Northwest Property**                      Inflow=0.51 cfs    1,713 cf  
Outflow=0.51 cfs    1,713 cf

**Reach 10R: DP3-Eastern Property**                      Inflow=8.87 cfs    35,102 cf  
Outflow=8.87 cfs    35,102 cf

**Reach 11R: DP2-Wells Avenue**                      Inflow=26.26 cfs    88,872 cf  
Outflow=26.26 cfs    88,872 cf

**Total Runoff Area = 358,604 sf    Runoff Volume = 125,687 cf    Average Runoff Depth = 4.21"**  
**48.43% Pervious = 173,672 sf    51.57% Impervious = 184,932 sf**

# Existing HydroCAD

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Existing Conditions  
Type III 24-hr 100-yr Rainfall=6.60"

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## Summary for Subcatchment 1S: SUB1

Runoff = 0.51 cfs @ 12.10 hrs, Volume= 1,713 cf, Depth= 1.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-yr Rainfall=6.60"

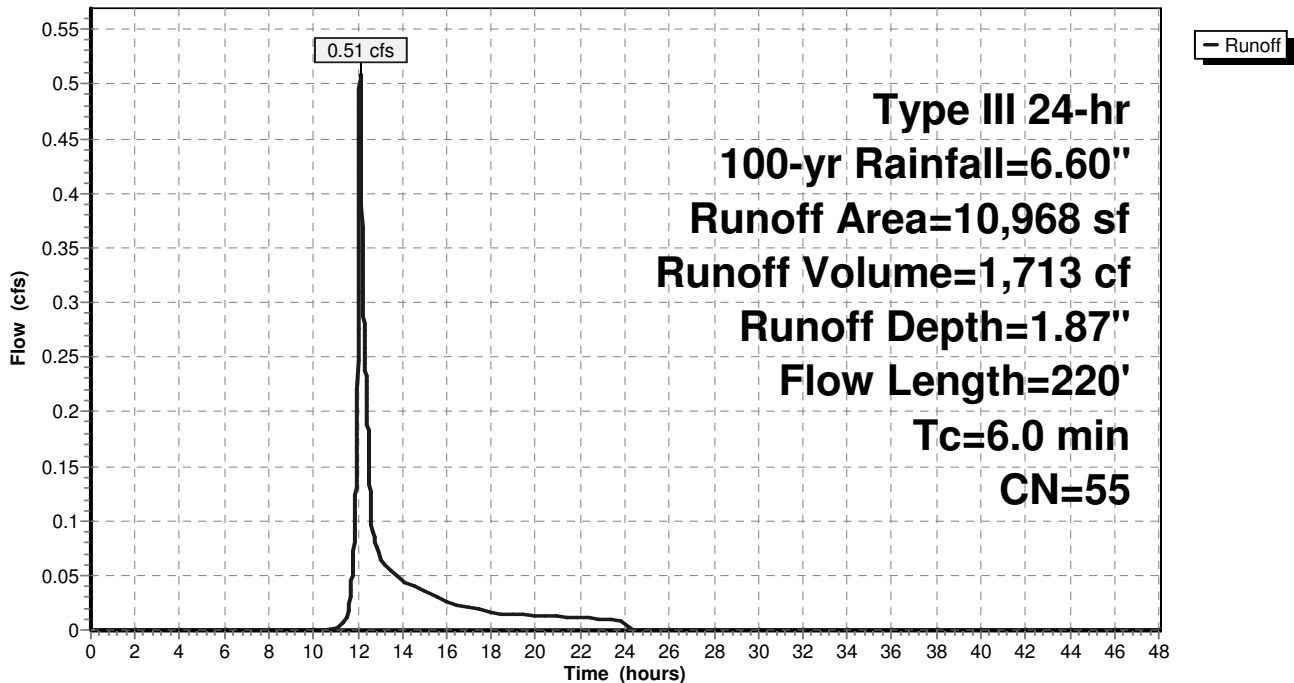
Area (sf)	CN	Description
10,968	55	Woods, Good, HSG B
10,968	55	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	50	0.2200	0.18		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.20"
0.6	170	0.0820	4.61		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
5.3	220	Total, Increased to minimum Tc = 6.0 min			

## Subcatchment 1S: SUB1

Hydrograph



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Existing Conditions  
Type III 24-hr 100-yr Rainfall=6.60"

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**Summary for Subcatchment 2S: SUB2**

Runoff = 15.07 cfs @ 12.11 hrs, Volume= 49,230 cf, Depth= 4.01"

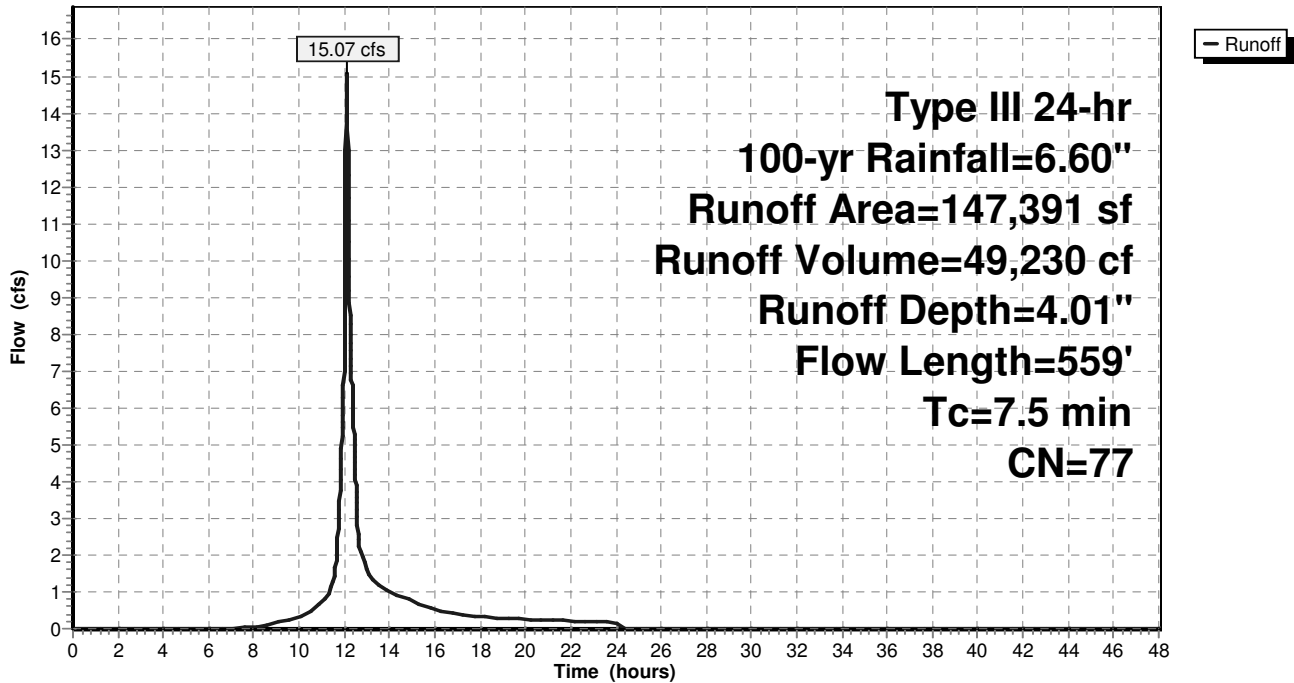
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-yr Rainfall=6.60"

	Area (sf)	CN	Description
*	71,077	98	Paved parking
	29,455	61	>75% Grass cover, Good, HSG B
	46,859	55	Woods, Good, HSG B
	147,391	77	Weighted Average
	76,314	57	51.78% Pervious Area
	71,077	98	48.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	50	0.2200	0.18		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.20"
2.8	509	0.0350	3.01		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
7.5	559	Total			

**Subcatchment 2S: SUB2**

Hydrograph



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Existing Conditions  
Type III 24-hr 100-yr Rainfall=6.60"

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**Summary for Subcatchment 3S: SUB3**

Runoff = 5.82 cfs @ 12.12 hrs, Volume= 20,554 cf, Depth= 5.21"

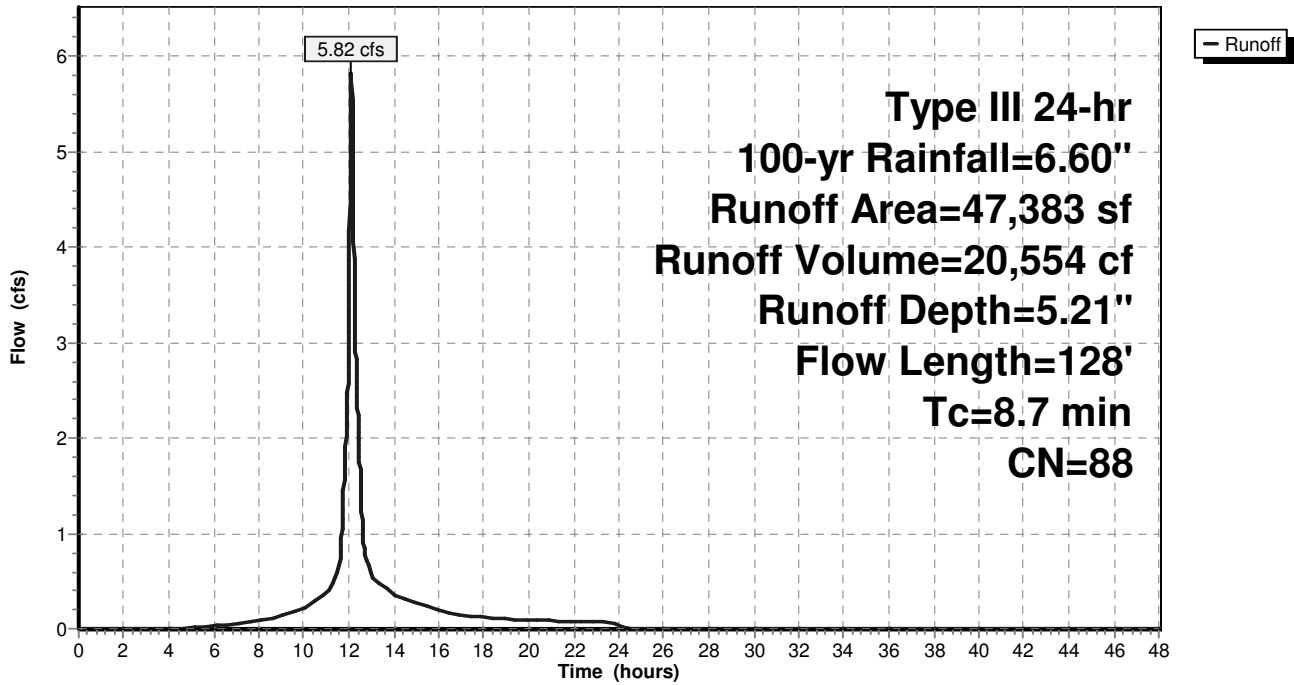
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-yr Rainfall=6.60"

Area (sf)	CN	Description
* 686	98	Paved parking
* 34,315	98	Roofs
12,382	61	>75% Grass cover, Good, HSG B
47,383	88	Weighted Average
12,382	61	26.13% Pervious Area
35,001	98	73.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	50	0.0080	0.10		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
0.6	78	0.0200	2.28		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
8.7	128	Total			

**Subcatchment 3S: SUB3**

Hydrograph



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Existing Conditions  
Type III 24-hr 100-yr Rainfall=6.60"

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**Summary for Subcatchment 4S: SUB4**

Runoff = 5.63 cfs @ 12.08 hrs, Volume= 19,088 cf, Depth= 5.89"

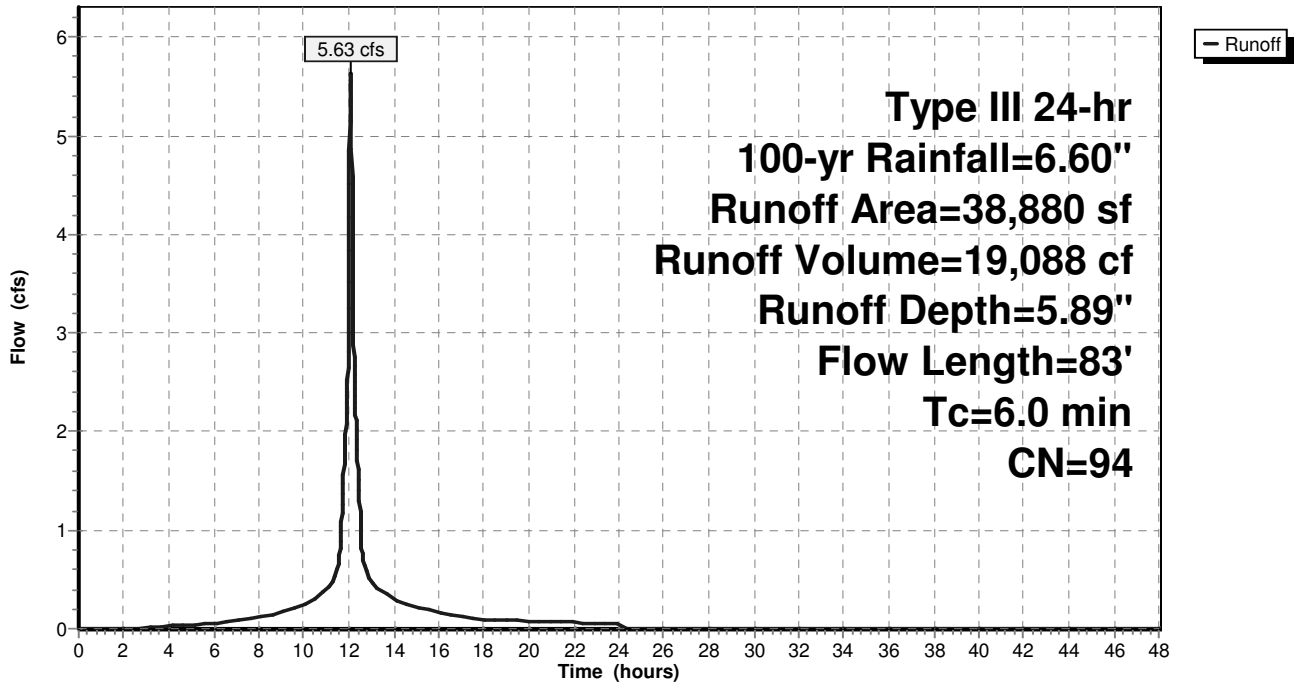
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-yr Rainfall=6.60"

Area (sf)	CN	Description
* 234	98	Paved parking
* 34,393	98	Roofs
4,253	61	>75% Grass cover, Good, HSG B
38,880	94	Weighted Average
4,253	61	10.94% Pervious Area
34,627	98	89.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	50	0.0360	0.19		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
0.2	33	0.0240	2.49		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
4.6	83	Total, Increased to minimum Tc = 6.0 min			

**Subcatchment 4S: SUB4**

Hydrograph



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Existing Conditions  
Type III 24-hr 100-yr Rainfall=6.60"

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**Summary for Subcatchment 5S: SUB5**

Runoff = 8.87 cfs @ 12.19 hrs, Volume= 35,102 cf, Depth= 3.70"

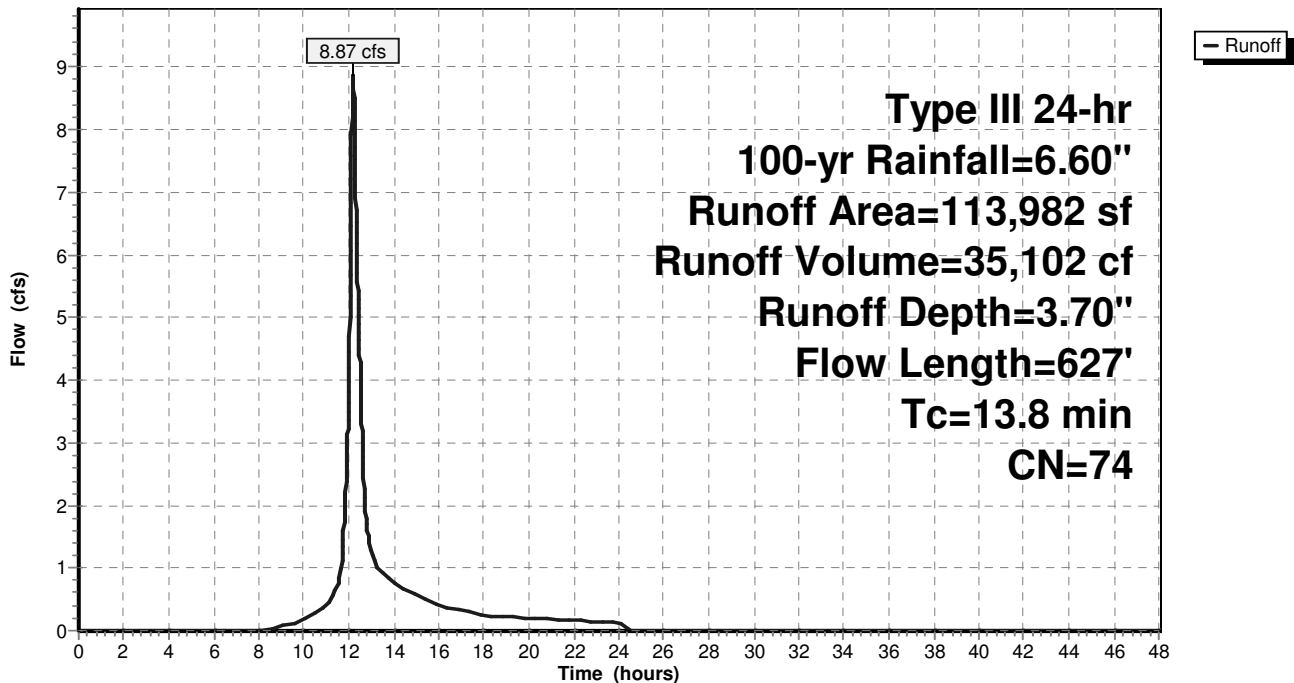
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-yr Rainfall=6.60"

	Area (sf)	CN	Description
*	44,227	98	Paved parking
	37,953	61	>75% Grass cover, Good, HSG B
	31,802	55	Woods, Good, HSG B
	113,982	74	Weighted Average
	69,755	58	61.20% Pervious Area
	44,227	98	38.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.0140	0.13		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
7.2	542	0.0060	1.25		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
0.1	35	0.0860	4.72		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
13.8	627	Total			

**Subcatchment 5S: SUB5**

Hydrograph





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Existing Conditions  
Type III 24-hr 100-yr Rainfall=6.60"

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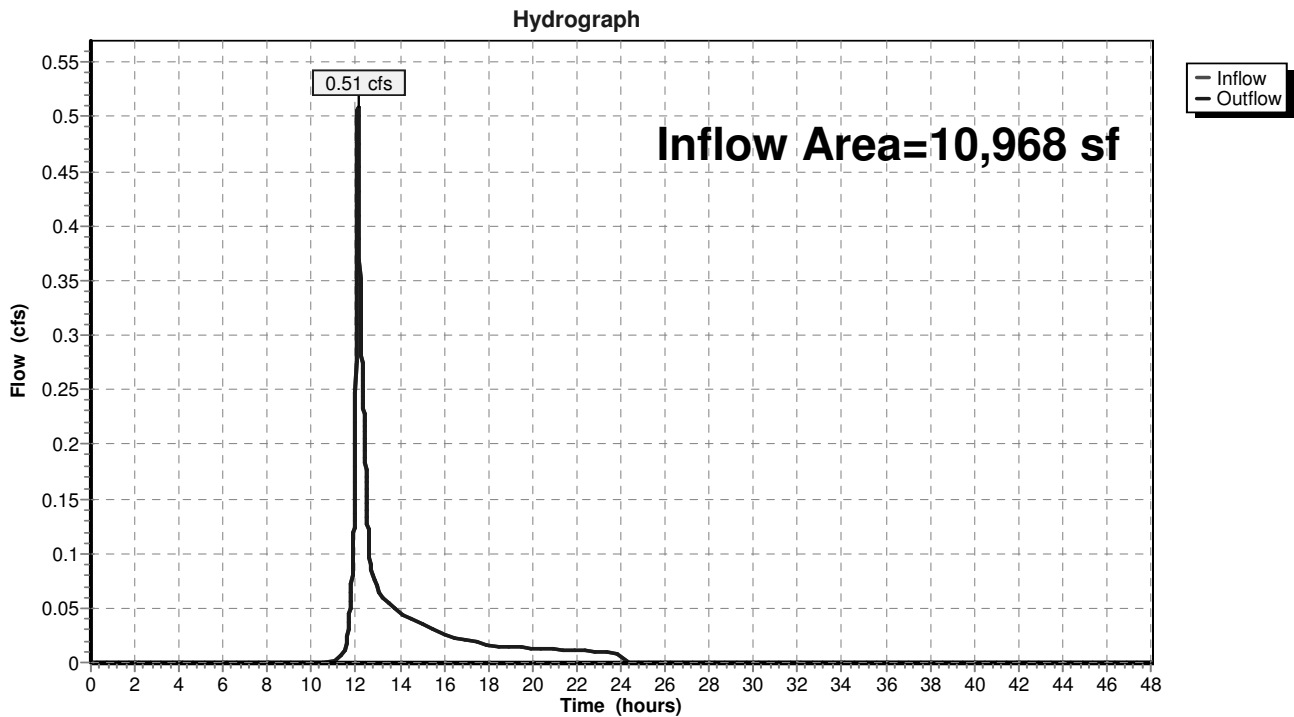
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**Summary for Reach 6R: DP1-Northwest Property**

Inflow Area = 10,968 sf, 0.00% Impervious, Inflow Depth = 1.87" for 100-yr event  
Inflow = 0.51 cfs @ 12.10 hrs, Volume= 1,713 cf  
Outflow = 0.51 cfs @ 12.10 hrs, Volume= 1,713 cf, Atten= 0%, Lag= 0.0 min

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

**Reach 6R: DP1-Northwest Property**



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Existing Conditions  
Type III 24-hr 100-yr Rainfall=6.60"

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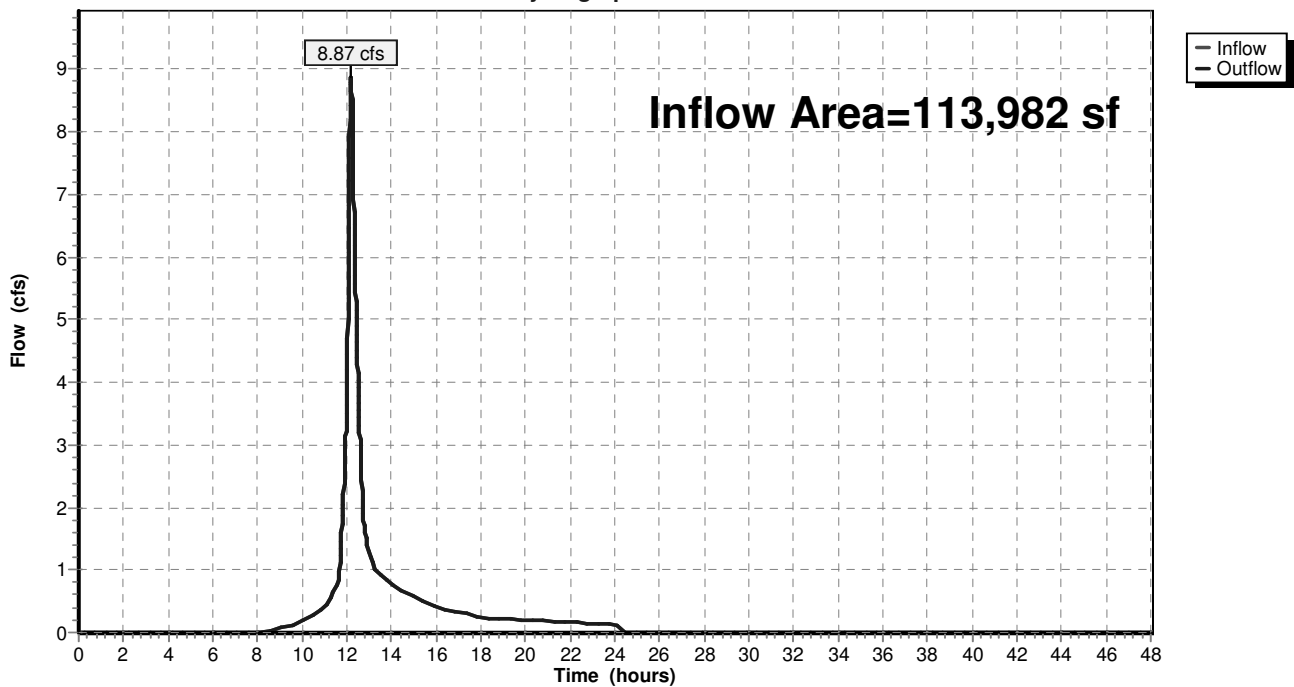
**Summary for Reach 10R: DP3-Eastern Property**

Inflow Area = 113,982 sf, 38.80% Impervious, Inflow Depth = 3.70" for 100-yr event  
Inflow = 8.87 cfs @ 12.19 hrs, Volume= 35,102 cf  
Outflow = 8.87 cfs @ 12.19 hrs, Volume= 35,102 cf, Atten= 0%, Lag= 0.0 min

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

**Reach 10R: DP3-Eastern Property**

Hydrograph



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Existing Conditions  
Type III 24-hr 100-yr Rainfall=6.60"

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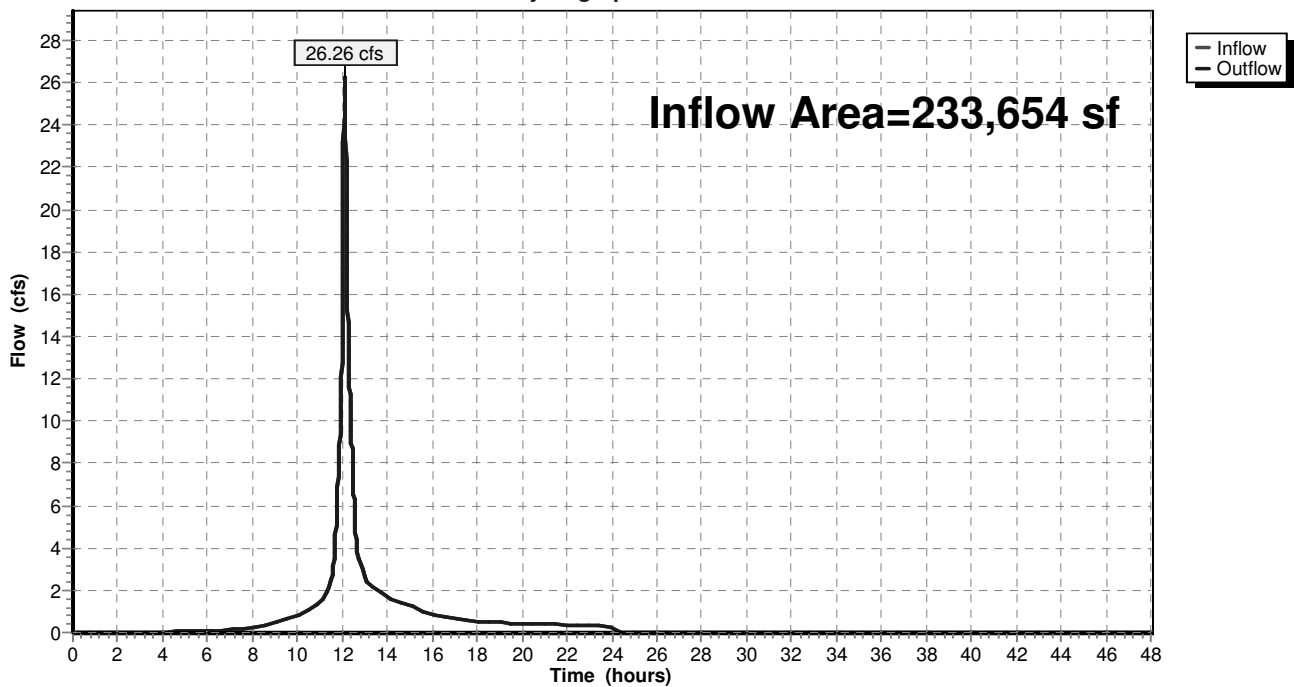
**Summary for Reach 11R: DP2-Wells Avenue**

Inflow Area = 233,654 sf, 60.22% Impervious, Inflow Depth = 4.56" for 100-yr event  
Inflow = 26.26 cfs @ 12.10 hrs, Volume= 88,872 cf  
Outflow = 26.26 cfs @ 12.10 hrs, Volume= 88,872 cf, Atten= 0%, Lag= 0.0 min

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

**Reach 11R: DP2-Wells Avenue**

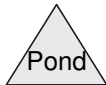
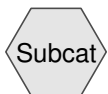
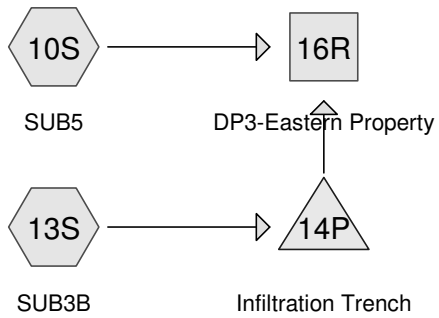
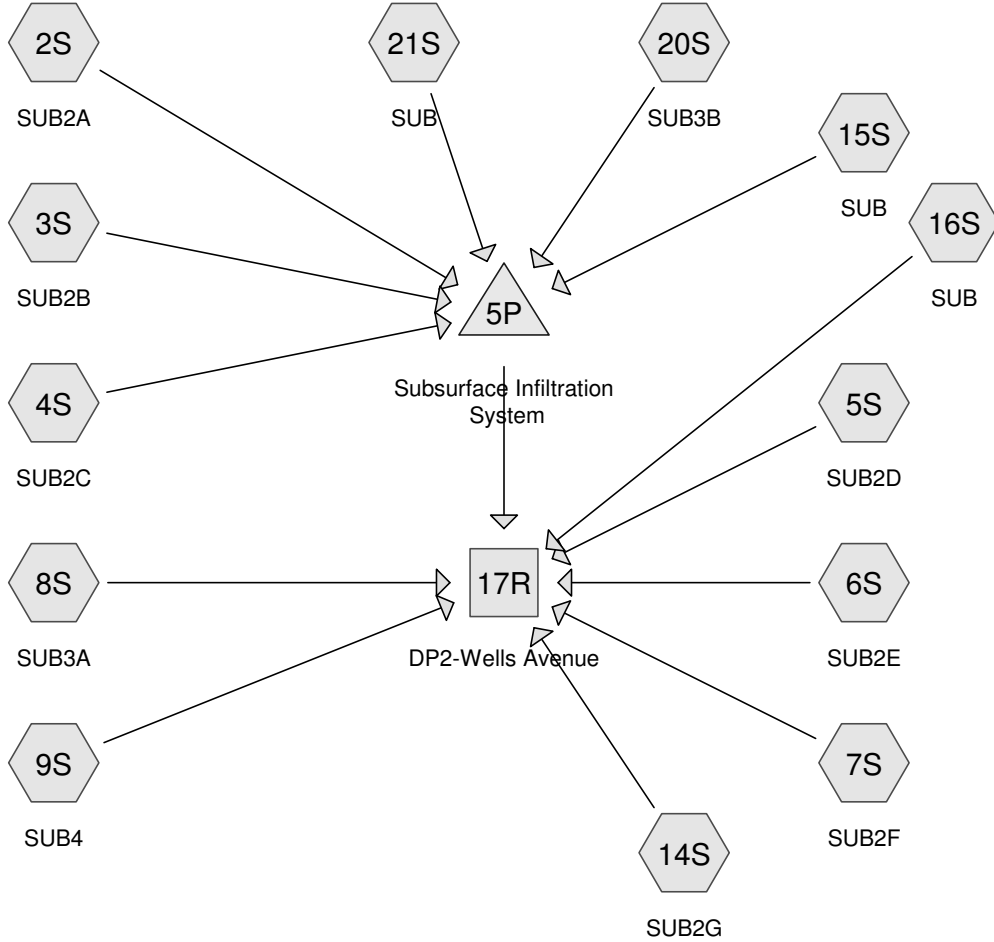
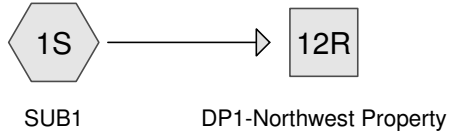
Hydrograph



**APPENDIX C**

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**Proposed Conditions – HydroCAD Calculations**



**Routing Diagram for Proposed HydroCAD**  
 Prepared by Nitsch Engineering, Printed 5/6/2015  
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**Proposed HydroCAD**

Prepared by Nitsch Engineering

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Page 2

**Area Listing (selected nodes)**

Area (sq-ft)	CN	Description (subcatchment-numbers)
111,518	61	>75% Grass cover, Good, HSG B (1S, 2S, 3S, 4S, 5S, 6S, 7S, 8S, 9S, 10S, 13S, 14S, 20S, 21S)
4,541	98	Impervious (8S)
99,299	98	Paved parking (2S, 3S, 4S, 5S, 6S, 7S, 9S, 10S, 14S)
6,330	98	Paved parking, HSG B (21S)
16,489	98	Pavement (20S)
22,782	98	Roofs (9S)
50,999	98	Roofs, HSG B (13S, 15S, 16S)
46,646	55	Woods, Good, HSG B (1S, 4S, 6S, 10S, 14S)
<b>358,604</b>	<b>81</b>	<b>TOTAL AREA</b>

**Proposed HydroCAD**

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**Soil Listing (selected nodes)**

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
215,493	HSG B	1S, 2S, 3S, 4S, 5S, 6S, 7S, 8S, 9S, 10S, 13S, 14S, 15S, 16S, 20S, 21S
0	HSG C	
0	HSG D	
143,111	Other	2S, 3S, 4S, 5S, 6S, 7S, 8S, 9S, 10S, 14S, 20S
<b>358,604</b>		<b>TOTAL AREA</b>

**Proposed HydroCAD**

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**Ground Covers (selected nodes)**

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover
0	111,518	0	0	0	111,518	>75% Grass cover, Good
0	0	0	0	4,541	4,541	Impervious
0	6,330	0	0	99,299	105,629	Paved parking
0	0	0	0	16,489	16,489	Pavement
0	50,999	0	0	22,782	73,781	Roofs
0	46,646	0	0	0	46,646	Woods, Good
<b>0</b>	<b>215,493</b>	<b>0</b>	<b>0</b>	<b>143,111</b>	<b>358,604</b>	<b>TOTAL AREA</b>



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Type III 24-hr 2-yr Rainfall=3.20"

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

<b>Subcatchment 1S: SUB1</b>	Runoff Area=6,521 sf 0.00% Impervious Runoff Depth=0.31" Tc=6.0 min CN=57 Runoff=0.02 cfs 168 cf
<b>Subcatchment 2S: SUB2A</b>	Runoff Area=28,661 sf 77.18% Impervious Runoff Depth=2.17" Tc=6.0 min CN=90 Runoff=1.65 cfs 5,180 cf
<b>Subcatchment 3S: SUB2B</b>	Runoff Area=18,034 sf 89.00% Impervious Runoff Depth=2.54" Tc=6.0 min CN=94 Runoff=1.18 cfs 3,823 cf
<b>Subcatchment 4S: SUB2C</b>	Runoff Area=25,380 sf 63.98% Impervious Runoff Depth=1.68" Tc=6.0 min CN=84 Runoff=1.15 cfs 3,558 cf
<b>Pond 5P: Subsurface Infiltration System</b>	Peak Elev=100.48' Storage=8,888 cf Inflow=5.87 cfs 18,596 cf Discarded=0.19 cfs 16,233 cf Primary=0.40 cfs 2,364 cf Outflow=0.58 cfs 18,596 cf
<b>Subcatchment 5S: SUB2D</b>	Runoff Area=12,647 sf 81.62% Impervious Runoff Depth=2.26" Tc=6.0 min CN=91 Runoff=0.76 cfs 2,380 cf
<b>Subcatchment 6S: SUB2E</b>	Runoff Area=10,382 sf 54.97% Impervious Runoff Depth=1.47" Tc=6.0 min CN=81 Runoff=0.41 cfs 1,271 cf
<b>Subcatchment 7S: SUB2F</b>	Runoff Area=17,153 sf 86.38% Impervious Runoff Depth=2.45" Tc=6.0 min CN=93 Runoff=1.09 cfs 3,496 cf
<b>Subcatchment 8S: SUB3A</b>	Runoff Area=14,967 sf 30.34% Impervious Runoff Depth=0.93" Tc=8.7 min CN=72 Runoff=0.31 cfs 1,160 cf
<b>Subcatchment 9S: SUB4</b>	Runoff Area=37,456 sf 75.33% Impervious Runoff Depth=2.08" Tc=6.0 min CN=89 Runoff=2.09 cfs 6,497 cf
<b>Subcatchment 10S: SUB5</b>	Runoff Area=93,190 sf 8.24% Impervious Runoff Depth=0.48" Tc=13.8 min CN=62 Runoff=0.63 cfs 3,735 cf
<b>Reach 12R: DP1-Northwest Property</b>	Inflow=0.02 cfs 168 cf Outflow=0.02 cfs 168 cf
<b>Subcatchment 13S: SUB3B</b>	Runoff Area=9,052 sf 98.80% Impervious Runoff Depth=2.97" Tc=6.0 min CN=98 Runoff=0.65 cfs 2,238 cf
<b>Pond 14P: Infiltration Trench</b>	Peak Elev=101.39' Storage=366 cf Inflow=0.65 cfs 2,238 cf Discarded=0.01 cfs 974 cf Primary=0.61 cfs 1,264 cf Outflow=0.62 cfs 2,238 cf
<b>Subcatchment 14S: SUB2G</b>	Runoff Area=15,595 sf 5.98% Impervious Runoff Depth=0.44" Tc=6.0 min CN=61 Runoff=0.12 cfs 577 cf
<b>Subcatchment 15S: SUB</b>	Runoff Area=2,500 sf 100.00% Impervious Runoff Depth=2.97" Tc=6.0 min CN=98 Runoff=0.18 cfs 618 cf

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### Reach 16R: DP3-Eastern Property

Inflow=1.01 cfs 5,000 cf  
Outflow=1.01 cfs 5,000 cf

### Subcatchment 16S: SUB

Runoff Area=39,556 sf 100.00% Impervious Runoff Depth=2.97"  
Tc=6.0 min CN=98 Runoff=2.82 cfs 9,782 cf

### Reach 17R: DP2-Wells Avenue

Inflow=7.54 cfs 27,526 cf  
Outflow=7.54 cfs 27,526 cf

### Subcatchment 20S: SUB3B

Runoff Area=19,312 sf 85.38% Impervious Runoff Depth=2.45"  
Tc=6.0 min CN=93 Runoff=1.23 cfs 3,936 cf

### Subcatchment 21S: SUB

Runoff Area=8,198 sf 77.21% Impervious Runoff Depth=2.17"  
Tc=6.0 min CN=90 Runoff=0.47 cfs 1,482 cf

**Total Runoff Area = 358,604 sf Runoff Volume = 49,901 cf Average Runoff Depth = 1.67"**  
**44.11% Pervious = 158,164 sf 55.89% Impervious = 200,440 sf**

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## Summary for Subcatchment 1S: SUB1

Runoff = 0.02 cfs @ 12.28 hrs, Volume= 168 cf, Depth= 0.31"

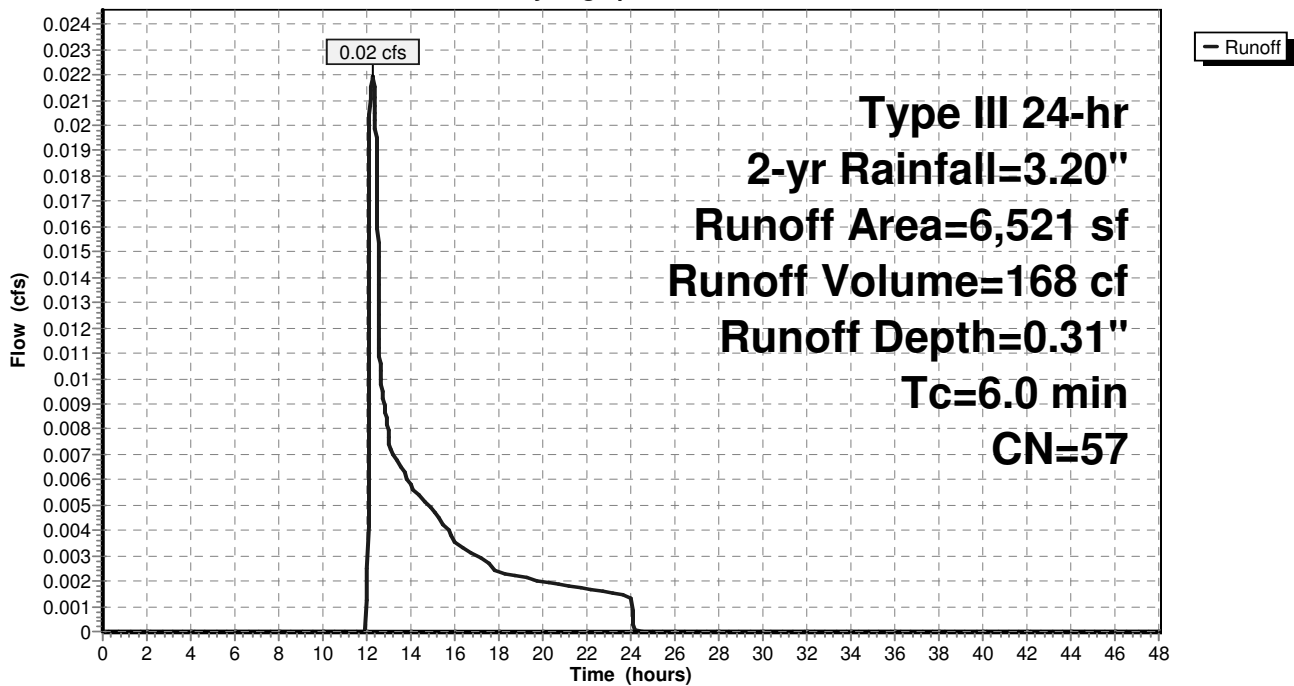
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-yr Rainfall=3.20"

Area (sf)	CN	Description
4,819	55	Woods, Good, HSG B
1,702	61	>75% Grass cover, Good, HSG B
6,521	57	Weighted Average
6,521		100.00% Pervious Area

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

## Subcatchment 1S: SUB1

Hydrograph



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Proposed Conditions  
Type III 24-hr 2-yr Rainfall=3.20"

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## Summary for Subcatchment 2S: SUB2A

Runoff = 1.65 cfs @ 12.09 hrs, Volume= 5,180 cf, Depth= 2.17"

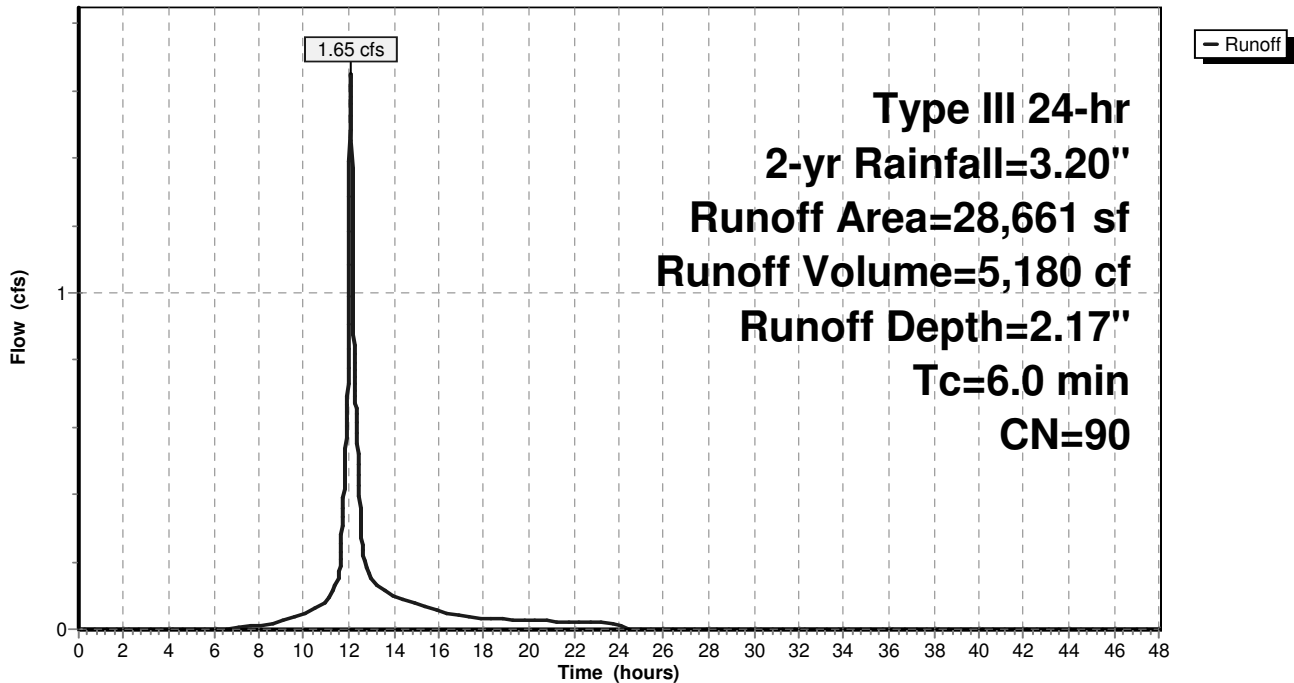
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-yr Rainfall=3.20"

	Area (sf)	CN	Description
*	22,121	98	Paved parking
	6,540	61	>75% Grass cover, Good, HSG B
	28,661	90	Weighted Average
	6,540		22.82% Pervious Area
	22,121		77.18% Impervious Area

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

## Subcatchment 2S: SUB2A

Hydrograph



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## Summary for Subcatchment 3S: SUB2B

Runoff = 1.18 cfs @ 12.08 hrs, Volume= 3,823 cf, Depth= 2.54"

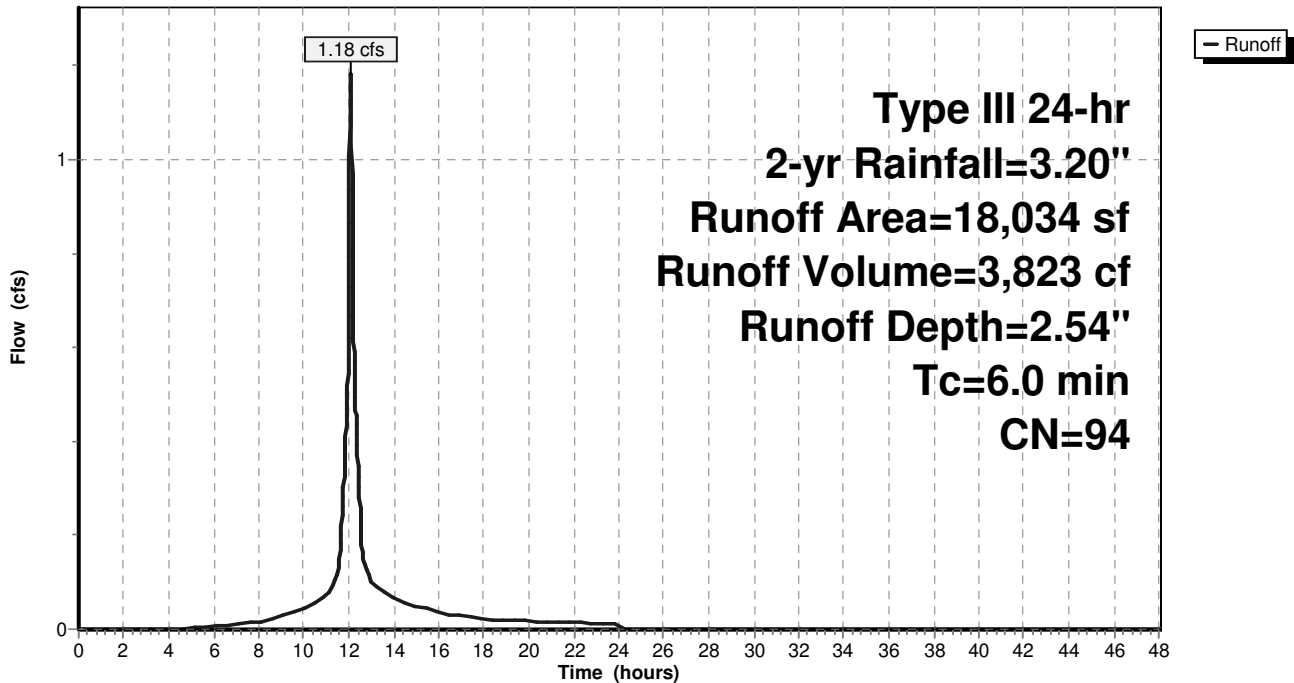
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-yr Rainfall=3.20"

	Area (sf)	CN	Description
*	16,050	98	Paved parking
	1,984	61	>75% Grass cover, Good, HSG B
	18,034	94	Weighted Average
	1,984		11.00% Pervious Area
	16,050		89.00% Impervious Area

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

## Subcatchment 3S: SUB2B

Hydrograph



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**Summary for Subcatchment 4S: SUB2C**

Runoff = 1.15 cfs @ 12.09 hrs, Volume= 3,558 cf, Depth= 1.68"

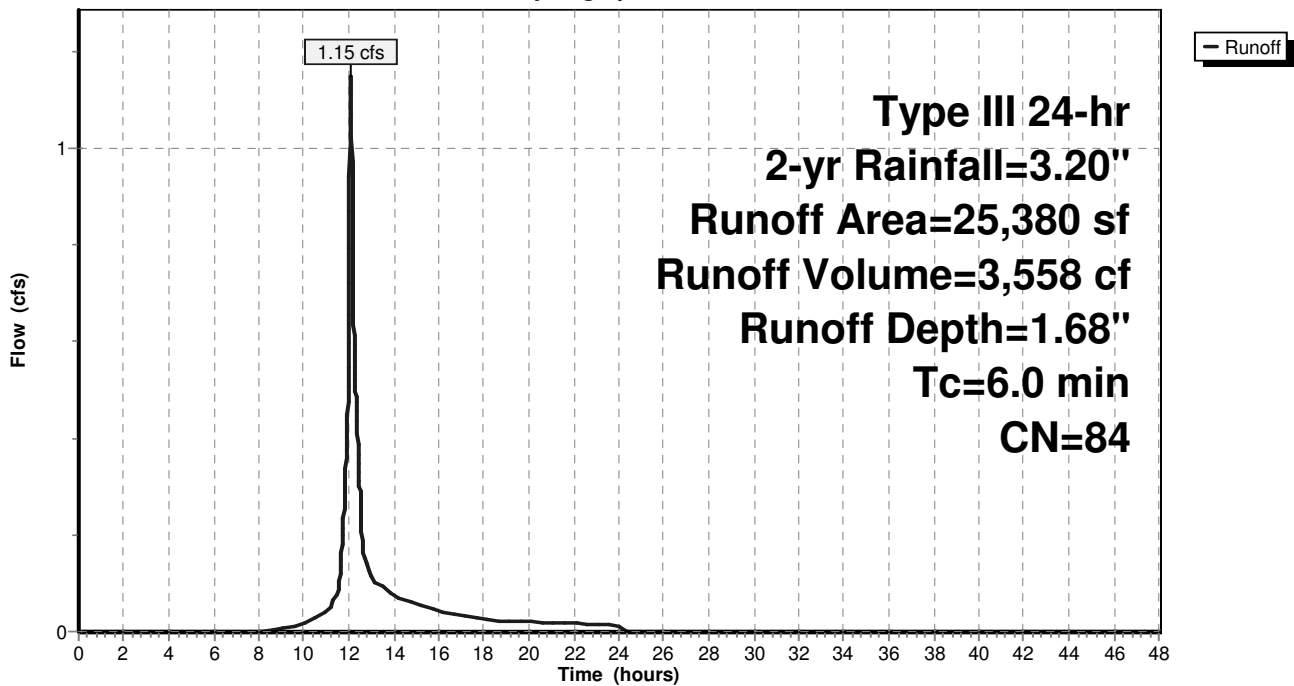
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-yr Rainfall=3.20"

	Area (sf)	CN	Description
*	16,237	98	Paved parking
	4,855	55	Woods, Good, HSG B
	4,288	61	>75% Grass cover, Good, HSG B
	25,380	84	Weighted Average
	9,143		36.02% Pervious Area
	16,237		63.98% Impervious Area

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

**Subcatchment 4S: SUB2C**

Hydrograph



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## Summary for Pond 5P: Subsurface Infiltration System

Inflow Area = 102,085 sf, 78.10% Impervious, Inflow Depth = 2.19" for 2-yr event  
Inflow = 5.87 cfs @ 12.09 hrs, Volume= 18,596 cf  
Outflow = 0.58 cfs @ 12.93 hrs, Volume= 18,596 cf, Atten= 90%, Lag= 50.7 min  
Discarded = 0.19 cfs @ 10.33 hrs, Volume= 16,233 cf  
Primary = 0.40 cfs @ 12.93 hrs, Volume= 2,364 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2  
Peak Elev= 100.48' @ 12.93 hrs Surf.Area= 7,912 sf Storage= 8,888 cf

Plug-Flow detention time= 389.0 min calculated for 18,593 cf (100% of inflow)  
Center-of-Mass det. time= 389.0 min ( 1,191.5 - 802.5 )

Volume	Invert	Avail.Storage	Storage Description
#1A	98.80'	6,077 cf	<b>68.00'W x 116.36'L x 3.50'H Field A</b> 27,694 cf Overall - 10,330 cf Embedded = 17,363 cf x 35.0% Voids
#2A	99.30'	10,330 cf	<b>ADS StormTech SC-740</b> x 224 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 14 rows
		16,407 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	98.80'	<b>1.020 in/hr Exfiltration over Horizontal area</b>
#2	Primary	99.30'	<b>12.0" Round Culvert out of OCS</b> L= 95.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 99.30' / 98.40' S= 0.0095 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	100.40'	<b>5.0' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)

**Discarded OutFlow** Max=0.19 cfs @ 10.33 hrs HW=98.84' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.19 cfs)

**Primary OutFlow** Max=0.39 cfs @ 12.93 hrs HW=100.48' (Free Discharge)

↑ **2=Culvert out of OCS** (Passes 0.39 cfs of 2.76 cfs potential flow)

↑ **3=Sharp-Crested Rectangular Weir** (Weir Controls 0.39 cfs @ 0.95 fps)

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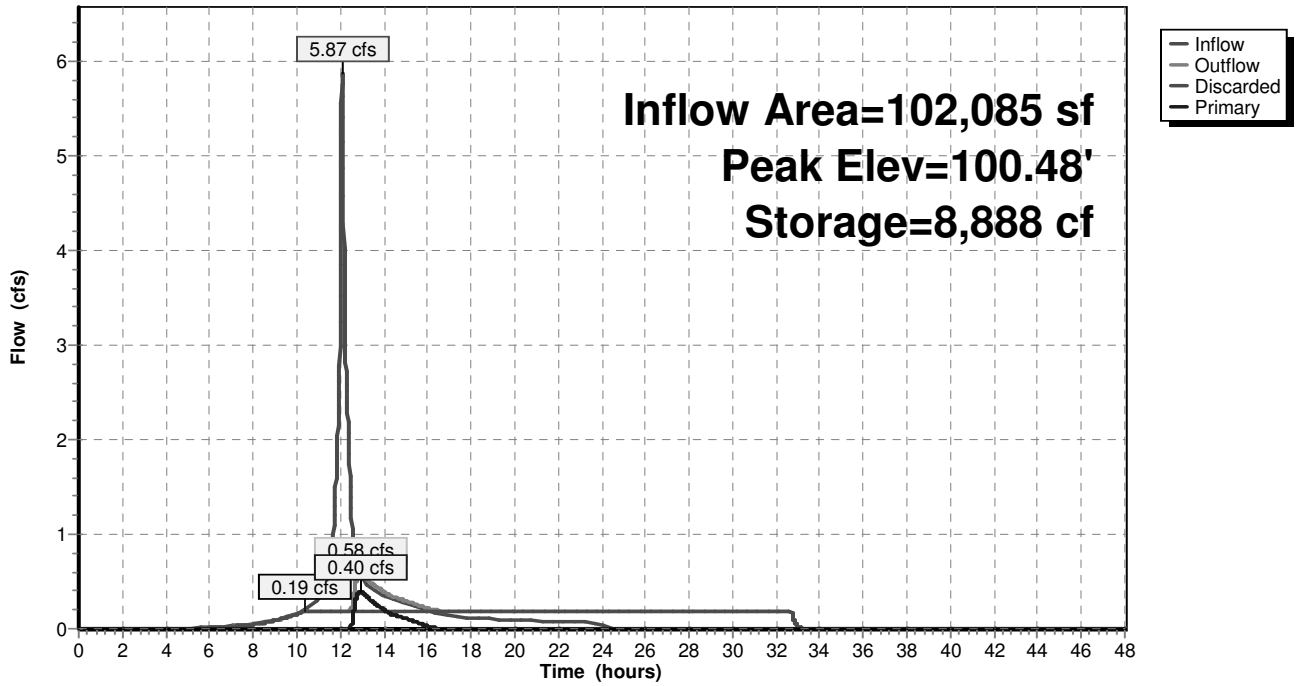
Proposed Conditions  
Type III 24-hr 2-yr Rainfall=3.20"

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**Pond 5P: Subsurface Infiltration System**

Hydrograph





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## Summary for Subcatchment 5S: SUB2D

Runoff = 0.76 cfs @ 12.09 hrs, Volume= 2,380 cf, Depth= 2.26"

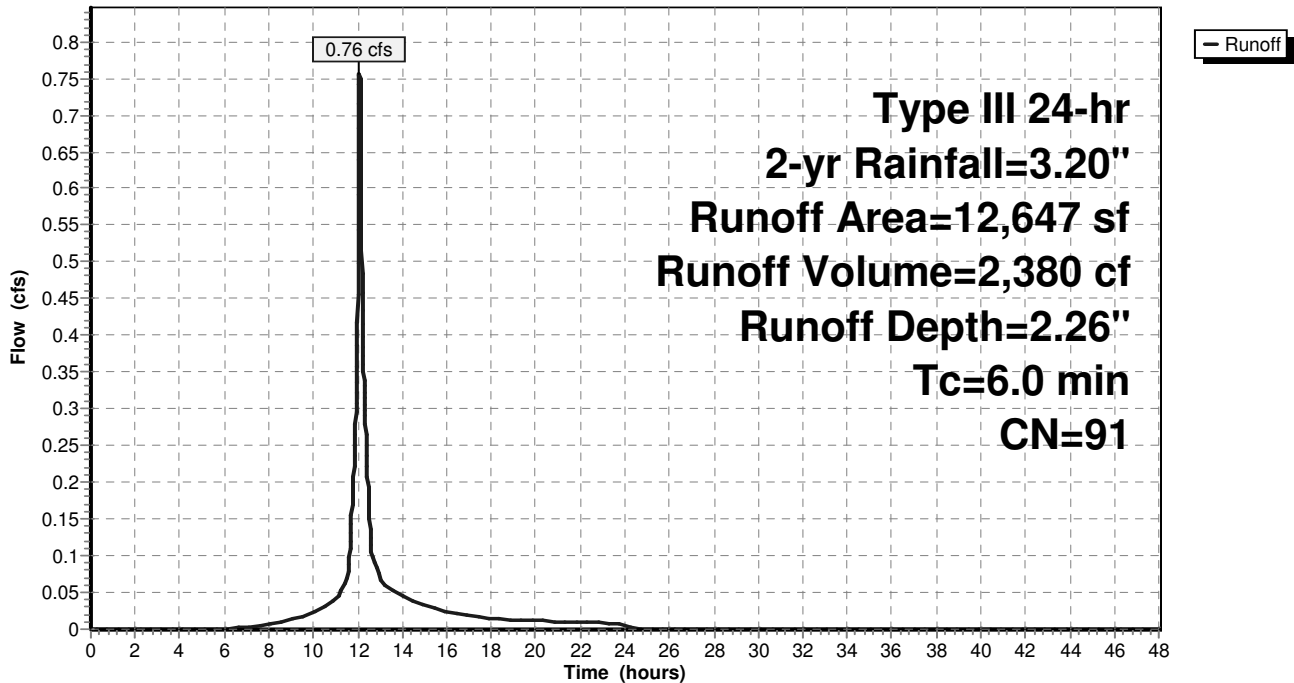
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-yr Rainfall=3.20"

	Area (sf)	CN	Description
*	10,322	98	Paved parking
	2,325	61	>75% Grass cover, Good, HSG B
	12,647	91	Weighted Average
	2,325		18.38% Pervious Area
	10,322		81.62% Impervious Area

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

## Subcatchment 5S: SUB2D

Hydrograph



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## Summary for Subcatchment 6S: SUB2E

Runoff = 0.41 cfs @ 12.09 hrs, Volume= 1,271 cf, Depth= 1.47"

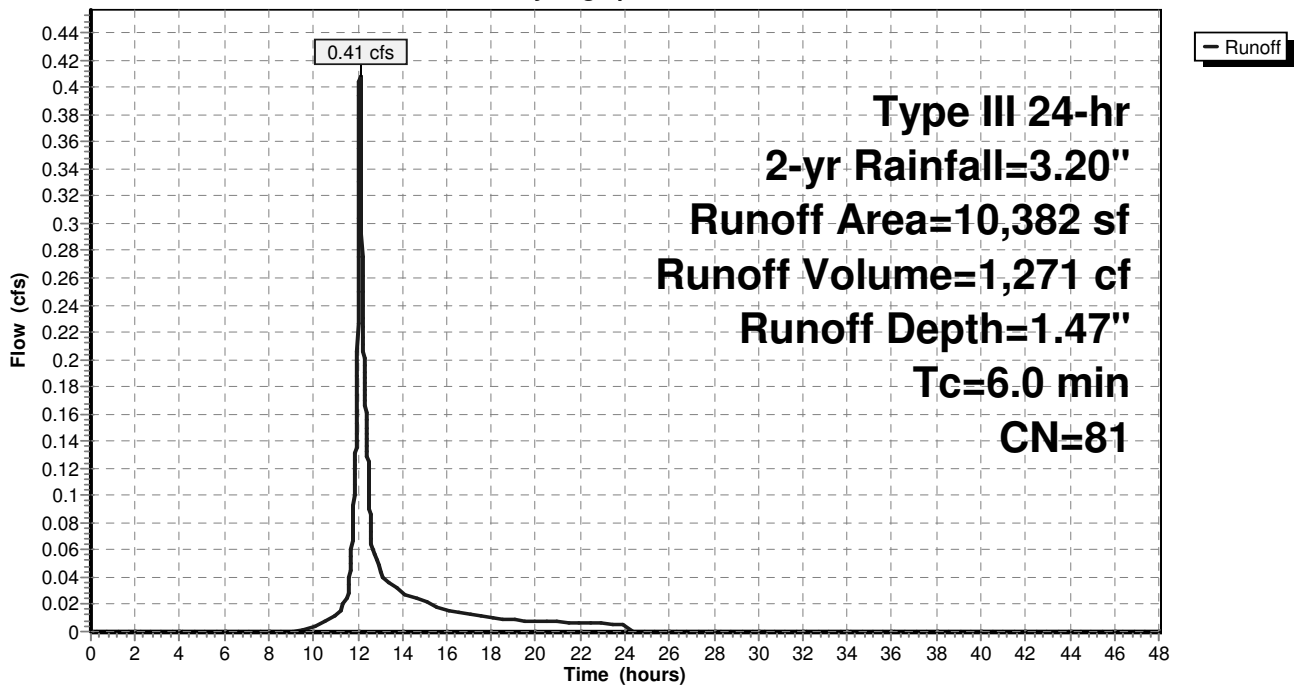
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-yr Rainfall=3.20"

	Area (sf)	CN	Description
*	5,707	98	Paved parking
	4,001	61	>75% Grass cover, Good, HSG B
	674	55	Woods, Good, HSG B
<hr/>			
	10,382	81	Weighted Average
	4,675		45.03% Pervious Area
	5,707		54.97% Impervious Area

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

## Subcatchment 6S: SUB2E

Hydrograph



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## Summary for Subcatchment 7S: SUB2F

Runoff = 1.09 cfs @ 12.09 hrs, Volume= 3,496 cf, Depth= 2.45"

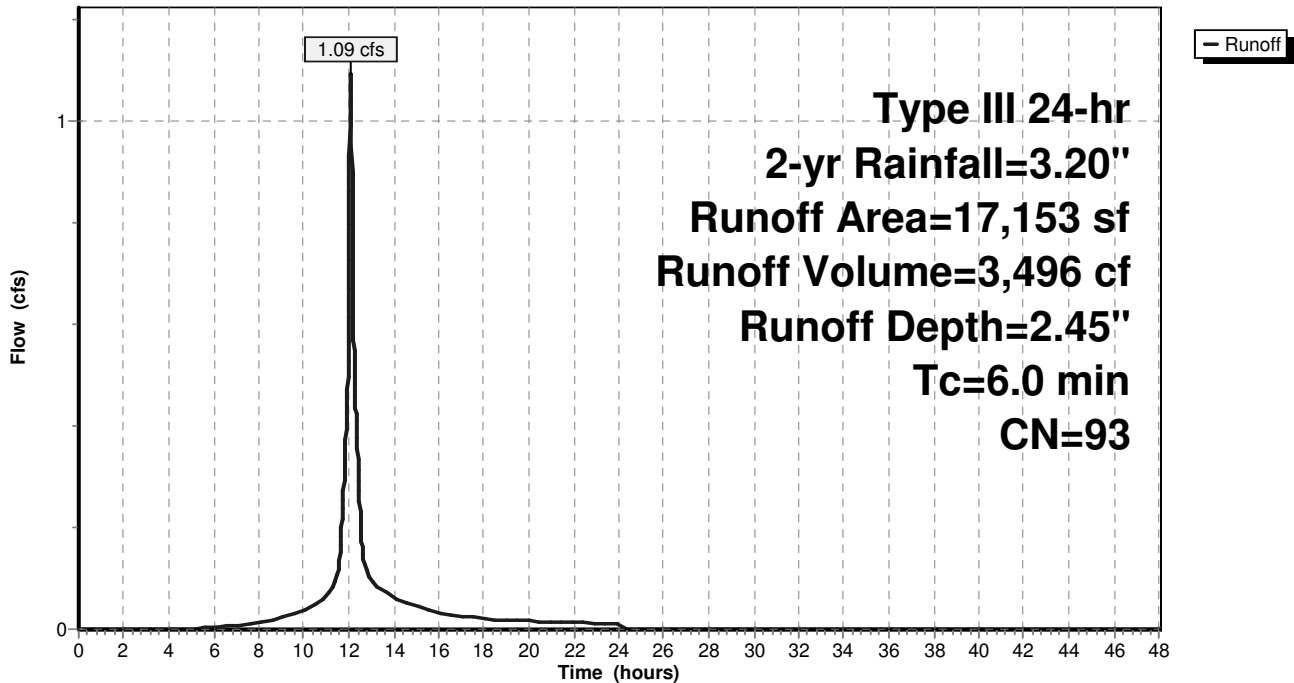
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-yr Rainfall=3.20"

	Area (sf)	CN	Description
*	14,816	98	Paved parking
	2,337	61	>75% Grass cover, Good, HSG B
	17,153	93	Weighted Average
	2,337		13.62% Pervious Area
	14,816		86.38% Impervious Area

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

## Subcatchment 7S: SUB2F

Hydrograph



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**Summary for Subcatchment 8S: SUB3A**

Runoff = 0.31 cfs @ 12.13 hrs, Volume= 1,160 cf, Depth= 0.93"

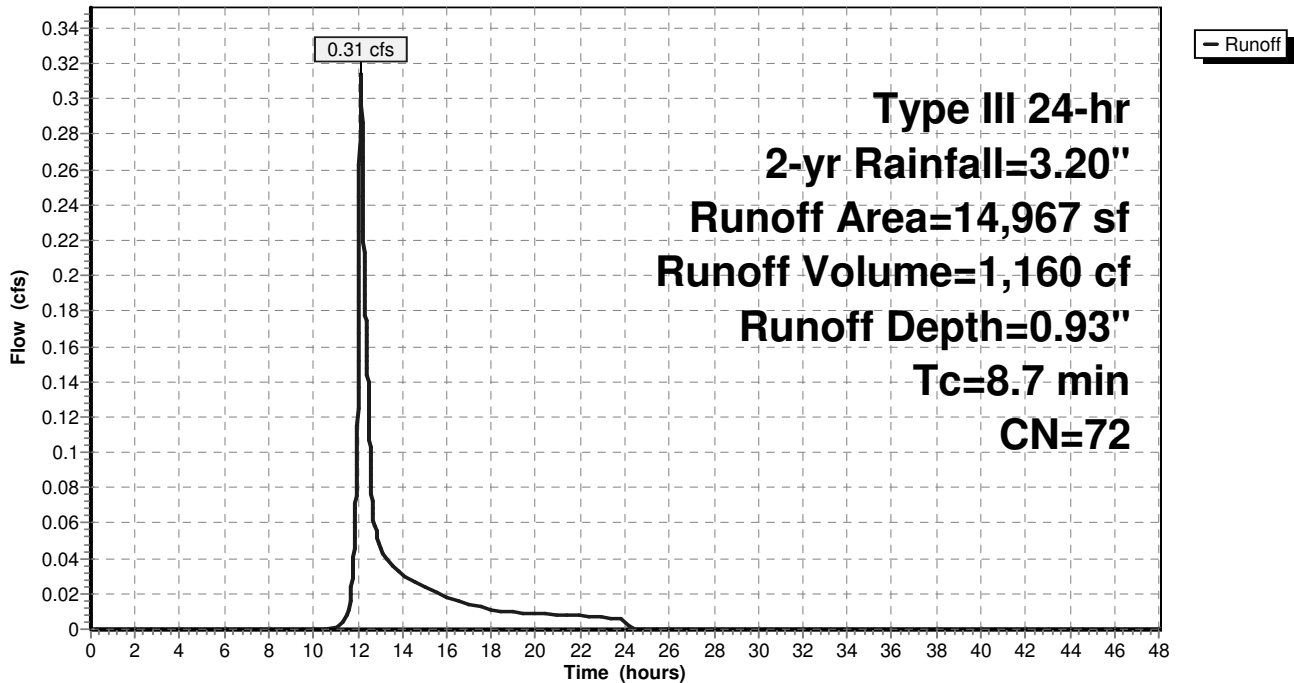
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-yr Rainfall=3.20"

	Area (sf)	CN	Description
*	4,541	98	Impervious
	10,426	61	>75% Grass cover, Good, HSG B
	14,967	72	Weighted Average
	10,426		69.66% Pervious Area
	4,541		30.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7					Direct Entry, NO CHANGE FROM EXISTING

**Subcatchment 8S: SUB3A**

Hydrograph



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## Summary for Subcatchment 9S: SUB4

Runoff = 2.09 cfs @ 12.09 hrs, Volume= 6,497 cf, Depth= 2.08"

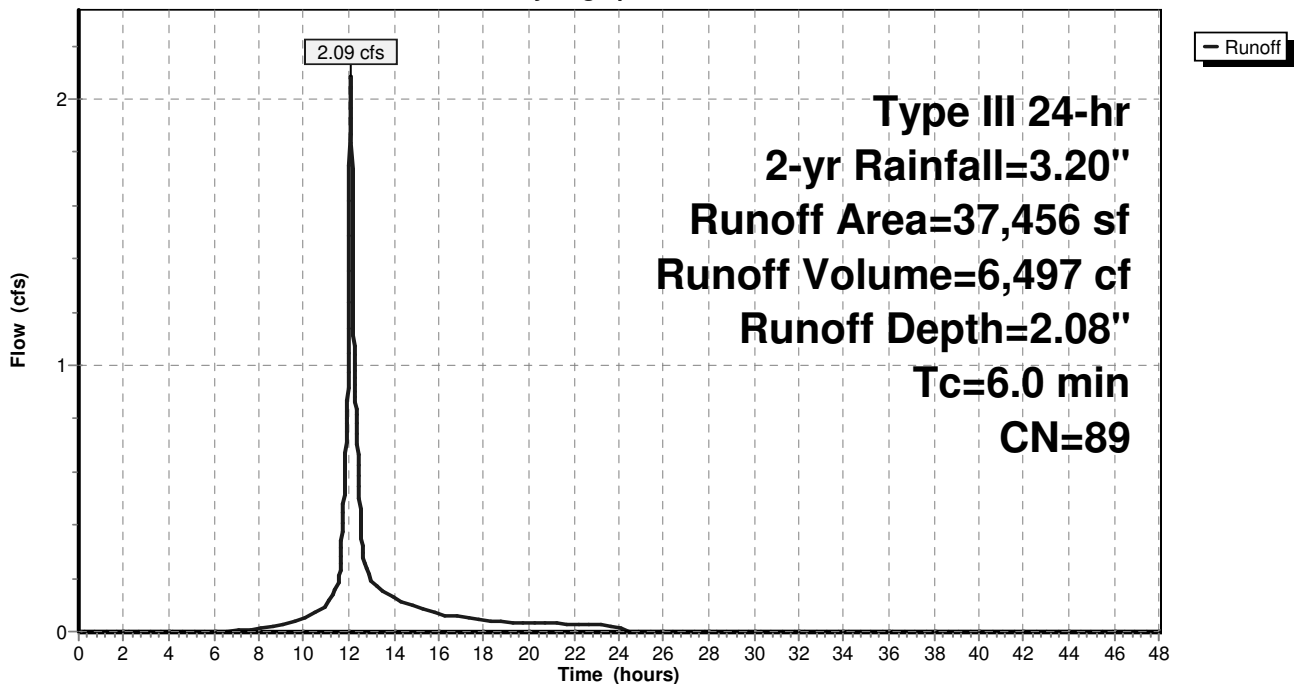
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-yr Rainfall=3.20"

	Area (sf)	CN	Description
*	5,435	98	Paved parking
*	22,782	98	Roofs
	9,239	61	>75% Grass cover, Good, HSG B
	37,456	89	Weighted Average
	9,239		24.67% Pervious Area
	28,217		75.33% Impervious Area

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

## Subcatchment 9S: SUB4

Hydrograph



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## Summary for Subcatchment 10S: SUB5

Runoff = 0.63 cfs @ 12.25 hrs, Volume= 3,735 cf, Depth= 0.48"

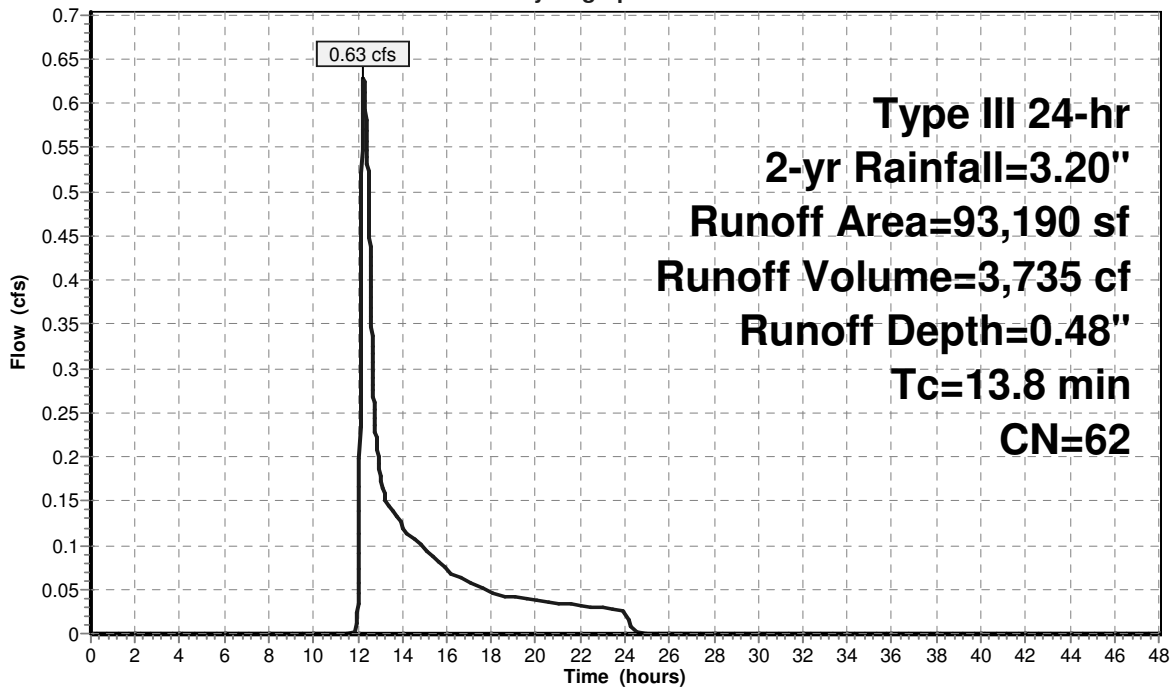
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-yr Rainfall=3.20"

	Area (sf)	CN	Description
*	7,678	98	Paved parking
	53,751	61	>75% Grass cover, Good, HSG B
	31,761	55	Woods, Good, HSG B
	93,190	62	Weighted Average
	85,512		91.76% Pervious Area
	7,678		8.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8					Direct Entry, NO CHANGE FROM EXISTING

## Subcatchment 10S: SUB5

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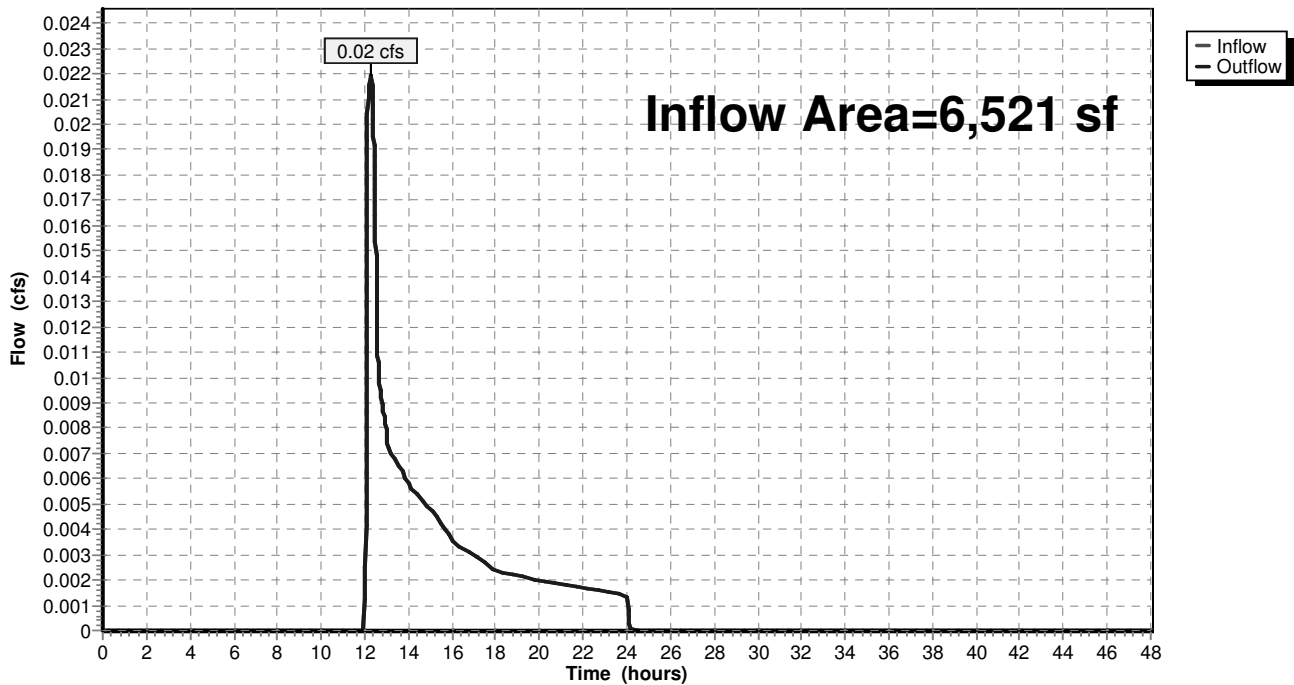
## Summary for Reach 12R: DP1-Northwest Property

Inflow Area = 6,521 sf, 0.00% Impervious, Inflow Depth = 0.31" for 2-yr event  
Inflow = 0.02 cfs @ 12.28 hrs, Volume= 168 cf  
Outflow = 0.02 cfs @ 12.28 hrs, Volume= 168 cf, Atten= 0%, Lag= 0.0 min

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

## Reach 12R: DP1-Northwest Property

Hydrograph



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## Summary for Subcatchment 13S: SUB3B

Runoff = 0.65 cfs @ 12.08 hrs, Volume= 2,238 cf, Depth= 2.97"

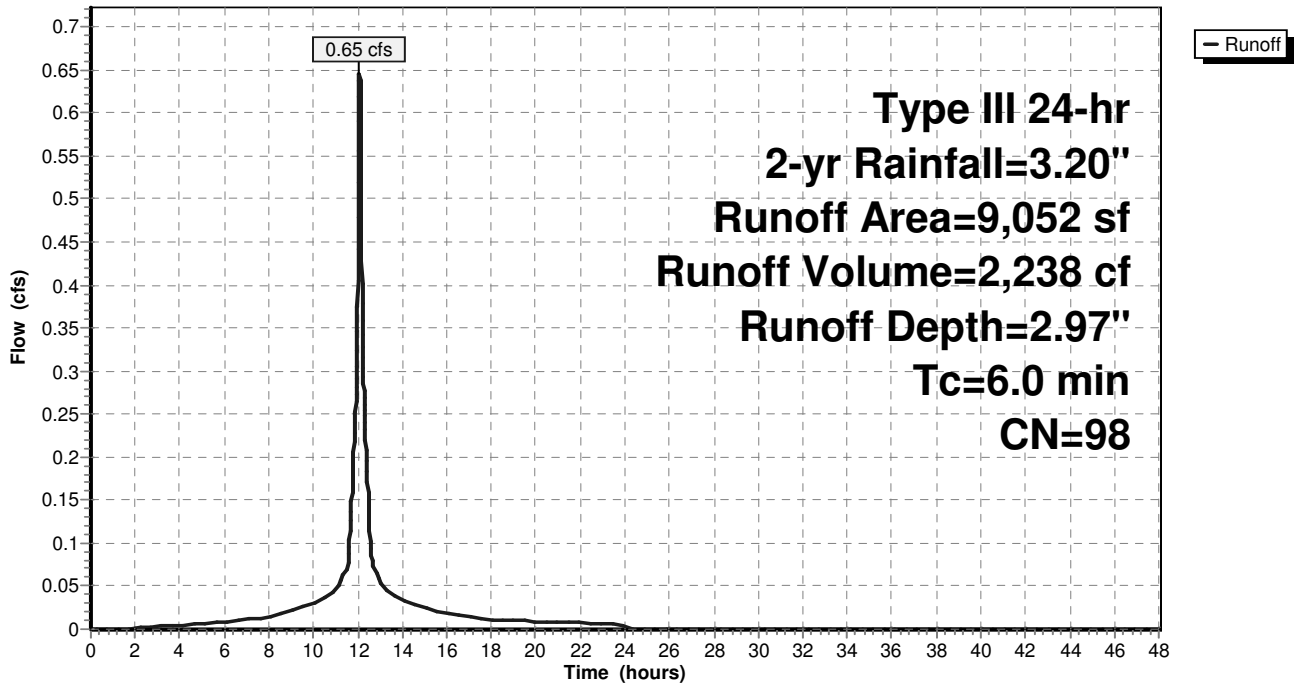
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-yr Rainfall=3.20"

Area (sf)	CN	Description
8,943	98	Roofs, HSG B
109	61	>75% Grass cover, Good, HSG B
9,052	98	Weighted Average
109		1.20% Pervious Area
8,943		98.80% Impervious Area

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

## Subcatchment 13S: SUB3B

Hydrograph





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Type III 24-hr 2-yr Rainfall=3.20"

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## Summary for Pond 14P: Infiltration Trench

Inflow Area = 9,052 sf, 98.80% Impervious, Inflow Depth = 2.97" for 2-yr event  
Inflow = 0.65 cfs @ 12.08 hrs, Volume= 2,238 cf  
Outflow = 0.62 cfs @ 12.11 hrs, Volume= 2,238 cf, Atten= 4%, Lag= 1.4 min  
Discarded = 0.01 cfs @ 7.14 hrs, Volume= 974 cf  
Primary = 0.61 cfs @ 12.11 hrs, Volume= 1,264 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Peak Elev= 101.39' @ 12.11 hrs Surf.Area= 458 sf Storage= 366 cf

Plug-Flow detention time= 118.1 min calculated for 2,238 cf (100% of inflow)  
Center-of-Mass det. time= 118.2 min ( 874.6 - 756.4 )

Volume	Invert	Avail.Storage	Storage Description
#1	99.50'	605 cf	<b>Stone (Prismatic)</b> Listed below (Recalc) 1,603 cf Overall - 90 cf Embedded = 1,513 cf x 40.0% Voids
#2	101.00'	90 cf	<b>12.0" Round Pipe Storage</b> Inside #1 L= 114.5'
695 cf			Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
99.50	458	0	0
103.00	458	1,603	1,603

Device	Routing	Invert	Outlet Devices
#1	Primary	101.00'	<b>12.0" Round Culvert</b> L= 52.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 101.00' / 100.20' S= 0.0154 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	99.50'	<b>1.020 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.01 cfs @ 7.14 hrs HW=99.54' (Free Discharge)  
↑**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

**Primary OutFlow** Max=0.61 cfs @ 12.11 hrs HW=101.39' (Free Discharge)  
↑**1=Culvert** (Inlet Controls 0.61 cfs @ 2.13 fps)

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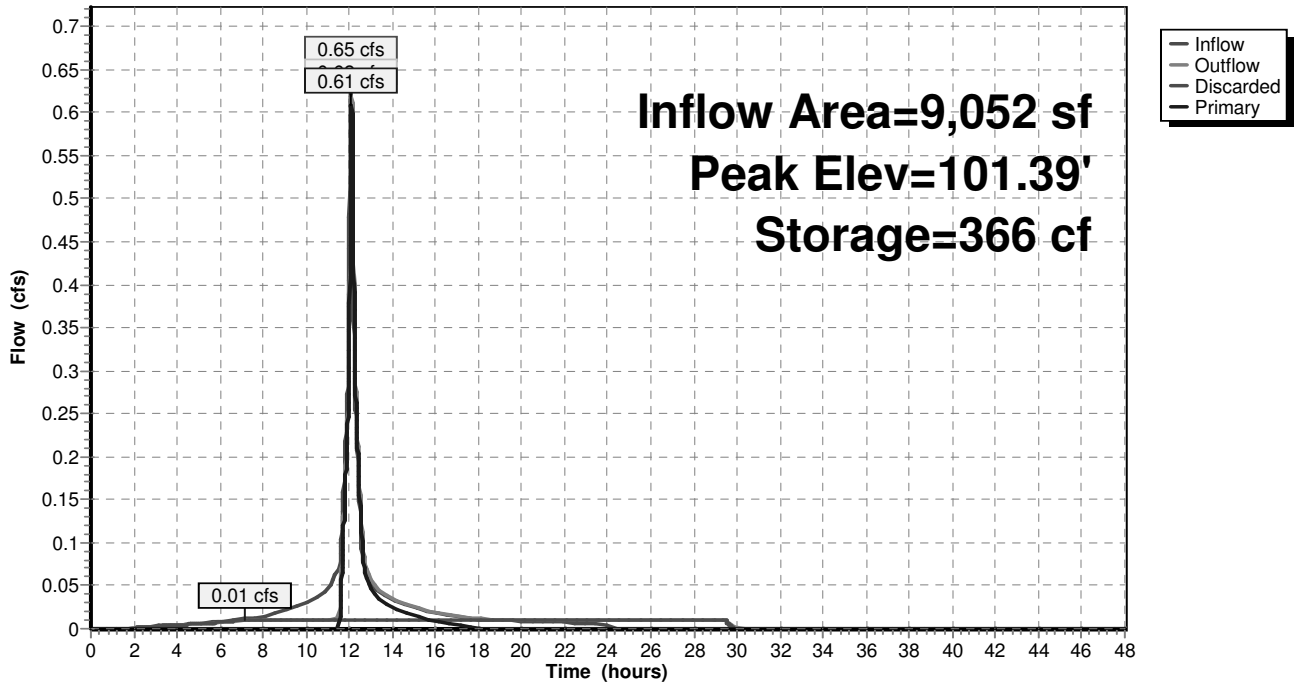
Proposed Conditions  
Type III 24-hr 2-yr Rainfall=3.20"

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**Pond 14P: Infiltration Trench**

Hydrograph



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Type III 24-hr 2-yr Rainfall=3.20"

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**Summary for Subcatchment 14S: SUB2G**

Runoff = 0.12 cfs @ 12.12 hrs, Volume= 577 cf, Depth= 0.44"

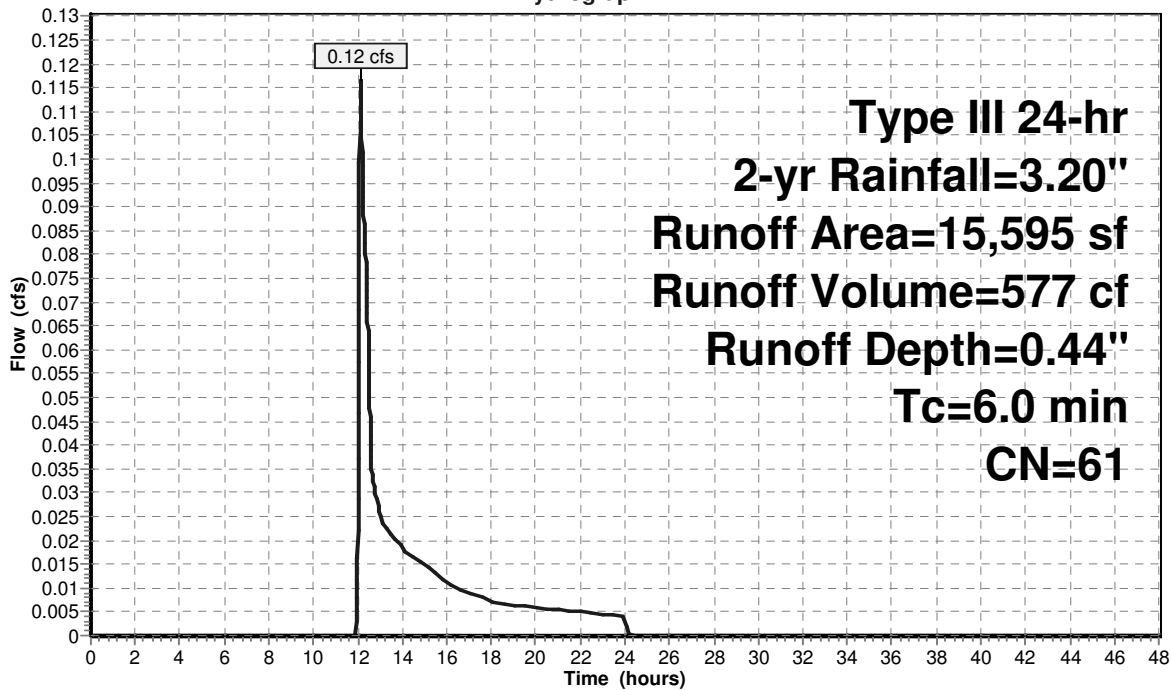
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-yr Rainfall=3.20"

Area (sf)	CN	Description
* 933	98	Paved parking
10,125	61	>75% Grass cover, Good, HSG B
4,537	55	Woods, Good, HSG B
15,595	61	Weighted Average
14,662		94.02% Pervious Area
933		5.98% Impervious Area

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

**Subcatchment 14S: SUB2G**

Hydrograph



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## Summary for Subcatchment 15S: SUB

Runoff = 0.18 cfs @ 12.08 hrs, Volume= 618 cf, Depth= 2.97"

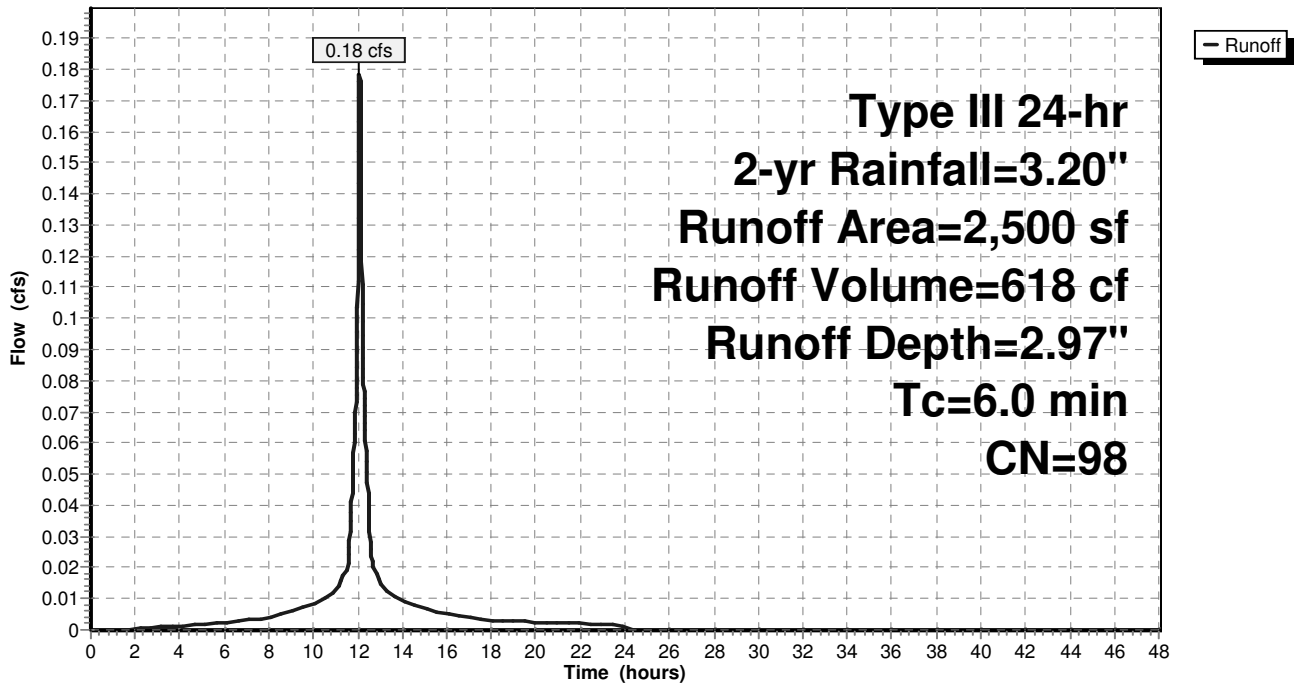
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-yr Rainfall=3.20"

Area (sf)	CN	Description
2,500	98	Roofs, HSG B
2,500		100.00% Impervious Area

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

## Subcatchment 15S: SUB

Hydrograph



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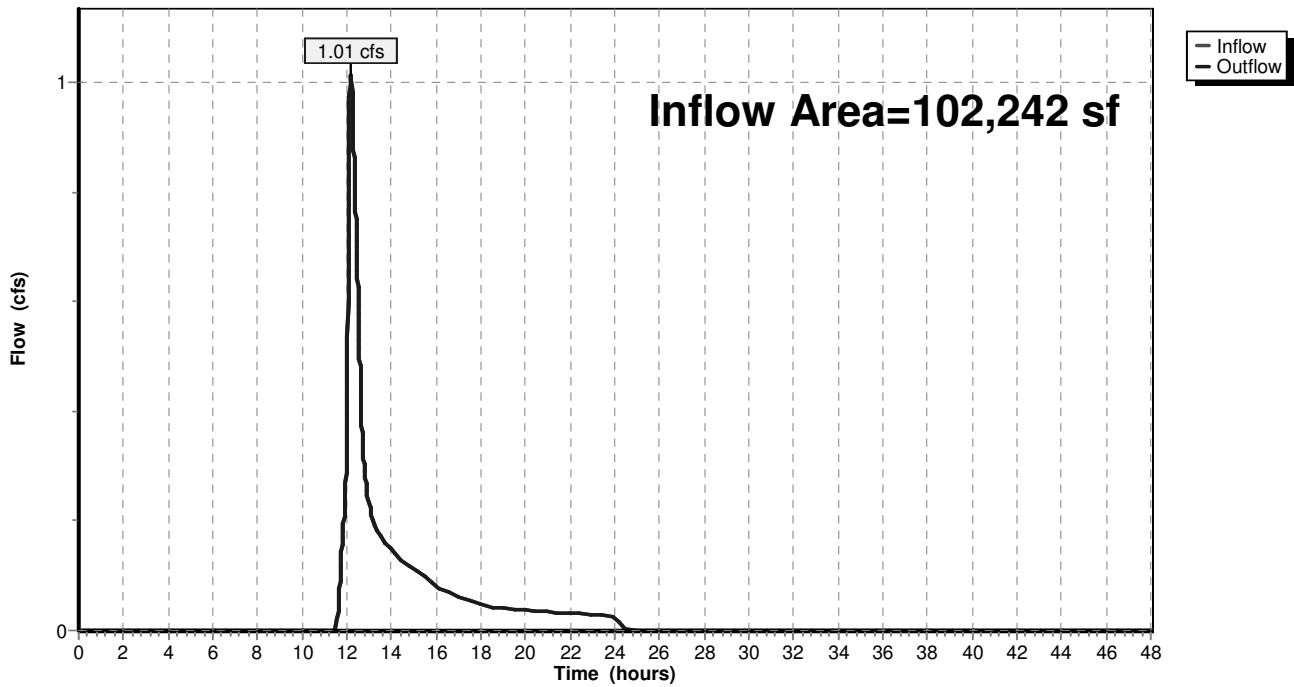
## Summary for Reach 16R: DP3-Eastern Property

Inflow Area = 102,242 sf, 16.26% Impervious, Inflow Depth = 0.59" for 2-yr event  
Inflow = 1.01 cfs @ 12.17 hrs, Volume= 5,000 cf  
Outflow = 1.01 cfs @ 12.17 hrs, Volume= 5,000 cf, Atten= 0%, Lag= 0.0 min

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

## Reach 16R: DP3-Eastern Property

Hydrograph



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Type III 24-hr 2-yr Rainfall=3.20"

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## Summary for Subcatchment 16S: SUB

Runoff = 2.82 cfs @ 12.08 hrs, Volume= 9,782 cf, Depth= 2.97"

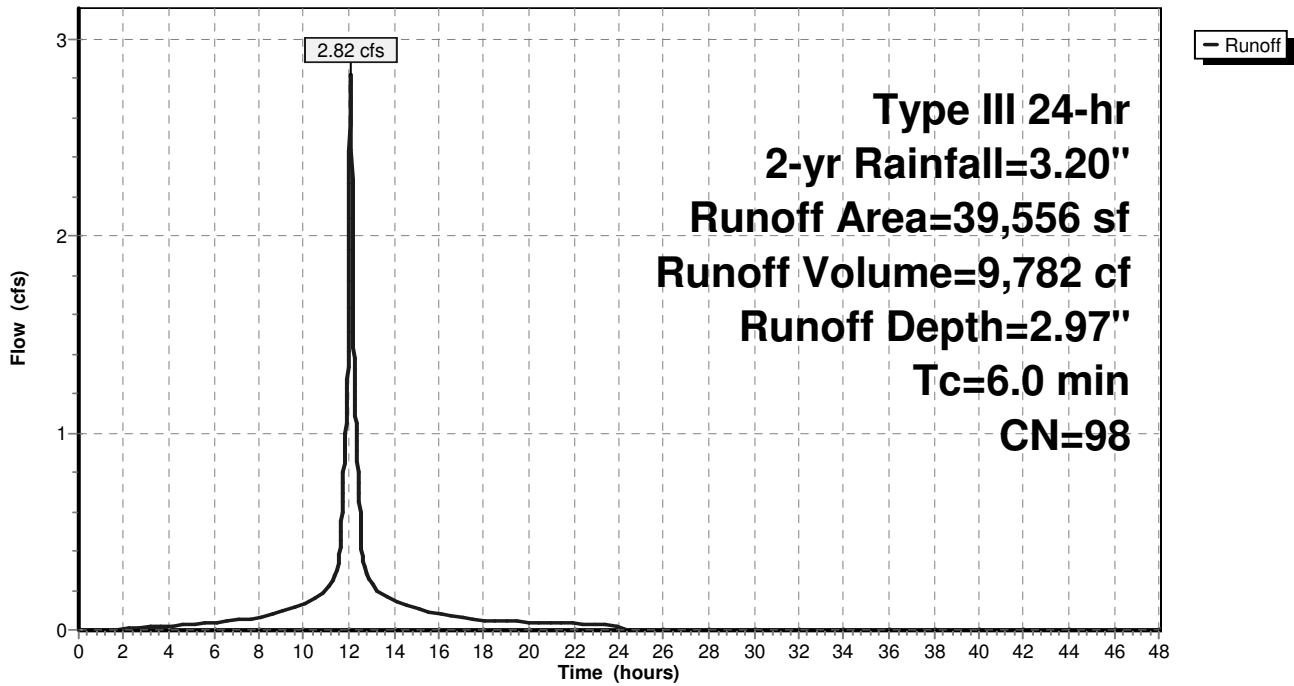
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-yr Rainfall=3.20"

Area (sf)	CN	Description
39,556	98	Roofs, HSG B
39,556		100.00% Impervious Area

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

## Subcatchment 16S: SUB

Hydrograph



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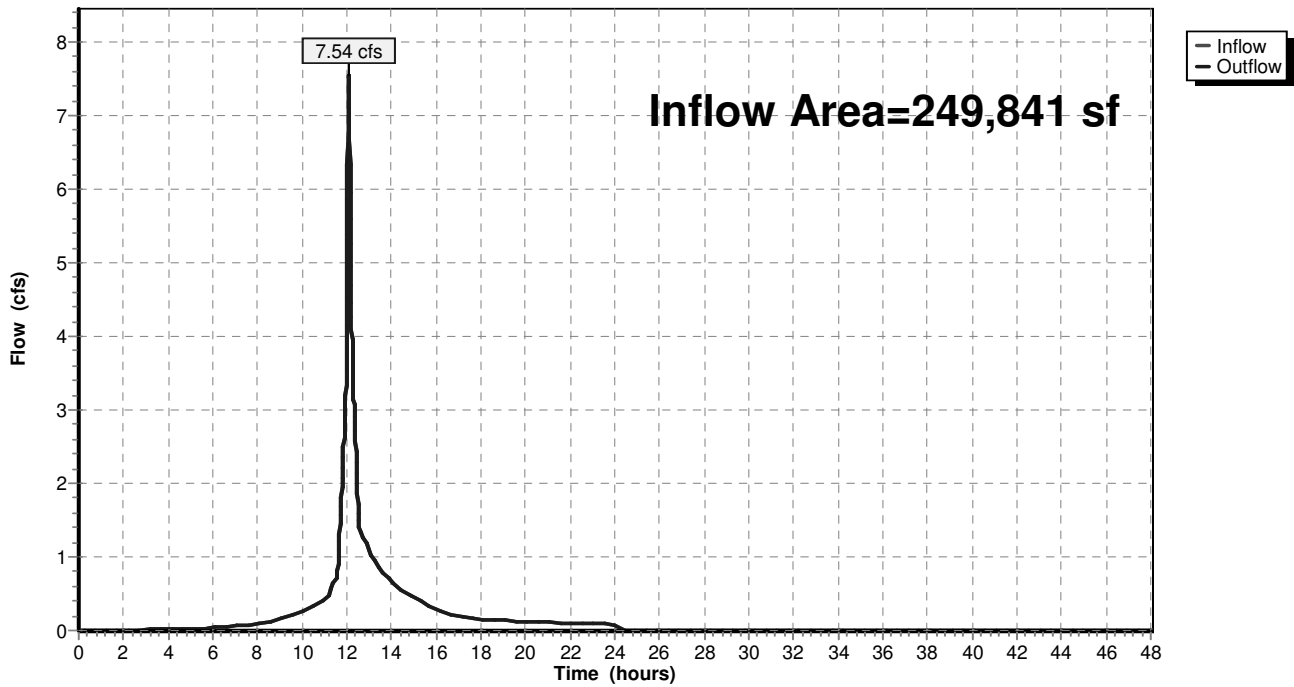
## Summary for Reach 17R: DP2-Wells Avenue

Inflow Area = 249,841 sf, 73.57% Impervious, Inflow Depth = 1.32" for 2-yr event  
Inflow = 7.54 cfs @ 12.09 hrs, Volume= 27,526 cf  
Outflow = 7.54 cfs @ 12.09 hrs, Volume= 27,526 cf, Atten= 0%, Lag= 0.0 min

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

### Reach 17R: DP2-Wells Avenue

Hydrograph



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Type III 24-hr 2-yr Rainfall=3.20"

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**Summary for Subcatchment 20S: SUB3B**

Runoff = 1.23 cfs @ 12.09 hrs, Volume= 3,936 cf, Depth= 2.45"

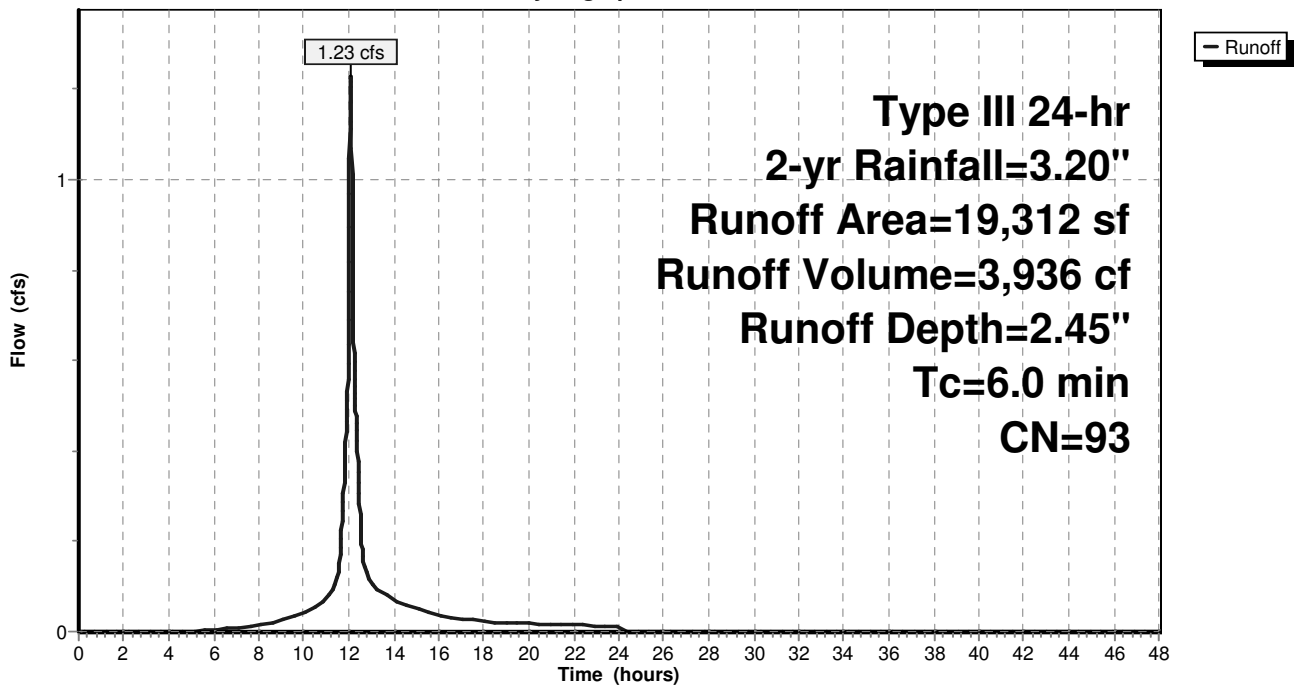
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-yr Rainfall=3.20"

	Area (sf)	CN	Description
*	14,089	98	Pavement
	2,823	61	>75% Grass cover, Good, HSG B
*	2,400	98	Pavement
	19,312	93	Weighted Average
	2,823		14.62% Pervious Area
	16,489		85.38% Impervious Area

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

**Subcatchment 20S: SUB3B**

Hydrograph





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Type III 24-hr 2-yr Rainfall=3.20"

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**Summary for Subcatchment 21S: SUB**

Runoff = 0.47 cfs @ 12.09 hrs, Volume= 1,482 cf, Depth= 2.17"

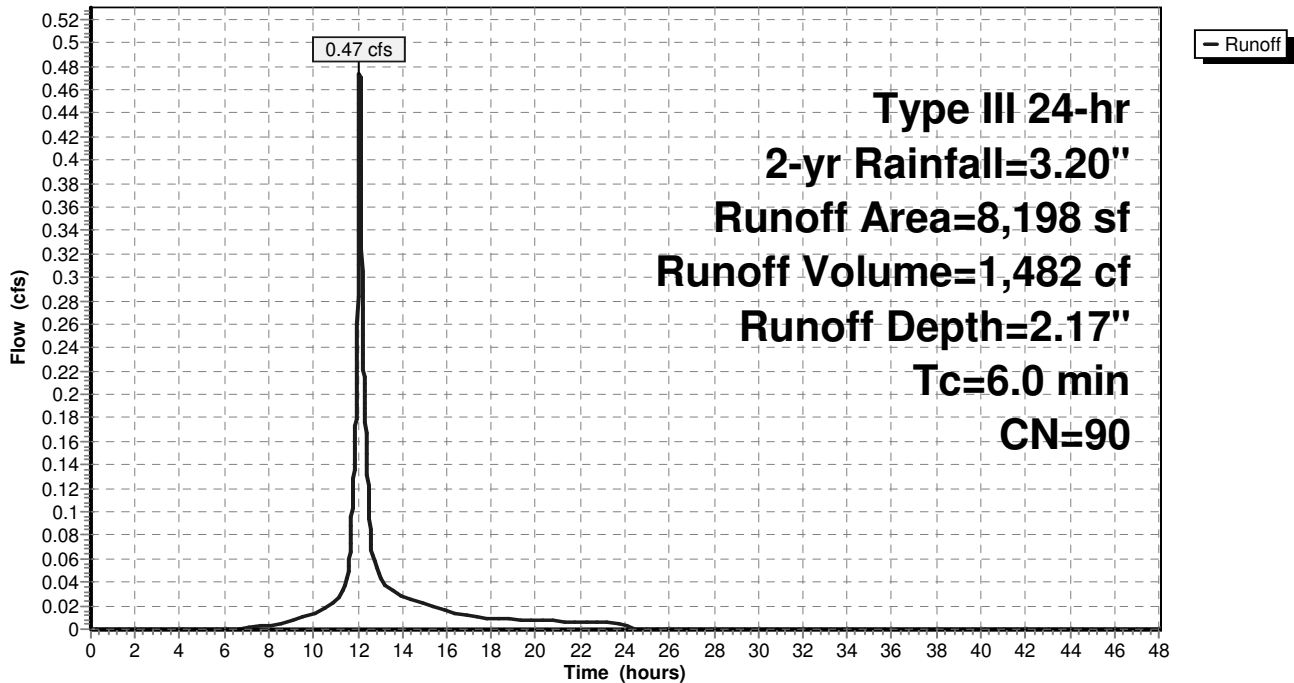
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-yr Rainfall=3.20"

Area (sf)	CN	Description
6,330	98	Paved parking, HSG B
1,868	61	>75% Grass cover, Good, HSG B
8,198	90	Weighted Average
1,868		22.79% Pervious Area
6,330		77.21% Impervious Area

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

**Subcatchment 21S: SUB**

Hydrograph



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

<b>Subcatchment 1S: SUB1</b>	Runoff Area=6,521 sf 0.00% Impervious Runoff Depth=0.90" Tc=6.0 min CN=57 Runoff=0.13 cfs 488 cf
<b>Subcatchment 2S: SUB2A</b>	Runoff Area=28,661 sf 77.18% Impervious Runoff Depth=3.49" Tc=6.0 min CN=90 Runoff=2.61 cfs 8,339 cf
<b>Subcatchment 3S: SUB2B</b>	Runoff Area=18,034 sf 89.00% Impervious Runoff Depth=3.91" Tc=6.0 min CN=94 Runoff=1.78 cfs 5,882 cf
<b>Subcatchment 4S: SUB2C</b>	Runoff Area=25,380 sf 63.98% Impervious Runoff Depth=2.91" Tc=6.0 min CN=84 Runoff=1.98 cfs 6,148 cf
<b>Pond 5P: Subsurface Infiltration System</b>	Peak Elev=100.83' Storage=10,855 cf Inflow=9.24 cfs 29,788 cf Discarded=0.19 cfs 18,345 cf Primary=3.39 cfs 11,443 cf Outflow=3.57 cfs 29,788 cf
<b>Subcatchment 5S: SUB2D</b>	Runoff Area=12,647 sf 81.62% Impervious Runoff Depth=3.59" Tc=6.0 min CN=91 Runoff=1.18 cfs 3,788 cf
<b>Subcatchment 6S: SUB2E</b>	Runoff Area=10,382 sf 54.97% Impervious Runoff Depth=2.63" Tc=6.0 min CN=81 Runoff=0.74 cfs 2,279 cf
<b>Subcatchment 7S: SUB2F</b>	Runoff Area=17,153 sf 86.38% Impervious Runoff Depth=3.81" Tc=6.0 min CN=93 Runoff=1.66 cfs 5,440 cf
<b>Subcatchment 8S: SUB3A</b>	Runoff Area=14,967 sf 30.34% Impervious Runoff Depth=1.89" Tc=8.7 min CN=72 Runoff=0.68 cfs 2,363 cf
<b>Subcatchment 9S: SUB4</b>	Runoff Area=37,456 sf 75.33% Impervious Runoff Depth=3.39" Tc=6.0 min CN=89 Runoff=3.34 cfs 10,582 cf
<b>Subcatchment 10S: SUB5</b>	Runoff Area=93,190 sf 8.24% Impervious Runoff Depth=1.20" Tc=13.8 min CN=62 Runoff=2.08 cfs 9,304 cf
<b>Reach 12R: DP1-Northwest Property</b>	Inflow=0.13 cfs 488 cf Outflow=0.13 cfs 488 cf
<b>Subcatchment 13S: SUB3B</b>	Runoff Area=9,052 sf 98.80% Impervious Runoff Depth=4.36" Tc=6.0 min CN=98 Runoff=0.93 cfs 3,292 cf
<b>Pond 14P: Infiltration Trench</b>	Peak Elev=101.48' Storage=389 cf Inflow=0.93 cfs 3,292 cf Discarded=0.01 cfs 1,084 cf Primary=0.89 cfs 2,208 cf Outflow=0.90 cfs 3,292 cf
<b>Subcatchment 14S: SUB2G</b>	Runoff Area=15,595 sf 5.98% Impervious Runoff Depth=1.14" Tc=6.0 min CN=61 Runoff=0.42 cfs 1,476 cf
<b>Subcatchment 15S: SUB</b>	Runoff Area=2,500 sf 100.00% Impervious Runoff Depth=4.36" Tc=6.0 min CN=98 Runoff=0.26 cfs 909 cf

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### Reach 16R: DP3-Eastern Property

Inflow=2.69 cfs 11,512 cf  
Outflow=2.69 cfs 11,512 cf

### Subcatchment 16S: SUB

Runoff Area=39,556 sf 100.00% Impervious Runoff Depth=4.36"  
Tc=6.0 min CN=98 Runoff=4.08 cfs 14,385 cf

### Reach 17R: DP2-Wells Avenue

Inflow=12.28 cfs 51,756 cf  
Outflow=12.28 cfs 51,756 cf

### Subcatchment 20S: SUB3B

Runoff Area=19,312 sf 85.38% Impervious Runoff Depth=3.81"  
Tc=6.0 min CN=93 Runoff=1.87 cfs 6,125 cf

### Subcatchment 21S: SUB

Runoff Area=8,198 sf 77.21% Impervious Runoff Depth=3.49"  
Tc=6.0 min CN=90 Runoff=0.75 cfs 2,385 cf

**Total Runoff Area = 358,604 sf Runoff Volume = 83,185 cf Average Runoff Depth = 2.78"**  
**44.11% Pervious = 158,164 sf 55.89% Impervious = 200,440 sf**

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Type III 24-hr 10-yr Rainfall=4.60"

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## Summary for Subcatchment 1S: SUB1

Runoff = 0.13 cfs @ 12.11 hrs, Volume= 488 cf, Depth= 0.90"

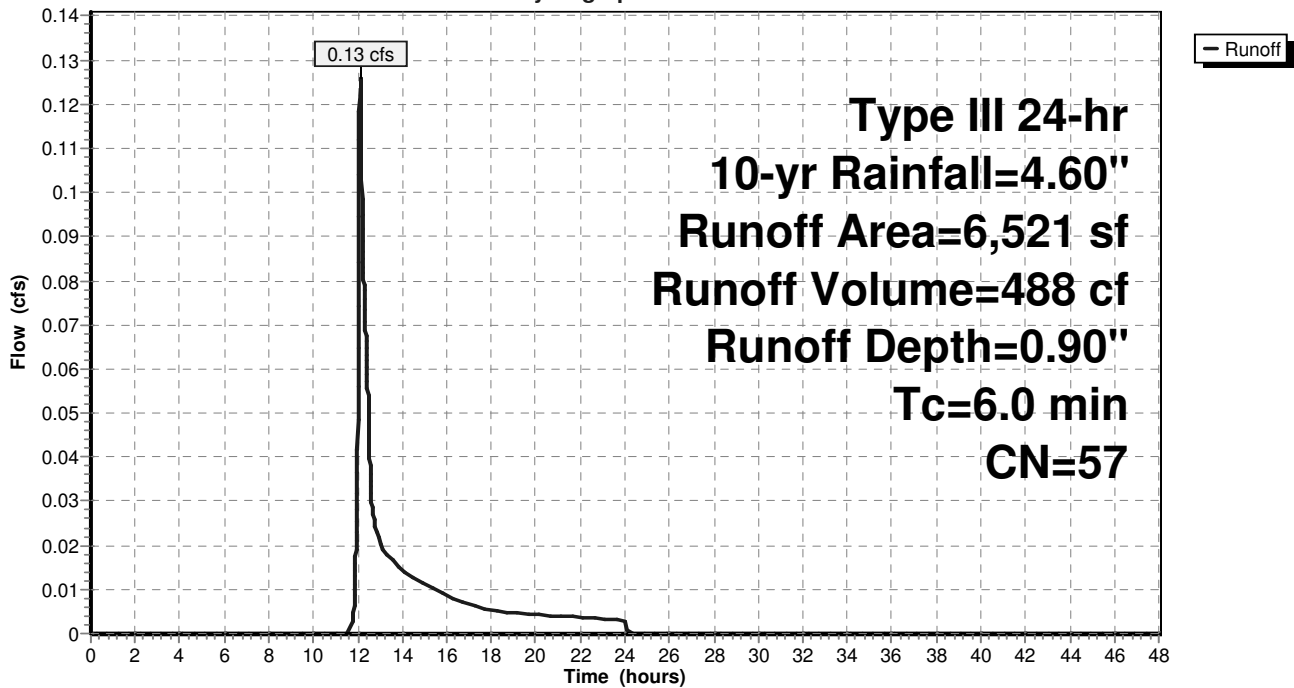
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-yr Rainfall=4.60"

Area (sf)	CN	Description
4,819	55	Woods, Good, HSG B
1,702	61	>75% Grass cover, Good, HSG B
6,521	57	Weighted Average
6,521		100.00% Pervious Area

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

## Subcatchment 1S: SUB1

Hydrograph



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Type III 24-hr 10-yr Rainfall=4.60"

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## Summary for Subcatchment 2S: SUB2A

Runoff = 2.61 cfs @ 12.09 hrs, Volume= 8,339 cf, Depth= 3.49"

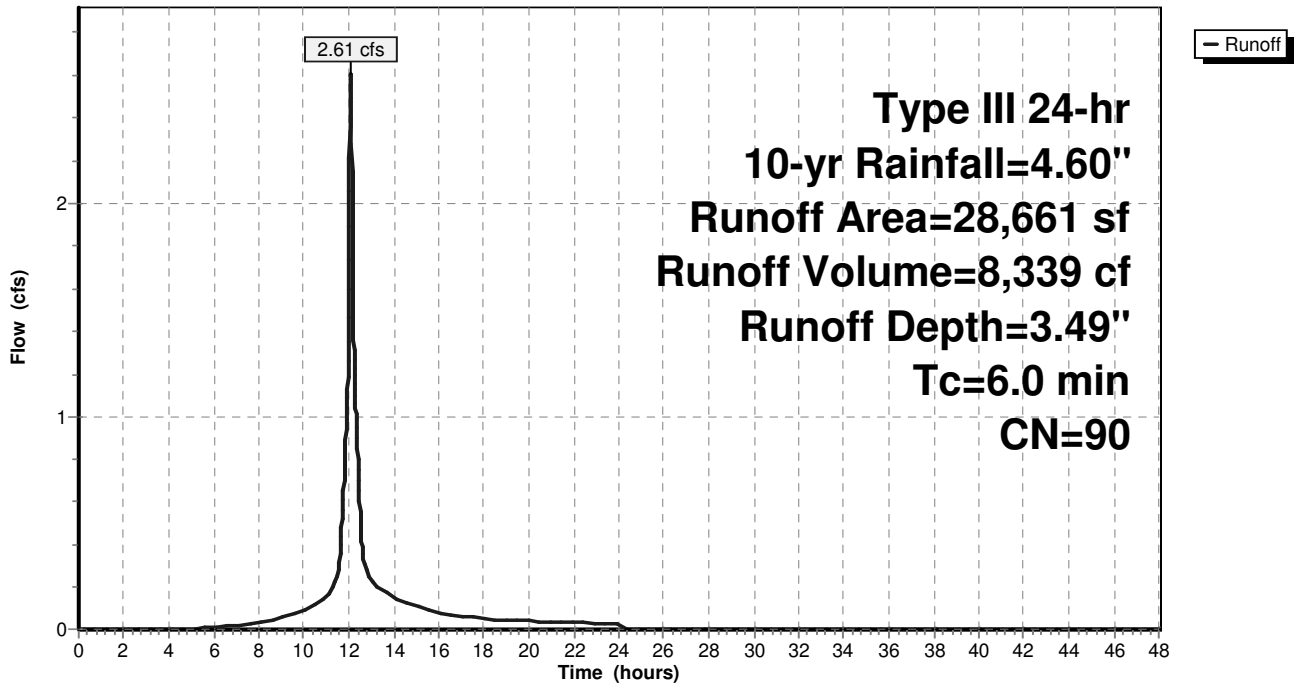
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-yr Rainfall=4.60"

	Area (sf)	CN	Description
*	22,121	98	Paved parking
	6,540	61	>75% Grass cover, Good, HSG B
	28,661	90	Weighted Average
	6,540		22.82% Pervious Area
	22,121		77.18% Impervious Area

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

## Subcatchment 2S: SUB2A

Hydrograph



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## Summary for Subcatchment 3S: SUB2B

Runoff = 1.78 cfs @ 12.08 hrs, Volume= 5,882 cf, Depth= 3.91"

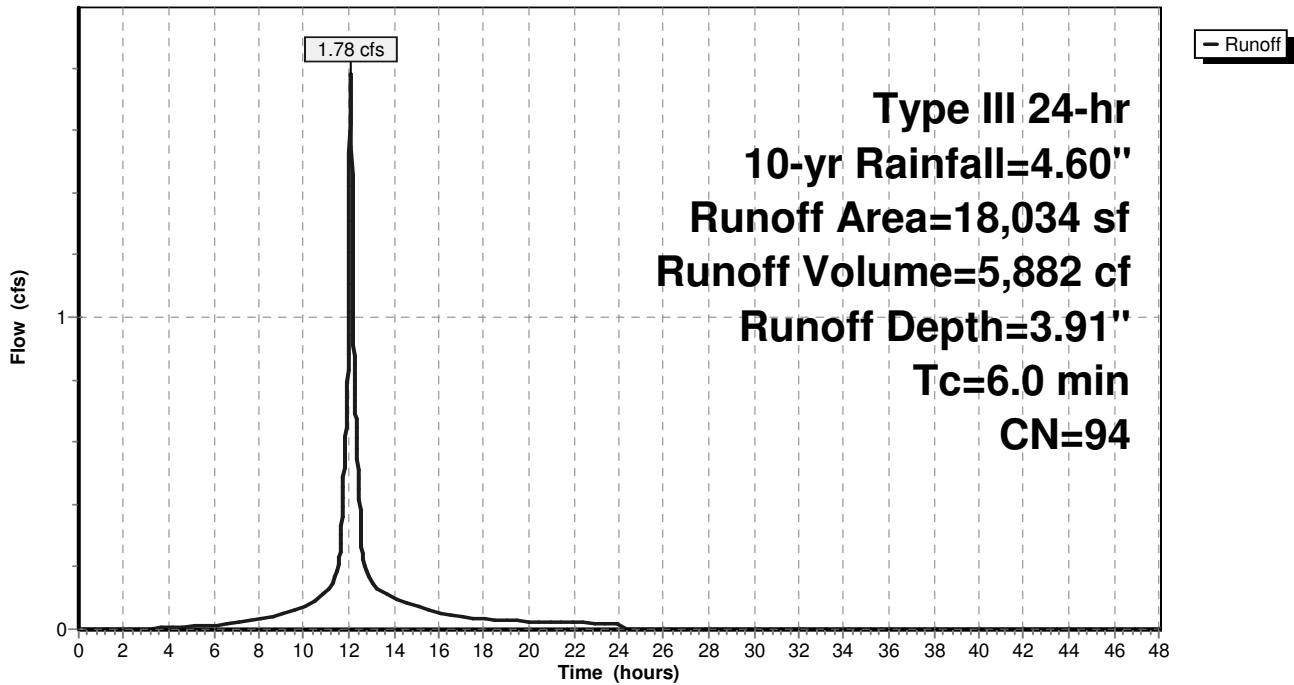
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-yr Rainfall=4.60"

	Area (sf)	CN	Description
*	16,050	98	Paved parking
	1,984	61	>75% Grass cover, Good, HSG B
	18,034	94	Weighted Average
	1,984		11.00% Pervious Area
	16,050		89.00% Impervious Area

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

## Subcatchment 3S: SUB2B

Hydrograph



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**Summary for Subcatchment 4S: SUB2C**

Runoff = 1.98 cfs @ 12.09 hrs, Volume= 6,148 cf, Depth= 2.91"

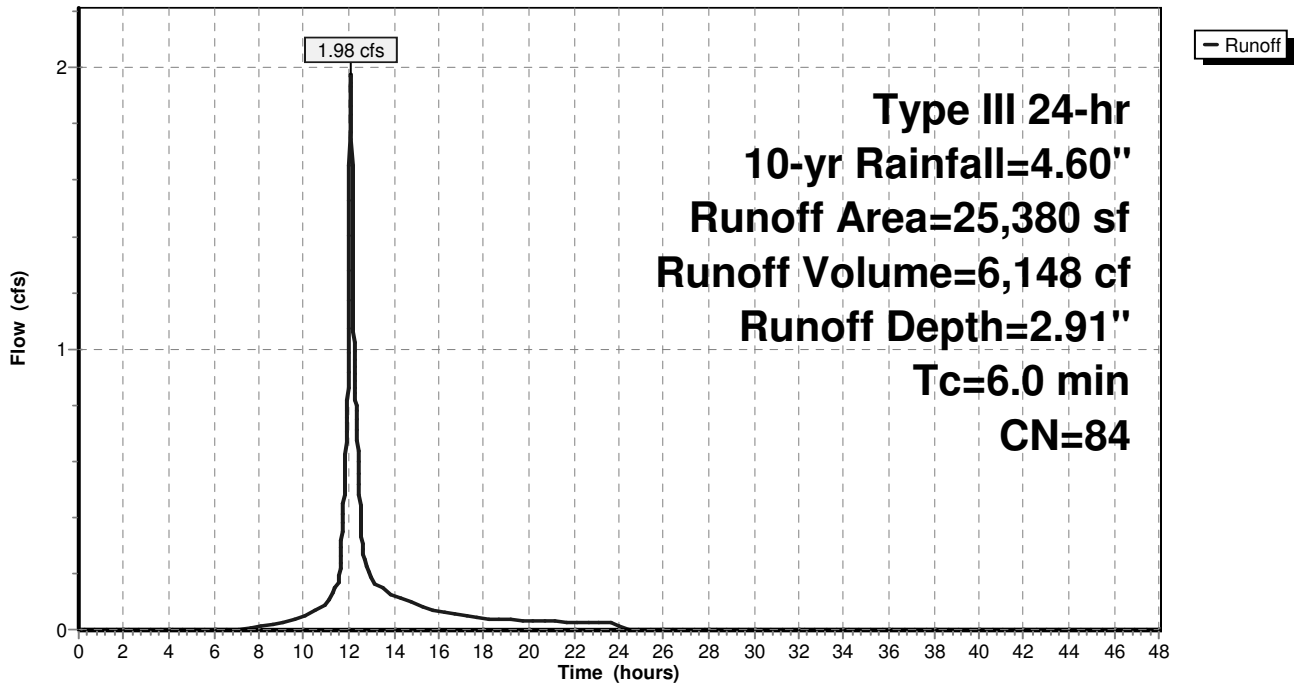
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-yr Rainfall=4.60"

	Area (sf)	CN	Description
*	16,237	98	Paved parking
	4,855	55	Woods, Good, HSG B
	4,288	61	>75% Grass cover, Good, HSG B
	25,380	84	Weighted Average
	9,143		36.02% Pervious Area
	16,237		63.98% Impervious Area

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

**Subcatchment 4S: SUB2C**

Hydrograph



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## Summary for Pond 5P: Subsurface Infiltration System

Inflow Area = 102,085 sf, 78.10% Impervious, Inflow Depth = 3.50" for 10-yr event  
 Inflow = 9.24 cfs @ 12.09 hrs, Volume= 29,788 cf  
 Outflow = 3.57 cfs @ 12.32 hrs, Volume= 29,788 cf, Atten= 61%, Lag= 14.1 min  
 Discarded = 0.19 cfs @ 9.03 hrs, Volume= 18,345 cf  
 Primary = 3.39 cfs @ 12.32 hrs, Volume= 11,443 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2  
 Peak Elev= 100.83' @ 12.32 hrs Surf.Area= 7,912 sf Storage= 10,855 cf

Plug-Flow detention time= 285.9 min calculated for 29,782 cf (100% of inflow)  
 Center-of-Mass det. time= 286.0 min ( 1,076.3 - 790.3 )

Volume	Invert	Avail.Storage	Storage Description
#1A	98.80'	6,077 cf	<b>68.00'W x 116.36'L x 3.50'H Field A</b> 27,694 cf Overall - 10,330 cf Embedded = 17,363 cf x 35.0% Voids
#2A	99.30'	10,330 cf	<b>ADS StormTech SC-740</b> x 224 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 14 rows
		16,407 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	98.80'	<b>1.020 in/hr Exfiltration over Horizontal area</b>
#2	Primary	99.30'	<b>12.0" Round Culvert out of OCS</b> L= 95.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 99.30' / 98.40' S= 0.0095 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	100.40'	<b>5.0' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)

**Discarded OutFlow** Max=0.19 cfs @ 9.03 hrs HW=98.84' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.19 cfs)

**Primary OutFlow** Max=3.39 cfs @ 12.32 hrs HW=100.83' (Free Discharge)

↑ **2=Culvert out of OCS** (Inlet Controls 3.39 cfs @ 4.31 fps)

↑ **3=Sharp-Crested Rectangular Weir** (Passes 3.39 cfs of 4.54 cfs potential flow)



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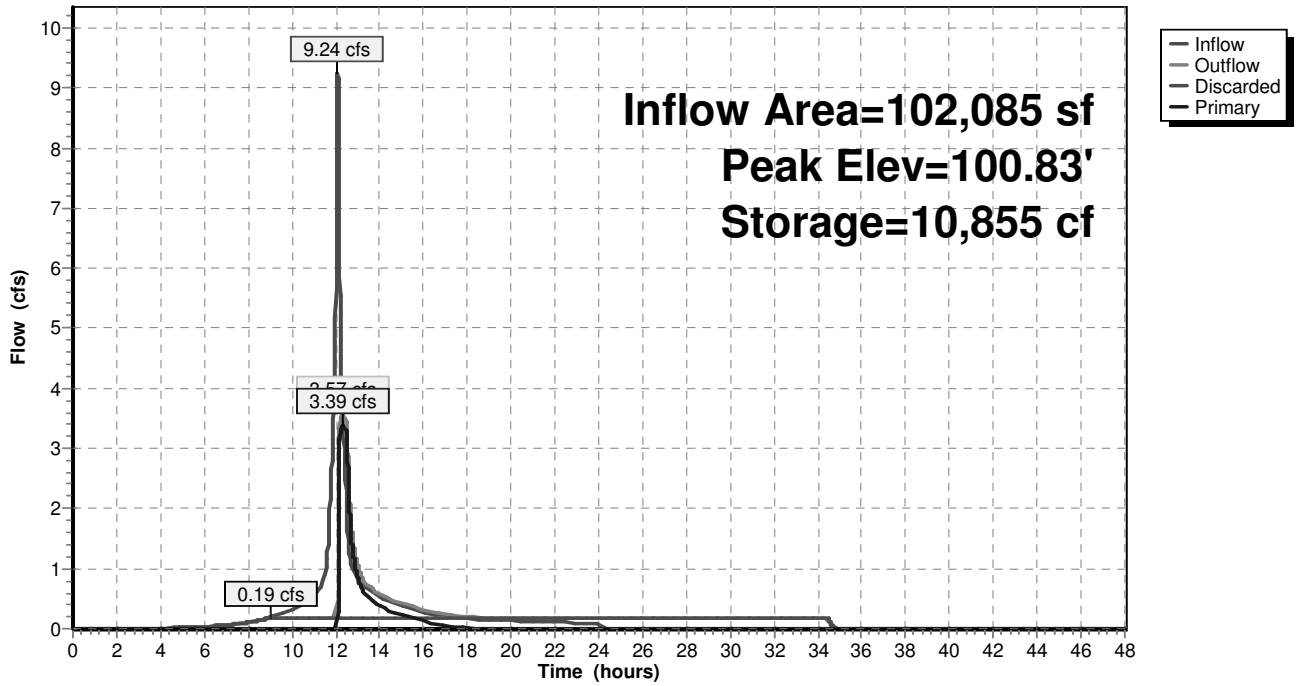
Type III 24-hr 10-yr Rainfall=4.60"

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**Pond 5P: Subsurface Infiltration System**

Hydrograph



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Type III 24-hr 10-yr Rainfall=4.60"

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## Summary for Subcatchment 5S: SUB2D

Runoff = 1.18 cfs @ 12.08 hrs, Volume= 3,788 cf, Depth= 3.59"

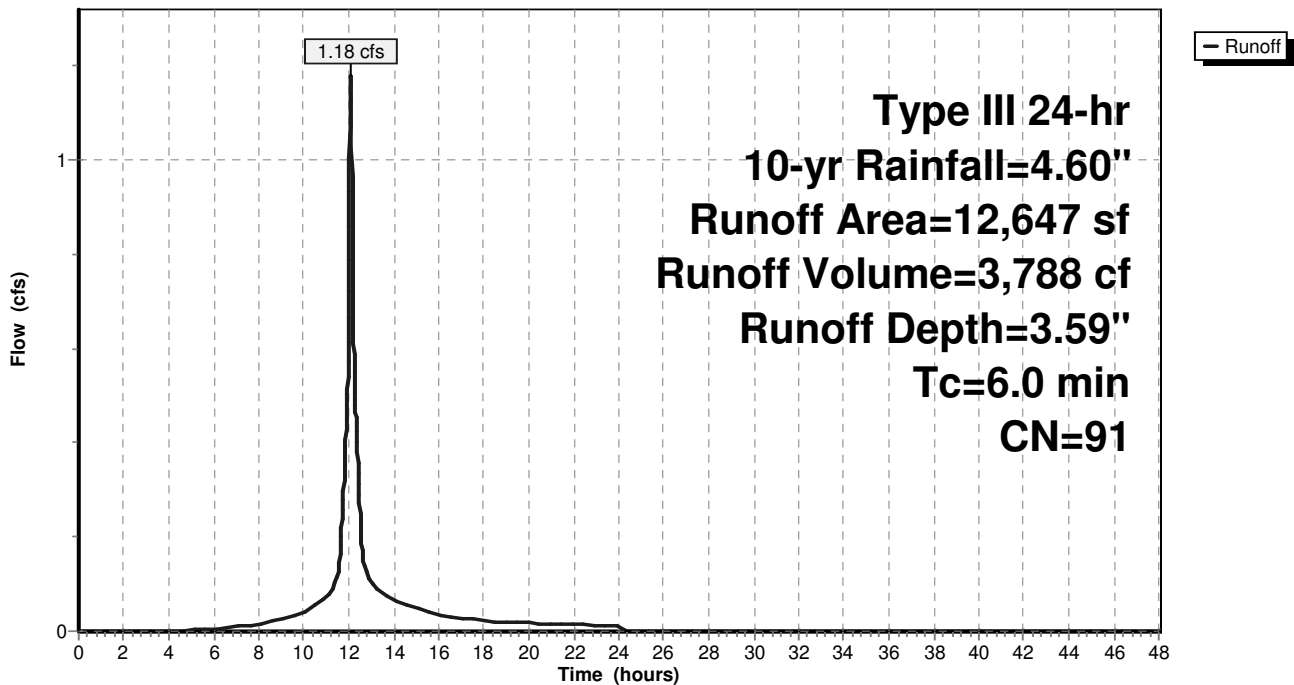
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-yr Rainfall=4.60"

	Area (sf)	CN	Description
*	10,322	98	Paved parking
	2,325	61	>75% Grass cover, Good, HSG B
	12,647	91	Weighted Average
	2,325		18.38% Pervious Area
	10,322		81.62% Impervious Area

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

## Subcatchment 5S: SUB2D

Hydrograph



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Type III 24-hr 10-yr Rainfall=4.60"

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## Summary for Subcatchment 6S: SUB2E

Runoff = 0.74 cfs @ 12.09 hrs, Volume= 2,279 cf, Depth= 2.63"

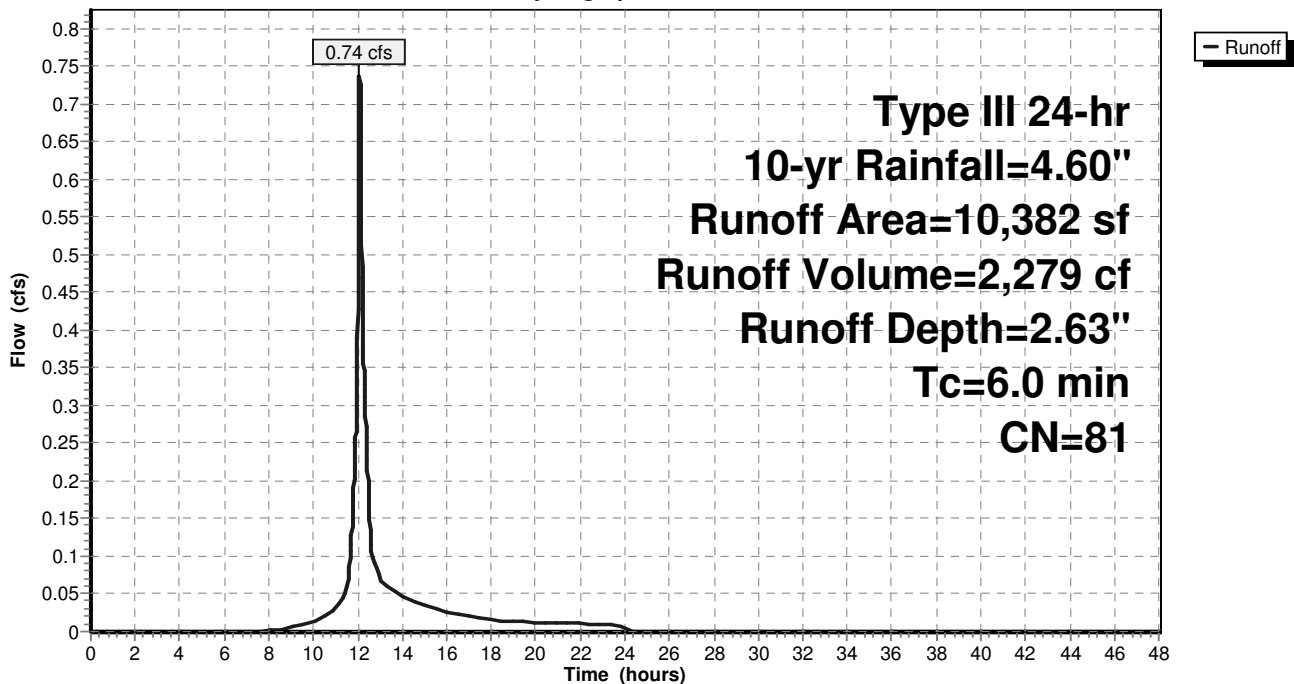
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-yr Rainfall=4.60"

	Area (sf)	CN	Description
*	5,707	98	Paved parking
	4,001	61	>75% Grass cover, Good, HSG B
	674	55	Woods, Good, HSG B
	10,382	81	Weighted Average
	4,675		45.03% Pervious Area
	5,707		54.97% Impervious Area

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

## Subcatchment 6S: SUB2E

Hydrograph



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Proposed Conditions  
Type III 24-hr 10-yr Rainfall=4.60"

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## Summary for Subcatchment 7S: SUB2F

Runoff = 1.66 cfs @ 12.08 hrs, Volume= 5,440 cf, Depth= 3.81"

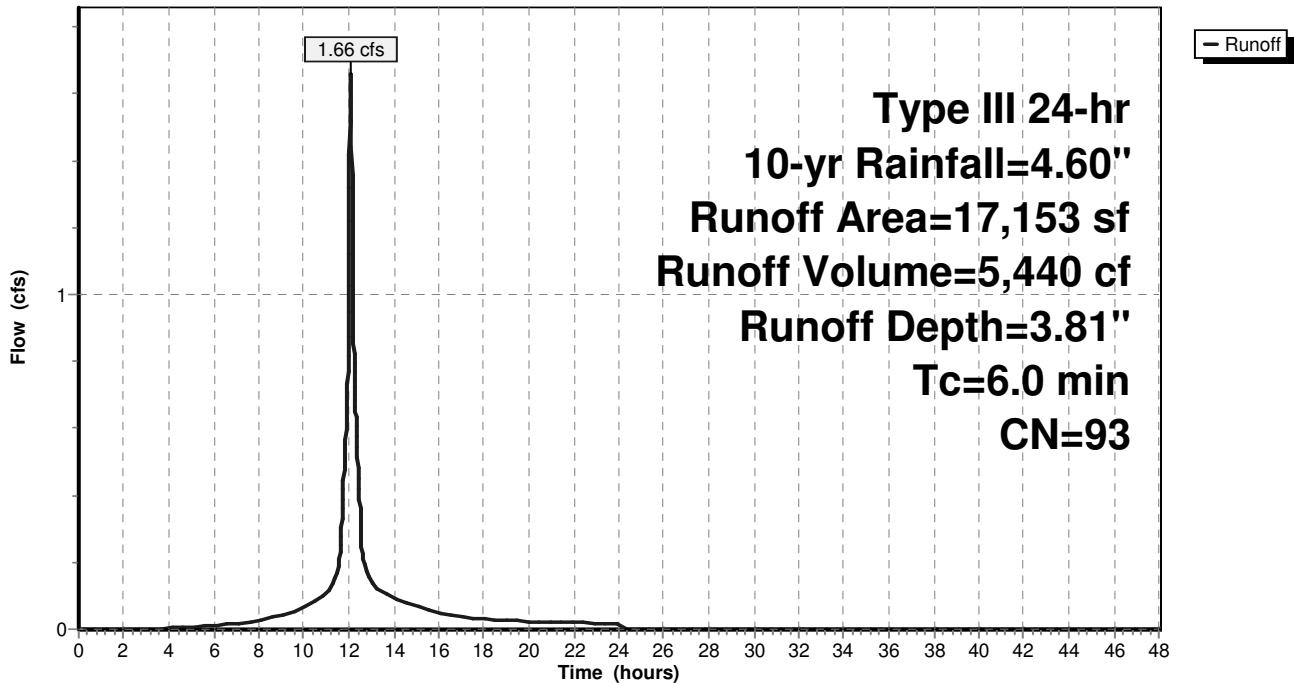
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-yr Rainfall=4.60"

	Area (sf)	CN	Description
*	14,816	98	Paved parking
	2,337	61	>75% Grass cover, Good, HSG B
	17,153	93	Weighted Average
	2,337		13.62% Pervious Area
	14,816		86.38% Impervious Area

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

## Subcatchment 7S: SUB2F

Hydrograph



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Type III 24-hr 10-yr Rainfall=4.60"

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## Summary for Subcatchment 8S: SUB3A

Runoff = 0.68 cfs @ 12.13 hrs, Volume= 2,363 cf, Depth= 1.89"

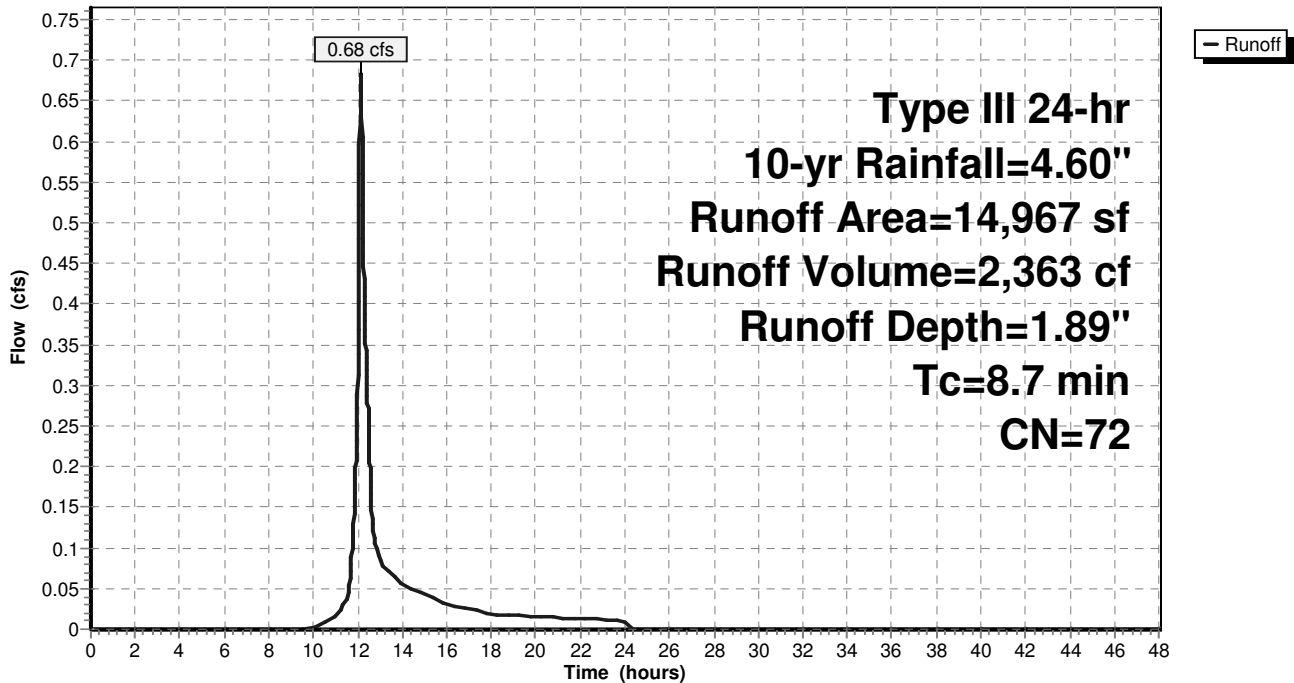
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-yr Rainfall=4.60"

	Area (sf)	CN	Description
*	4,541	98	Impervious
	10,426	61	>75% Grass cover, Good, HSG B
	14,967	72	Weighted Average
	10,426		69.66% Pervious Area
	4,541		30.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7					Direct Entry, NO CHANGE FROM EXISTING

## Subcatchment 8S: SUB3A

Hydrograph



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Type III 24-hr 10-yr Rainfall=4.60"

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## Summary for Subcatchment 9S: SUB4

Runoff = 3.34 cfs @ 12.09 hrs, Volume= 10,582 cf, Depth= 3.39"

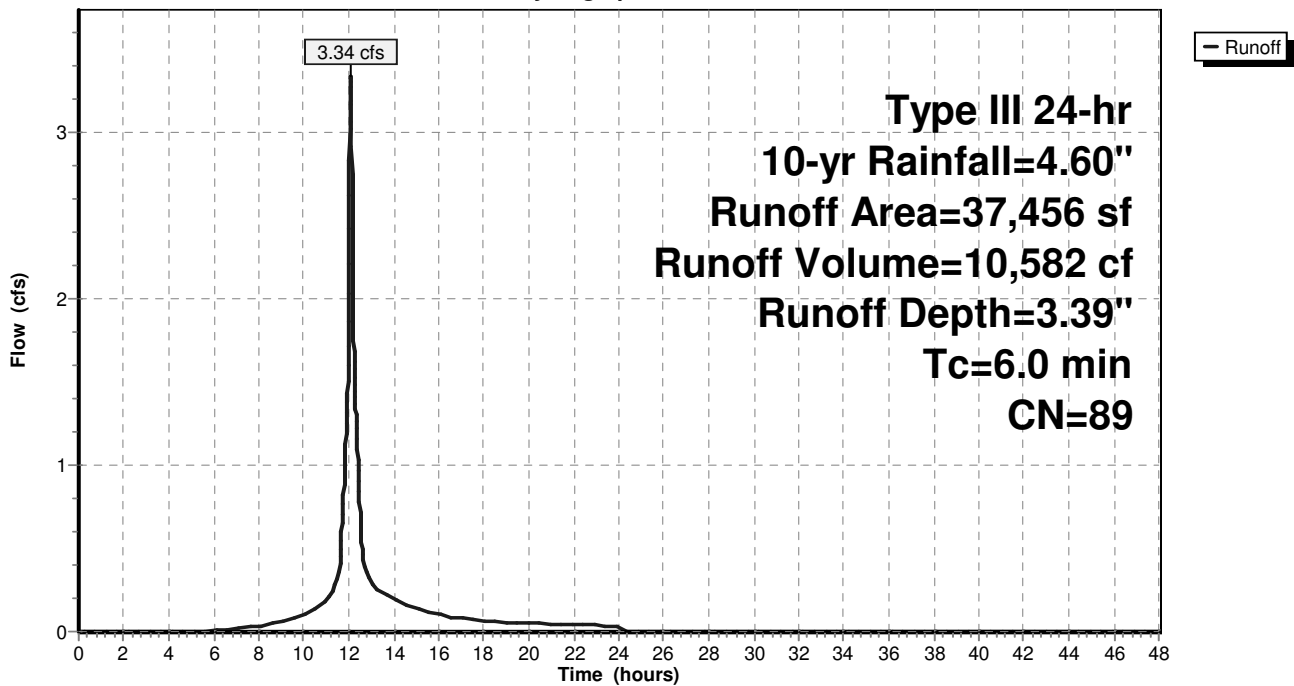
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-yr Rainfall=4.60"

	Area (sf)	CN	Description
*	5,435	98	Paved parking
*	22,782	98	Roofs
	9,239	61	>75% Grass cover, Good, HSG B
	37,456	89	Weighted Average
	9,239		24.67% Pervious Area
	28,217		75.33% Impervious Area

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

## Subcatchment 9S: SUB4

Hydrograph



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Type III 24-hr 10-yr Rainfall=4.60"

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**Summary for Subcatchment 10S: SUB5**

Runoff = 2.08 cfs @ 12.21 hrs, Volume= 9,304 cf, Depth= 1.20"

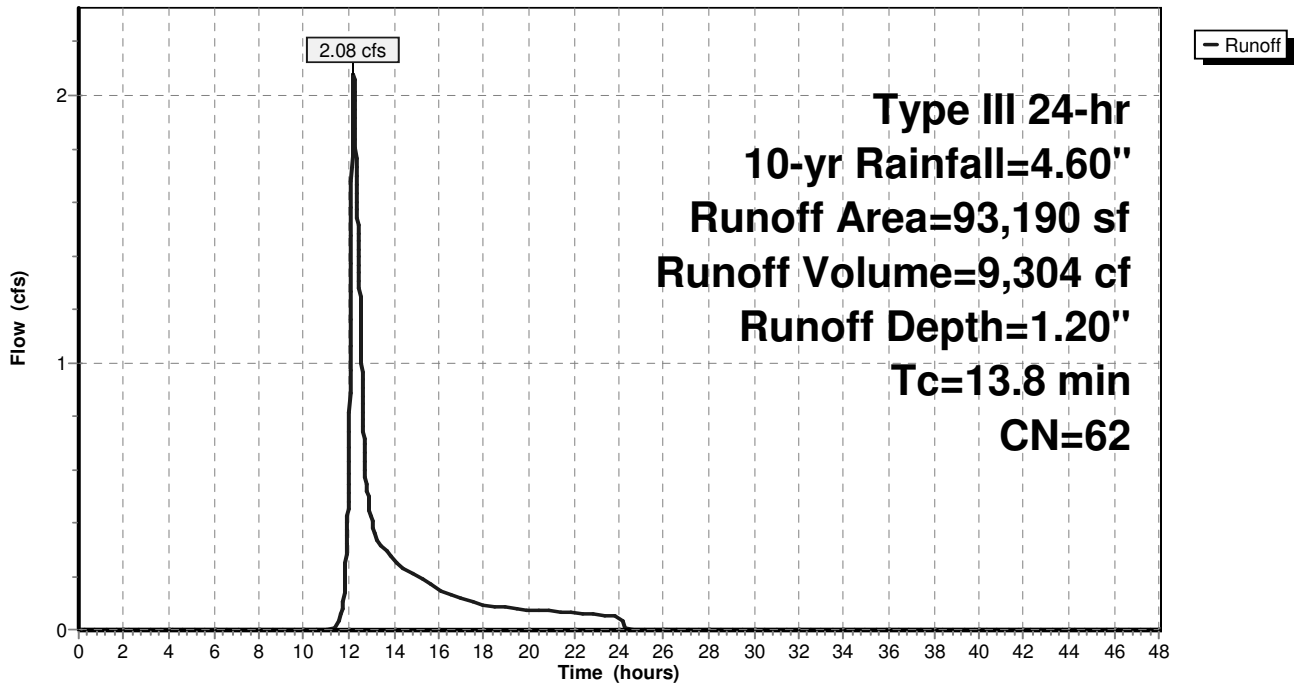
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-yr Rainfall=4.60"

Area (sf)	CN	Description
* 7,678	98	Paved parking
53,751	61	>75% Grass cover, Good, HSG B
31,761	55	Woods, Good, HSG B
93,190	62	Weighted Average
85,512		91.76% Pervious Area
7,678		8.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8					Direct Entry, NO CHANGE FROM EXISTING

**Subcatchment 10S: SUB5**

Hydrograph



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Type III 24-hr 10-yr Rainfall=4.60"

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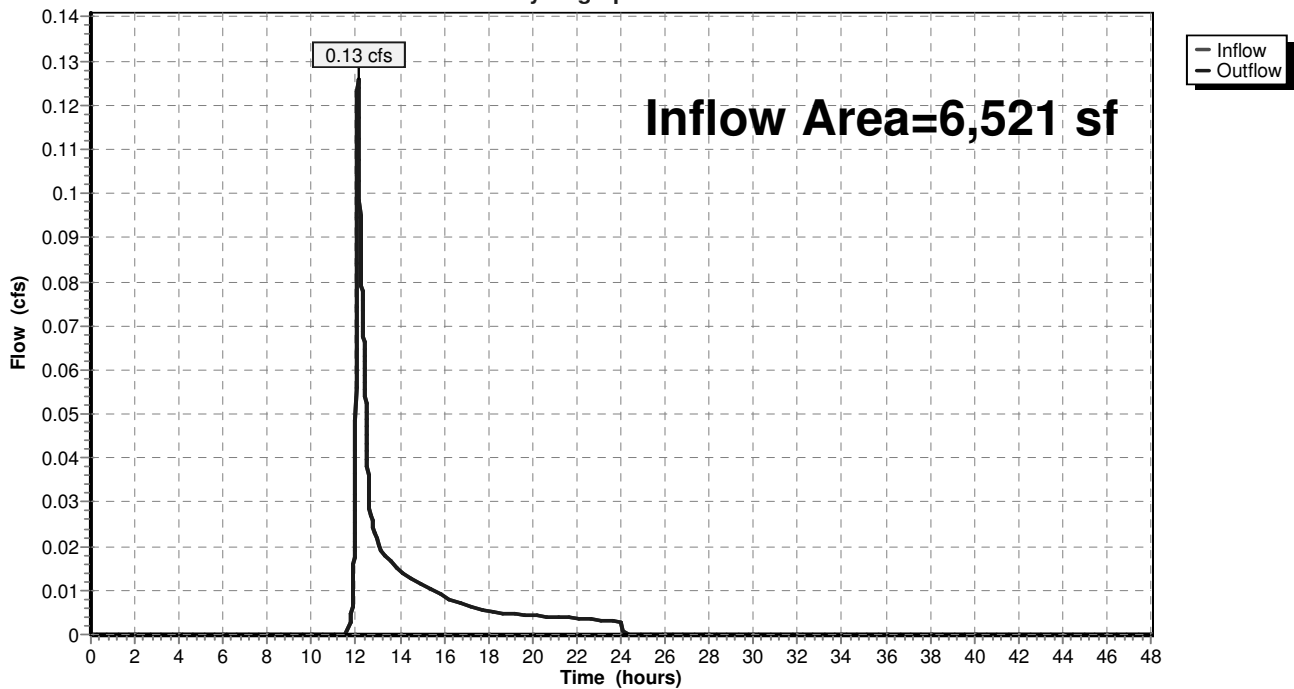
**Summary for Reach 12R: DP1-Northwest Property**

Inflow Area = 6,521 sf, 0.00% Impervious, Inflow Depth = 0.90" for 10-yr event  
Inflow = 0.13 cfs @ 12.11 hrs, Volume= 488 cf  
Outflow = 0.13 cfs @ 12.11 hrs, Volume= 488 cf, Atten= 0%, Lag= 0.0 min

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

**Reach 12R: DP1-Northwest Property**

Hydrograph





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Type III 24-hr 10-yr Rainfall=4.60"

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## Summary for Subcatchment 13S: SUB3B

Runoff = 0.93 cfs @ 12.08 hrs, Volume= 3,292 cf, Depth= 4.36"

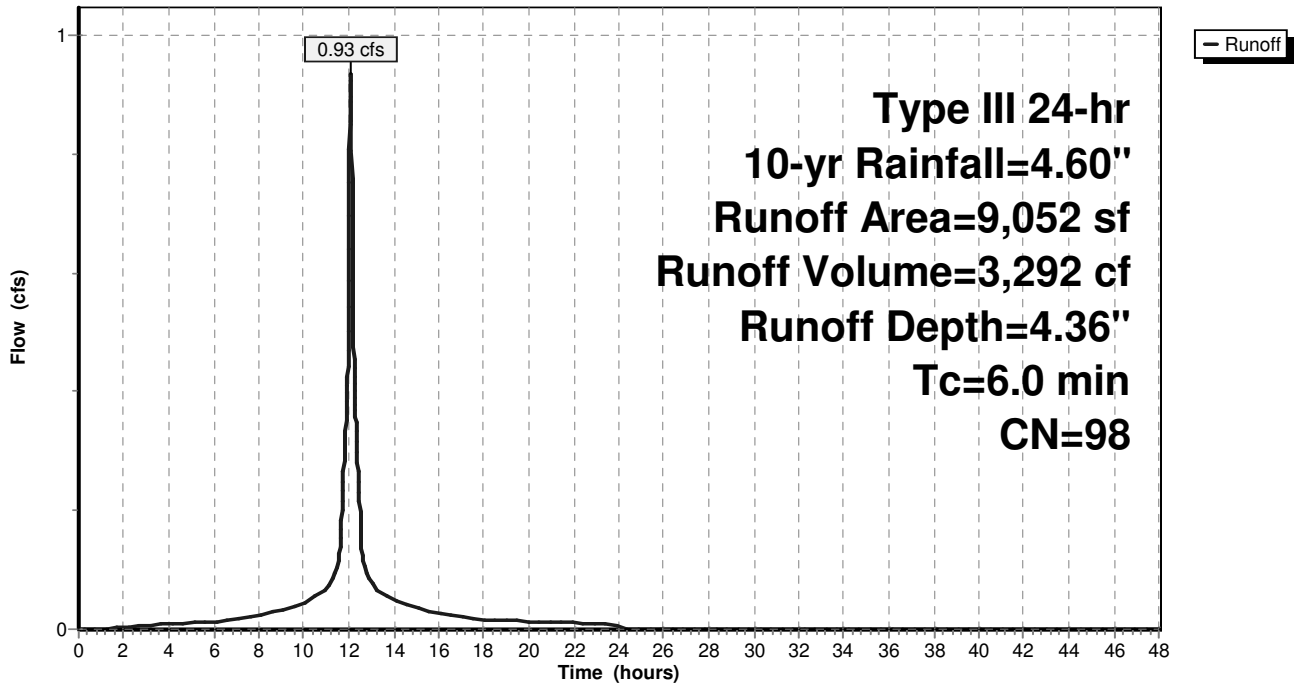
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-yr Rainfall=4.60"

Area (sf)	CN	Description
8,943	98	Roofs, HSG B
109	61	>75% Grass cover, Good, HSG B
9,052	98	Weighted Average
109		1.20% Pervious Area
8,943		98.80% Impervious Area

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

## Subcatchment 13S: SUB3B

Hydrograph



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Type III 24-hr 10-yr Rainfall=4.60"

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## Summary for Pond 14P: Infiltration Trench

Inflow Area = 9,052 sf, 98.80% Impervious, Inflow Depth = 4.36" for 10-yr event  
 Inflow = 0.93 cfs @ 12.08 hrs, Volume= 3,292 cf  
 Outflow = 0.90 cfs @ 12.10 hrs, Volume= 3,292 cf, Atten= 3%, Lag= 1.3 min  
 Discarded = 0.01 cfs @ 5.30 hrs, Volume= 1,084 cf  
 Primary = 0.89 cfs @ 12.10 hrs, Volume= 2,208 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
 Peak Elev= 101.48' @ 12.10 hrs Surf.Area= 458 sf Storage= 389 cf

Plug-Flow detention time= 95.8 min calculated for 3,291 cf (100% of inflow)  
 Center-of-Mass det. time= 95.9 min ( 845.3 - 749.4 )

Volume	Invert	Avail.Storage	Storage Description
#1	99.50'	605 cf	<b>Stone (Prismatic)</b> Listed below (Recalc) 1,603 cf Overall - 90 cf Embedded = 1,513 cf x 40.0% Voids
#2	101.00'	90 cf	<b>12.0" Round Pipe Storage</b> Inside #1 L= 114.5'
		695 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
99.50	458	0	0
103.00	458	1,603	1,603

Device	Routing	Invert	Outlet Devices
#1	Primary	101.00'	<b>12.0" Round Culvert</b> L= 52.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 101.00' / 100.20' S= 0.0154 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	99.50'	<b>1.020 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.01 cfs @ 5.30 hrs HW=99.54' (Free Discharge)  
 ↑ **2=Exfiltration** (Exfiltration Controls 0.01 cfs)

**Primary OutFlow** Max=0.89 cfs @ 12.10 hrs HW=101.48' (Free Discharge)  
 ↑ **1=Culvert** (Inlet Controls 0.89 cfs @ 2.37 fps)

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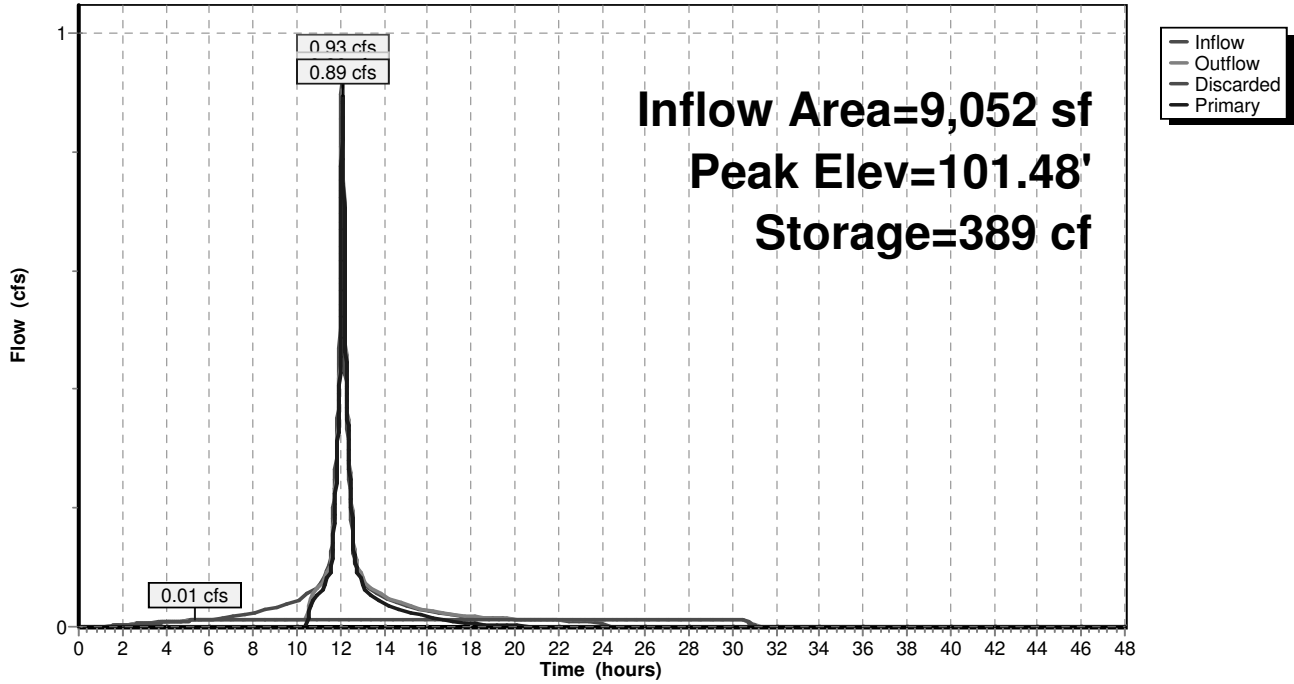
Proposed Conditions  
Type III 24-hr 10-yr Rainfall=4.60"

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**Pond 14P: Infiltration Trench**

Hydrograph



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**Summary for Subcatchment 14S: SUB2G**

Runoff = 0.42 cfs @ 12.10 hrs, Volume= 1,476 cf, Depth= 1.14"

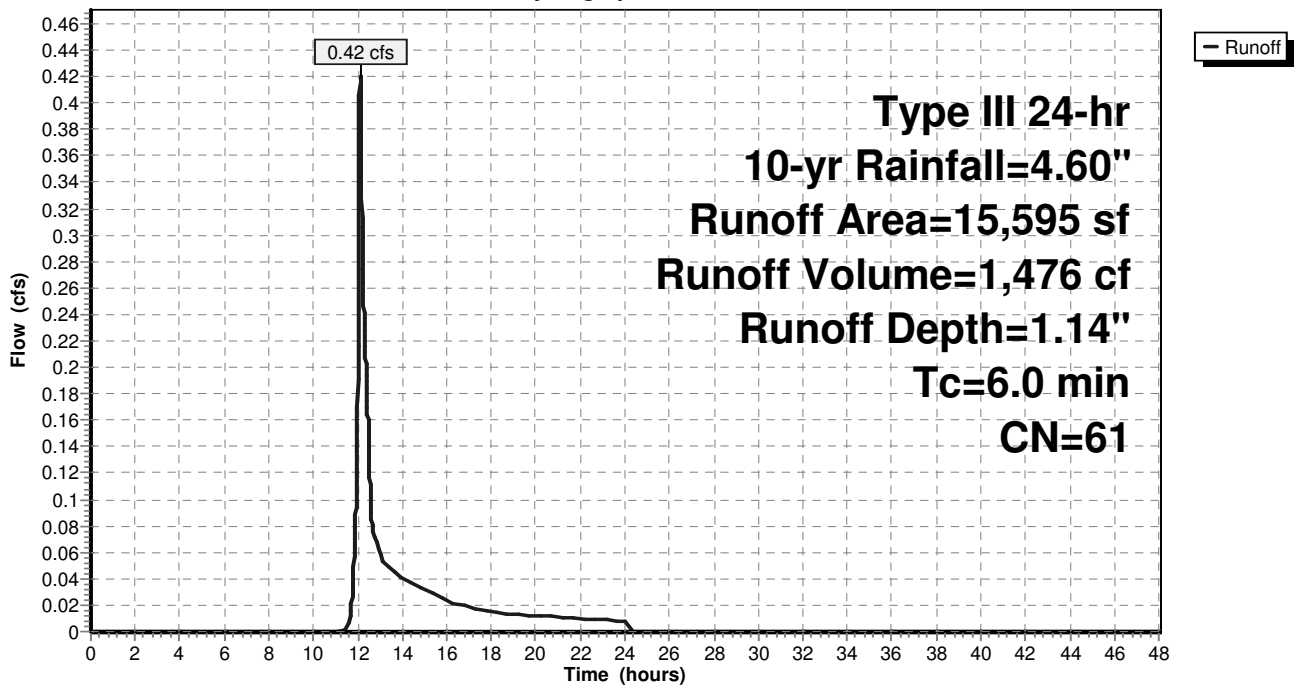
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-yr Rainfall=4.60"

Area (sf)	CN	Description
* 933	98	Paved parking
10,125	61	>75% Grass cover, Good, HSG B
4,537	55	Woods, Good, HSG B
15,595	61	Weighted Average
14,662		94.02% Pervious Area
933		5.98% Impervious Area

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

**Subcatchment 14S: SUB2G**

Hydrograph



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## Summary for Subcatchment 15S: SUB

Runoff = 0.26 cfs @ 12.08 hrs, Volume= 909 cf, Depth= 4.36"

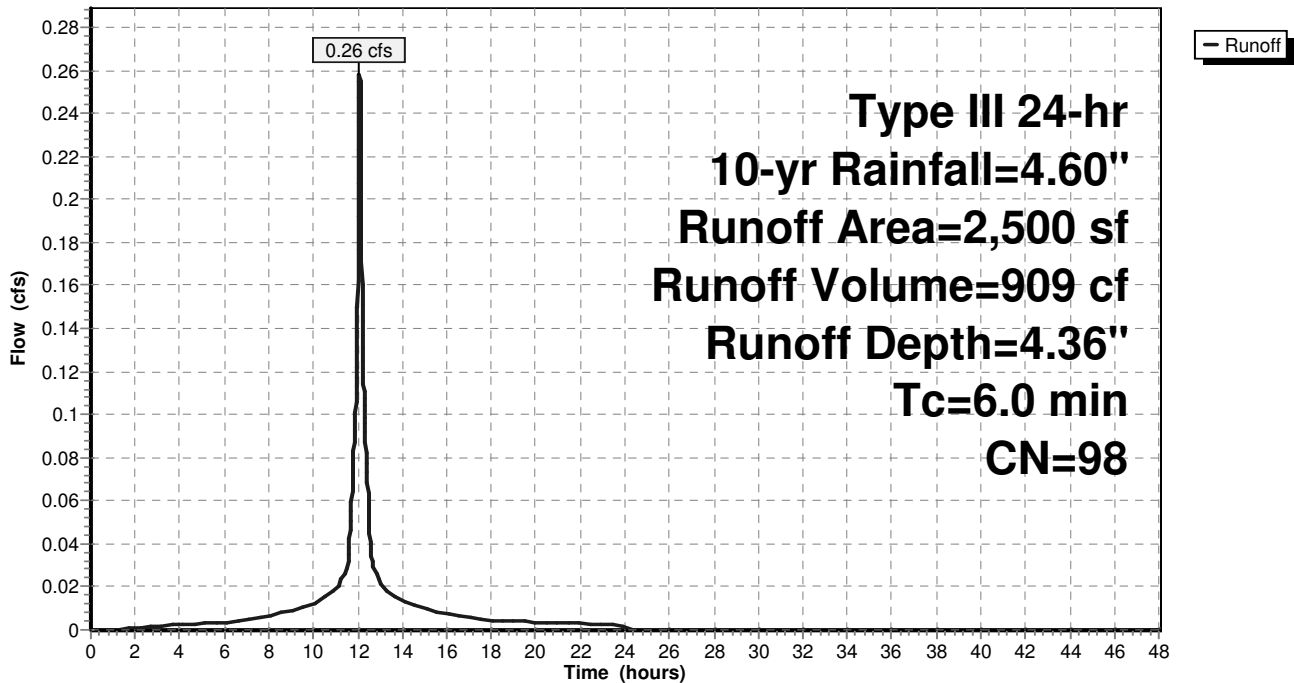
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-yr Rainfall=4.60"

Area (sf)	CN	Description
2,500	98	Roofs, HSG B
2,500		100.00% Impervious Area

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

## Subcatchment 15S: SUB

Hydrograph



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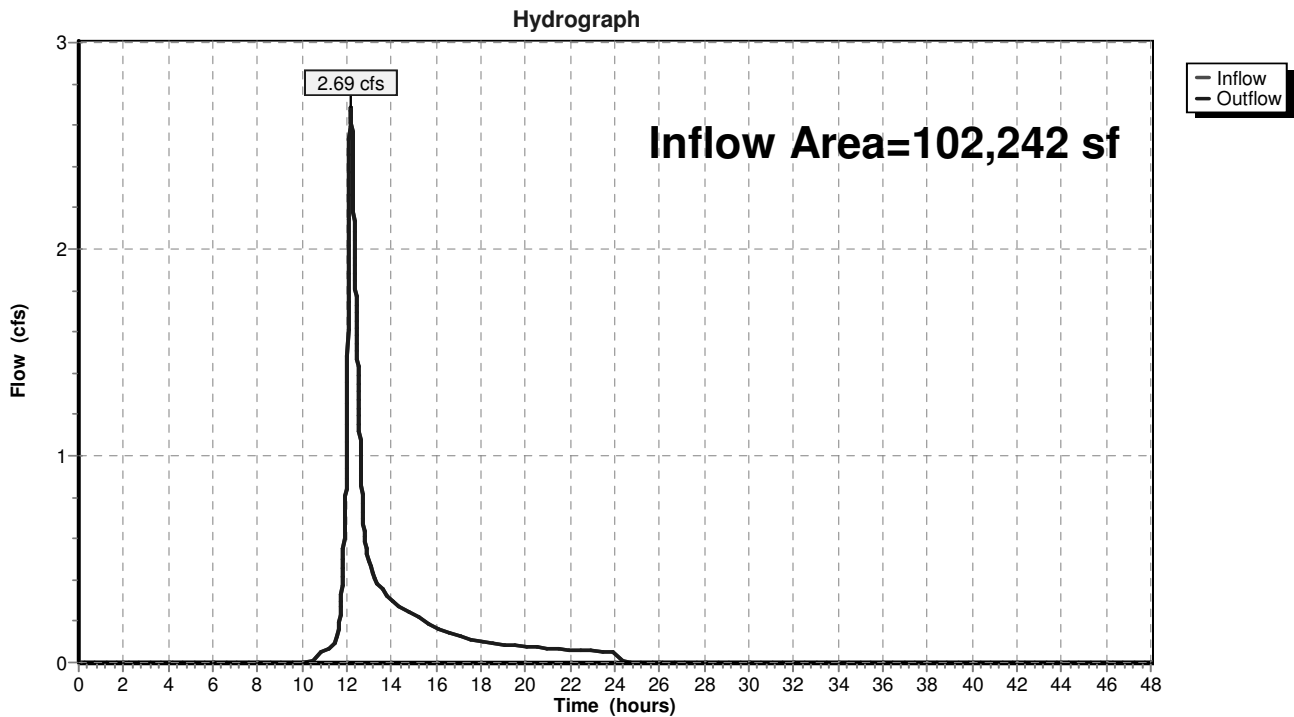
Page 50

## Summary for Reach 16R: DP3-Eastern Property

Inflow Area = 102,242 sf, 16.26% Impervious, Inflow Depth = 1.35" for 10-yr event  
Inflow = 2.69 cfs @ 12.18 hrs, Volume= 11,512 cf  
Outflow = 2.69 cfs @ 12.18 hrs, Volume= 11,512 cf, Atten= 0%, Lag= 0.0 min

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

## Reach 16R: DP3-Eastern Property



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Type III 24-hr 10-yr Rainfall=4.60"

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## Summary for Subcatchment 16S: SUB

Runoff = 4.08 cfs @ 12.08 hrs, Volume= 14,385 cf, Depth= 4.36"

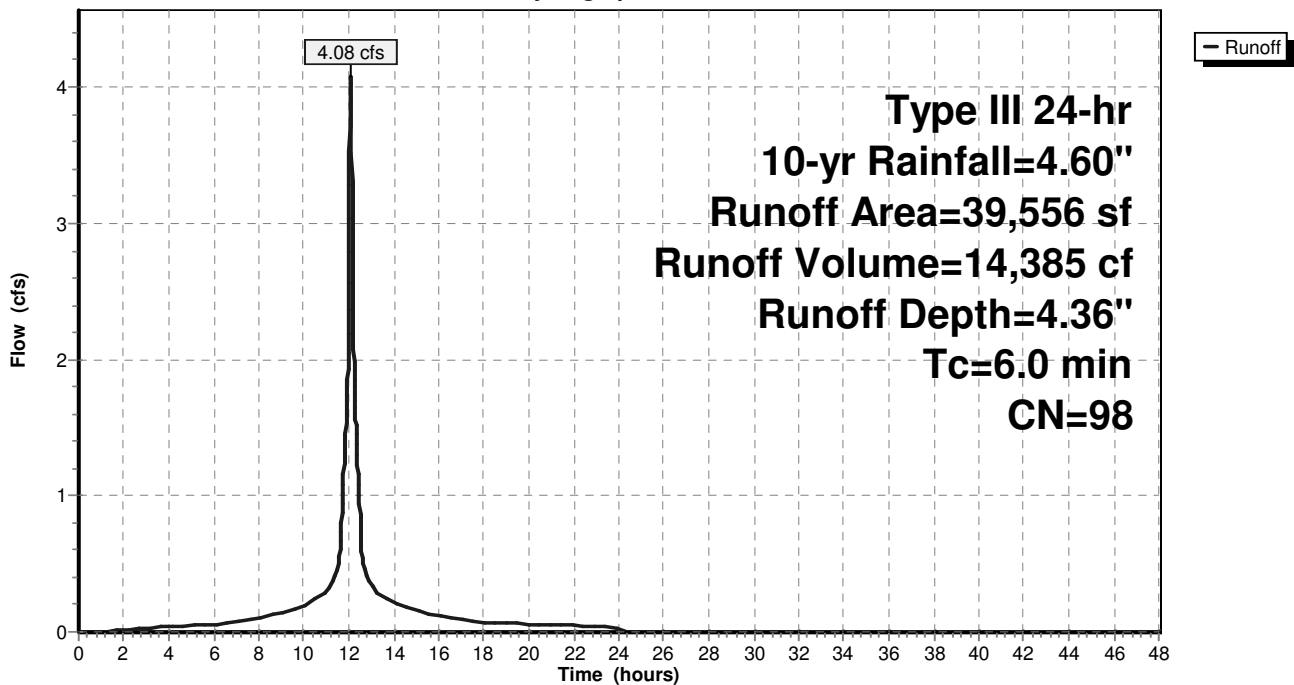
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-yr Rainfall=4.60"

Area (sf)	CN	Description
39,556	98	Roofs, HSG B
39,556		100.00% Impervious Area

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

## Subcatchment 16S: SUB

Hydrograph



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Type III 24-hr 10-yr Rainfall=4.60"

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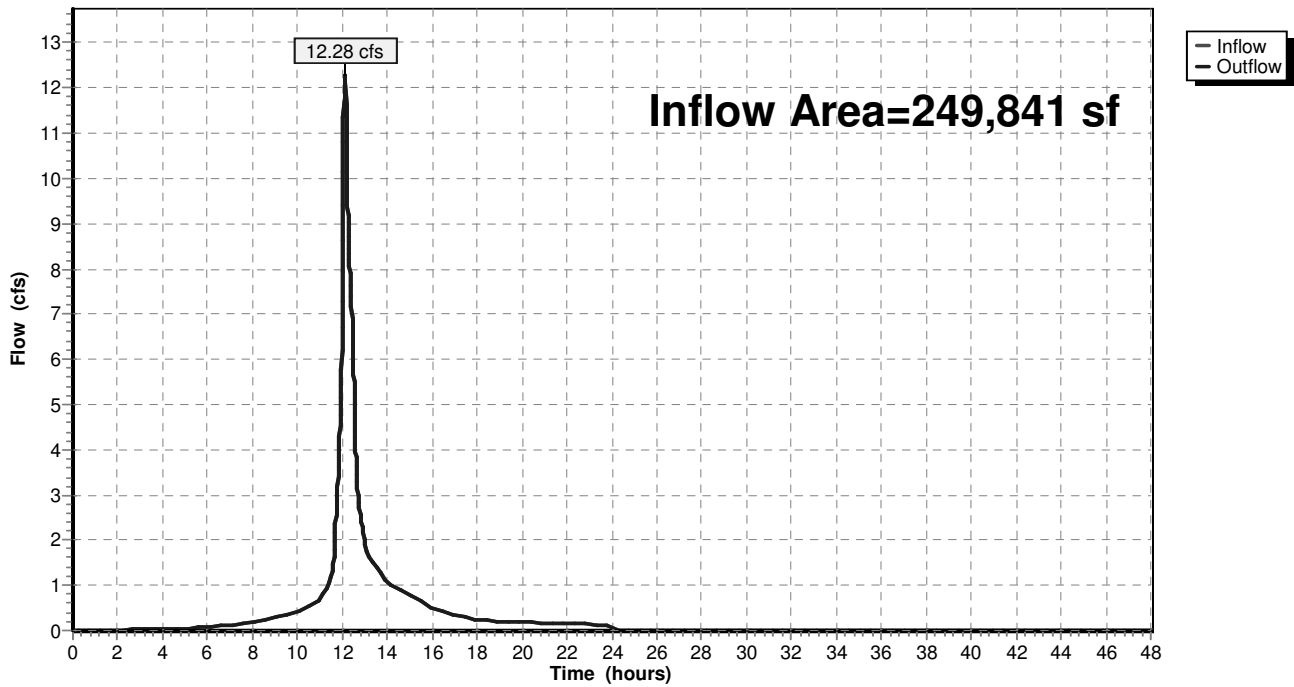
## Summary for Reach 17R: DP2-Wells Avenue

Inflow Area = 249,841 sf, 73.57% Impervious, Inflow Depth = 2.49" for 10-yr event  
Inflow = 12.28 cfs @ 12.12 hrs, Volume= 51,756 cf  
Outflow = 12.28 cfs @ 12.12 hrs, Volume= 51,756 cf, Atten= 0%, Lag= 0.0 min

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

## Reach 17R: DP2-Wells Avenue

Hydrograph





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Type III 24-hr 10-yr Rainfall=4.60"

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**Summary for Subcatchment 20S: SUB3B**

Runoff = 1.87 cfs @ 12.08 hrs, Volume= 6,125 cf, Depth= 3.81"

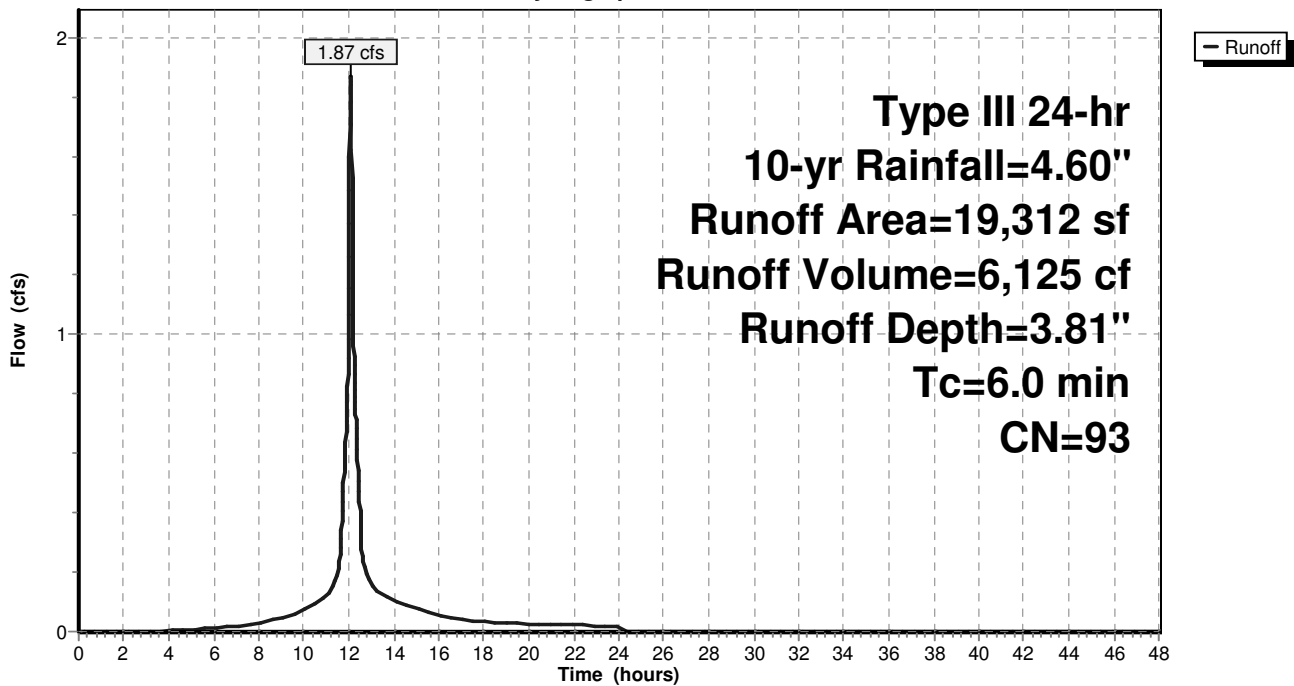
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-yr Rainfall=4.60"

	Area (sf)	CN	Description
*	14,089	98	Pavement
	2,823	61	>75% Grass cover, Good, HSG B
*	2,400	98	Pavement
	19,312	93	Weighted Average
	2,823		14.62% Pervious Area
	16,489		85.38% Impervious Area

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

**Subcatchment 20S: SUB3B**

Hydrograph



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## Summary for Subcatchment 21S: SUB

Runoff = 0.75 cfs @ 12.09 hrs, Volume= 2,385 cf, Depth= 3.49"

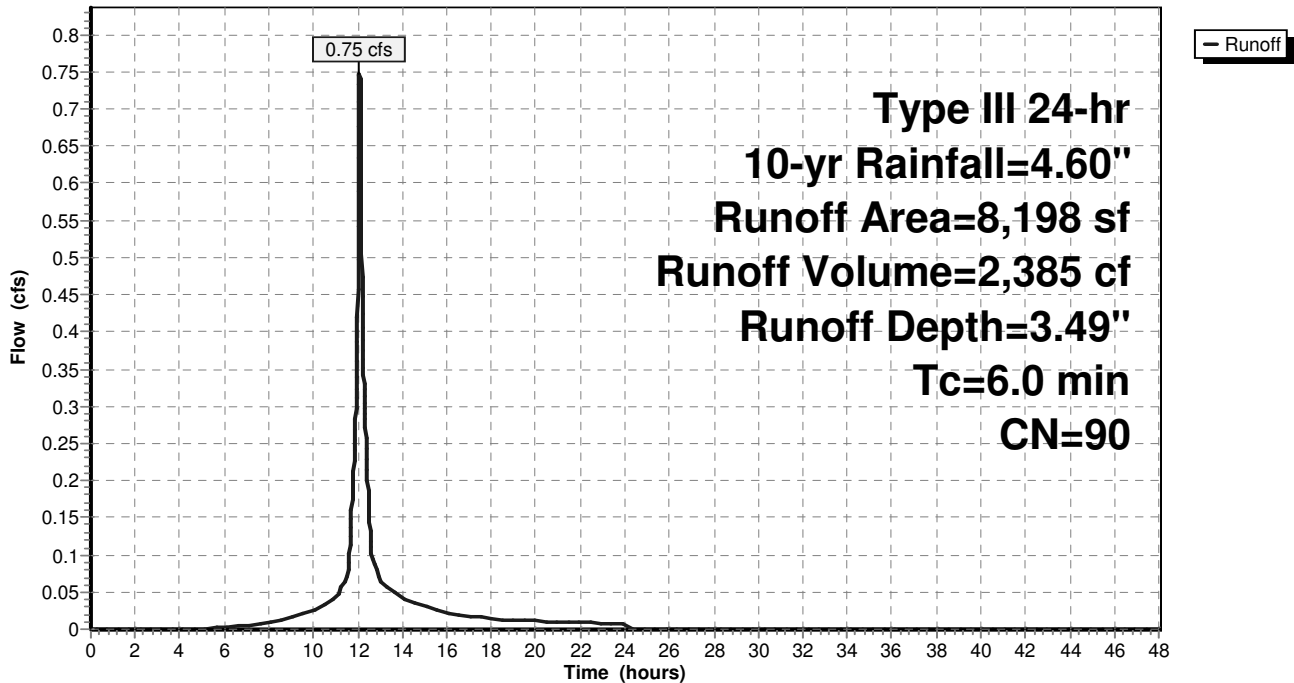
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-yr Rainfall=4.60"

Area (sf)	CN	Description
6,330	98	Paved parking, HSG B
1,868	61	>75% Grass cover, Good, HSG B
8,198	90	Weighted Average
1,868		22.79% Pervious Area
6,330		77.21% Impervious Area

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

## Subcatchment 21S: SUB

Hydrograph



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Type III 24-hr 25-yr Rainfall=5.50"

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

<b>Subcatchment 1S: SUB1</b>	Runoff Area=6,521 sf 0.00% Impervious Runoff Depth=1.38" Tc=6.0 min CN=57 Runoff=0.21 cfs 750 cf
<b>Subcatchment 2S: SUB2A</b>	Runoff Area=28,661 sf 77.18% Impervious Runoff Depth=4.36" Tc=6.0 min CN=90 Runoff=3.22 cfs 10,413 cf
<b>Subcatchment 3S: SUB2B</b>	Runoff Area=18,034 sf 89.00% Impervious Runoff Depth=4.80" Tc=6.0 min CN=94 Runoff=2.15 cfs 7,216 cf
<b>Subcatchment 4S: SUB2C</b>	Runoff Area=25,380 sf 63.98% Impervious Runoff Depth=3.73" Tc=6.0 min CN=84 Runoff=2.52 cfs 7,891 cf
<b>Pond 5P: Subsurface Infiltration System</b>	Peak Elev=101.33' Storage=13,356 cf Inflow=11.41 cfs 37,142 cf Discarded=0.19 cfs 19,384 cf Primary=4.05 cfs 17,759 cf Outflow=4.23 cfs 37,142 cf
<b>Subcatchment 5S: SUB2D</b>	Runoff Area=12,647 sf 81.62% Impervious Runoff Depth=4.47" Tc=6.0 min CN=91 Runoff=1.45 cfs 4,710 cf
<b>Subcatchment 6S: SUB2E</b>	Runoff Area=10,382 sf 54.97% Impervious Runoff Depth=3.43" Tc=6.0 min CN=81 Runoff=0.96 cfs 2,968 cf
<b>Subcatchment 7S: SUB2F</b>	Runoff Area=17,153 sf 86.38% Impervious Runoff Depth=4.69" Tc=6.0 min CN=93 Runoff=2.02 cfs 6,703 cf
<b>Subcatchment 8S: SUB3A</b>	Runoff Area=14,967 sf 30.34% Impervious Runoff Depth=2.59" Tc=8.7 min CN=72 Runoff=0.95 cfs 3,230 cf
<b>Subcatchment 9S: SUB4</b>	Runoff Area=37,456 sf 75.33% Impervious Runoff Depth=4.25" Tc=6.0 min CN=89 Runoff=4.14 cfs 13,273 cf
<b>Subcatchment 10S: SUB5</b>	Runoff Area=93,190 sf 8.24% Impervious Runoff Depth=1.76" Tc=13.8 min CN=62 Runoff=3.22 cfs 13,637 cf
<b>Reach 12R: DP1-Northwest Property</b>	Inflow=0.21 cfs 750 cf Outflow=0.21 cfs 750 cf
<b>Subcatchment 13S: SUB3B</b>	Runoff Area=9,052 sf 98.80% Impervious Runoff Depth=5.26" Tc=6.0 min CN=98 Runoff=1.12 cfs 3,970 cf
<b>Pond 14P: Infiltration Trench</b>	Peak Elev=101.54' Storage=403 cf Inflow=1.12 cfs 3,970 cf Discarded=0.01 cfs 1,119 cf Primary=1.08 cfs 2,851 cf Outflow=1.09 cfs 3,970 cf
<b>Subcatchment 14S: SUB2G</b>	Runoff Area=15,595 sf 5.98% Impervious Runoff Depth=1.68" Tc=6.0 min CN=61 Runoff=0.66 cfs 2,182 cf
<b>Subcatchment 15S: SUB</b>	Runoff Area=2,500 sf 100.00% Impervious Runoff Depth=5.26" Tc=6.0 min CN=98 Runoff=0.31 cfs 1,096 cf

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*Type III 24-hr 25-yr Rainfall=5.50"*

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**Reach 16R: DP3-Eastern Property**

Inflow=3.96 cfs 16,488 cf  
Outflow=3.96 cfs 16,488 cf

**Subcatchment 16S: SUB**

Runoff Area=39,556 sf 100.00% Impervious Runoff Depth=5.26"  
Tc=6.0 min CN=98 Runoff=4.89 cfs 17,347 cf

**Reach 17R: DP2-Wells Avenue**

Inflow=18.35 cfs 68,171 cf  
Outflow=18.35 cfs 68,171 cf

**Subcatchment 20S: SUB3B**

Runoff Area=19,312 sf 85.38% Impervious Runoff Depth=4.69"  
Tc=6.0 min CN=93 Runoff=2.28 cfs 7,547 cf

**Subcatchment 21S: SUB**

Runoff Area=8,198 sf 77.21% Impervious Runoff Depth=4.36"  
Tc=6.0 min CN=90 Runoff=0.92 cfs 2,979 cf

**Total Runoff Area = 358,604 sf Runoff Volume = 105,912 cf Average Runoff Depth = 3.54"**  
**44.11% Pervious = 158,164 sf 55.89% Impervious = 200,440 sf**

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## Summary for Subcatchment 1S: SUB1

Runoff = 0.21 cfs @ 12.10 hrs, Volume= 750 cf, Depth= 1.38"

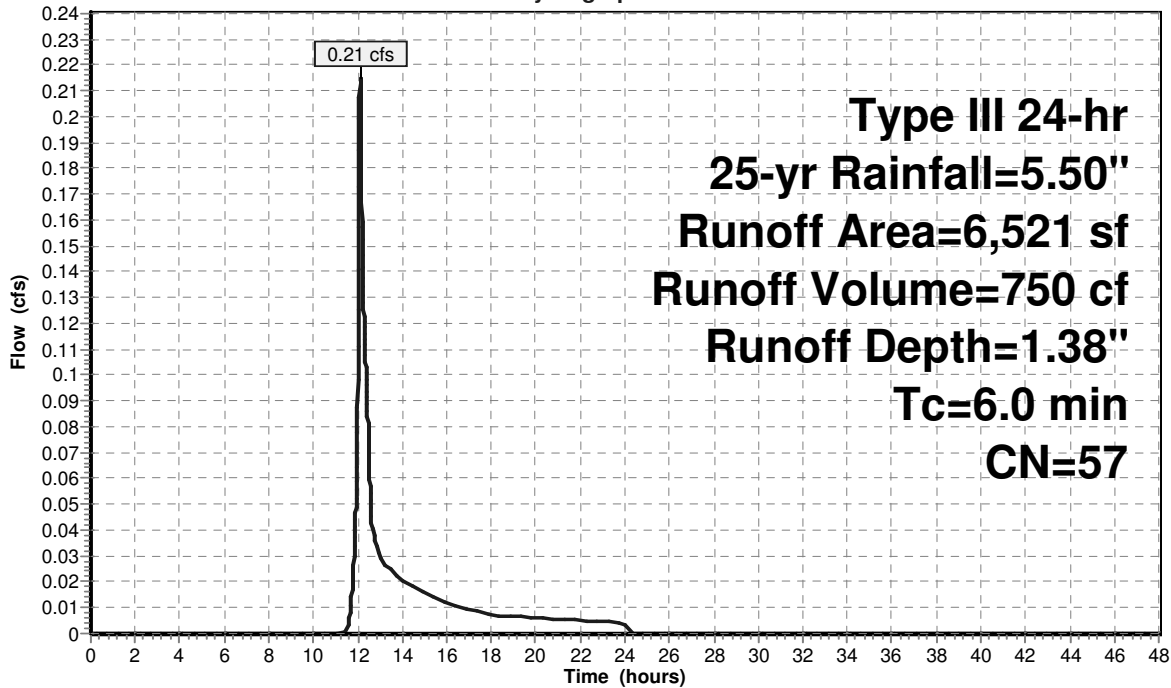
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-yr Rainfall=5.50"

Area (sf)	CN	Description
4,819	55	Woods, Good, HSG B
1,702	61	>75% Grass cover, Good, HSG B
6,521	57	Weighted Average
6,521		100.00% Pervious Area

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

## Subcatchment 1S: SUB1

Hydrograph



# Proposed HydroCAD

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Proposed Conditions  
Type III 24-hr 25-yr Rainfall=5.50"

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## Summary for Subcatchment 2S: SUB2A

Runoff = 3.22 cfs @ 12.08 hrs, Volume= 10,413 cf, Depth= 4.36"

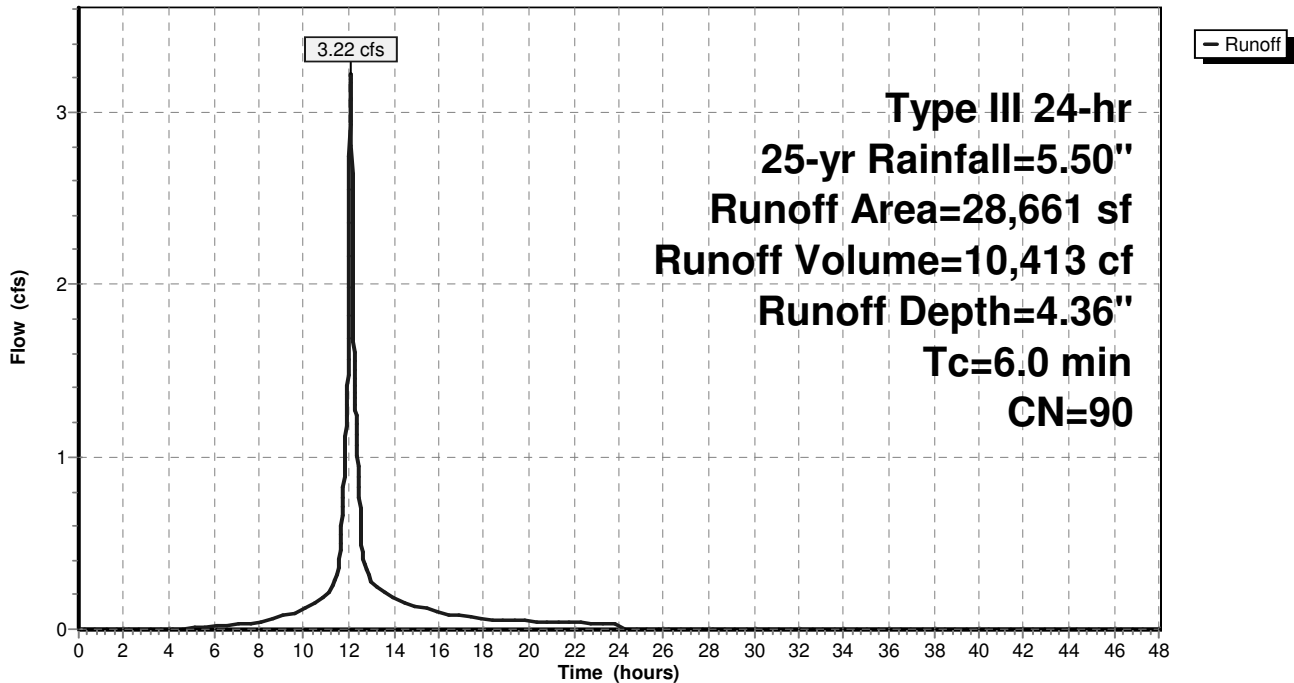
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-yr Rainfall=5.50"

	Area (sf)	CN	Description
*	22,121	98	Paved parking
	6,540	61	>75% Grass cover, Good, HSG B
	28,661	90	Weighted Average
	6,540		22.82% Pervious Area
	22,121		77.18% Impervious Area

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

## Subcatchment 2S: SUB2A

Hydrograph



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Type III 24-hr 25-yr Rainfall=5.50"

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## Summary for Subcatchment 3S: SUB2B

Runoff = 2.15 cfs @ 12.08 hrs, Volume= 7,216 cf, Depth= 4.80"

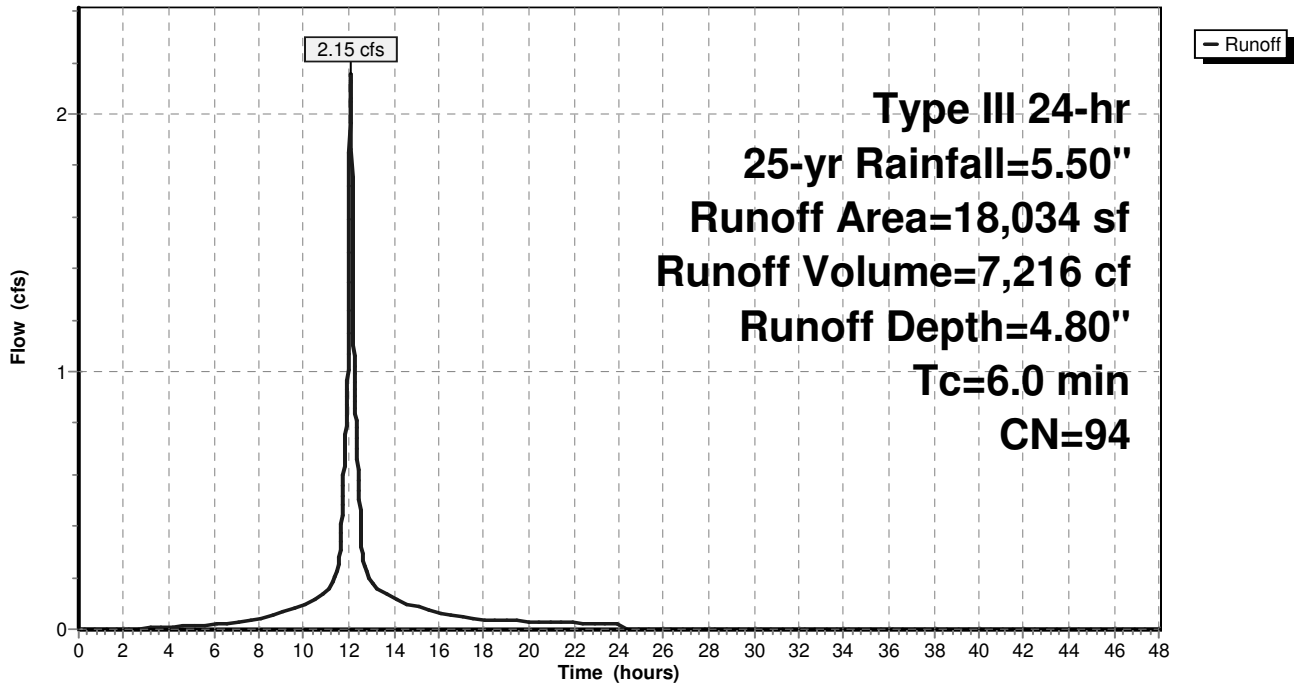
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-yr Rainfall=5.50"

	Area (sf)	CN	Description
*	16,050	98	Paved parking
	1,984	61	>75% Grass cover, Good, HSG B
	18,034	94	Weighted Average
	1,984		11.00% Pervious Area
	16,050		89.00% Impervious Area

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

## Subcatchment 3S: SUB2B

Hydrograph



# Proposed HydroCAD

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Type III 24-hr 25-yr Rainfall=5.50"

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## Summary for Subcatchment 4S: SUB2C

Runoff = 2.52 cfs @ 12.09 hrs, Volume= 7,891 cf, Depth= 3.73"

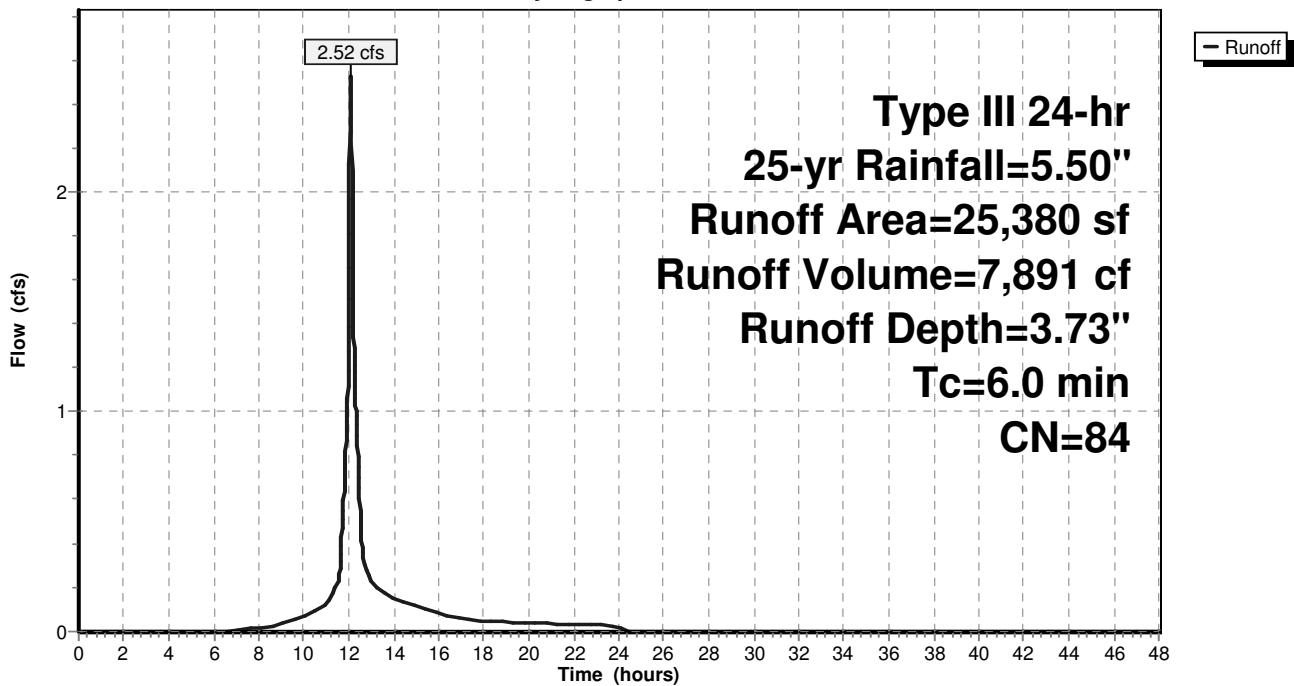
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-yr Rainfall=5.50"

	Area (sf)	CN	Description
*	16,237	98	Paved parking
	4,855	55	Woods, Good, HSG B
	4,288	61	>75% Grass cover, Good, HSG B
	25,380	84	Weighted Average
	9,143		36.02% Pervious Area
	16,237		63.98% Impervious Area

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

## Subcatchment 4S: SUB2C

Hydrograph





# Proposed HydroCAD

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Type III 24-hr 25-yr Rainfall=5.50"

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## Summary for Pond 5P: Subsurface Infiltration System

Inflow Area = 102,085 sf, 78.10% Impervious, Inflow Depth = 4.37" for 25-yr event  
Inflow = 11.41 cfs @ 12.08 hrs, Volume= 37,142 cf  
Outflow = 4.23 cfs @ 12.33 hrs, Volume= 37,142 cf, Atten= 63%, Lag= 14.9 min  
Discarded = 0.19 cfs @ 8.45 hrs, Volume= 19,384 cf  
Primary = 4.05 cfs @ 12.33 hrs, Volume= 17,759 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2  
Peak Elev= 101.33' @ 12.33 hrs Surf.Area= 7,912 sf Storage= 13,356 cf

Plug-Flow detention time= 249.3 min calculated for 37,135 cf (100% of inflow)  
Center-of-Mass det. time= 249.4 min ( 1,034.2 - 784.7 )

Volume	Invert	Avail.Storage	Storage Description
#1A	98.80'	6,077 cf	<b>68.00'W x 116.36'L x 3.50'H Field A</b> 27,694 cf Overall - 10,330 cf Embedded = 17,363 cf x 35.0% Voids
#2A	99.30'	10,330 cf	<b>ADS StormTech SC-740</b> x 224 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 14 rows
		16,407 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	98.80'	<b>1.020 in/hr Exfiltration over Horizontal area</b>
#2	Primary	99.30'	<b>12.0" Round Culvert out of OCS</b> L= 95.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 99.30' / 98.40' S= 0.0095 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	100.40'	<b>5.0' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)

**Discarded OutFlow** Max=0.19 cfs @ 8.45 hrs HW=98.84' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.19 cfs)

**Primary OutFlow** Max=4.05 cfs @ 12.33 hrs HW=101.33' (Free Discharge)

↑**2=Culvert out of OCS** (Barrel Controls 4.05 cfs @ 5.15 fps)

↑**3=Sharp-Crested Rectangular Weir** (Passes 4.05 cfs of 14.13 cfs potential flow)

**Proposed HydroCAD**

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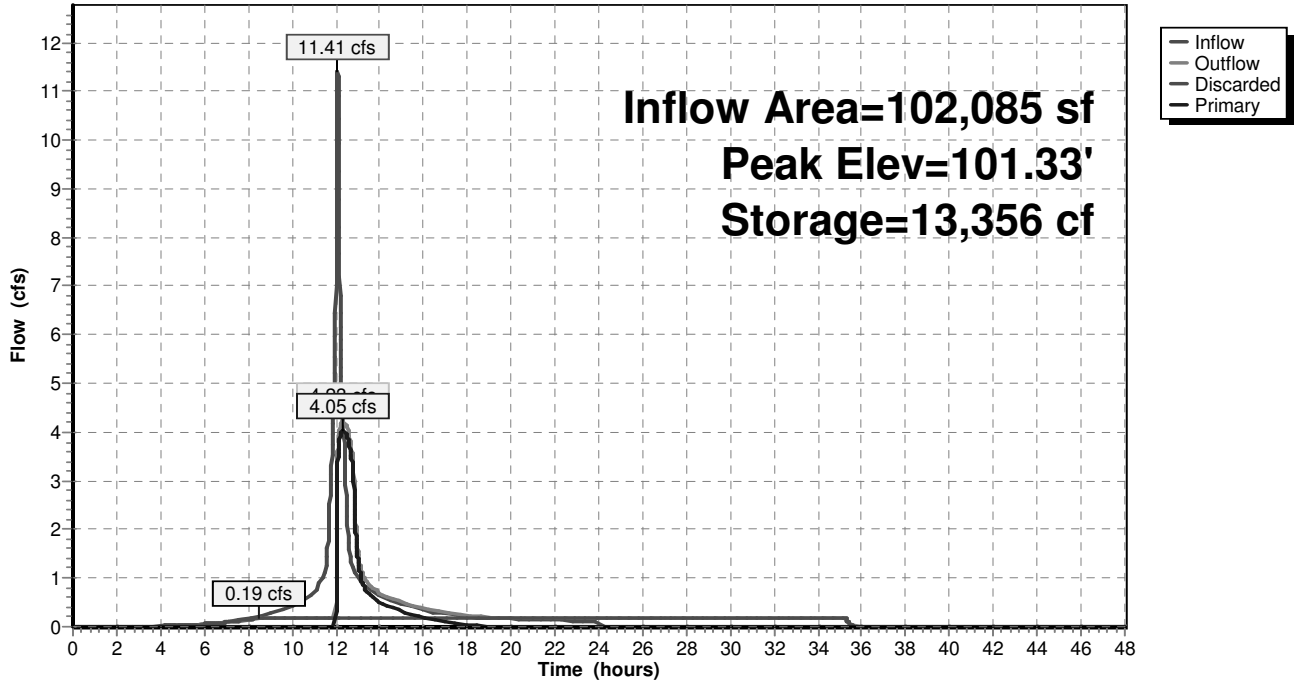
Proposed Conditions  
Type III 24-hr 25-yr Rainfall=5.50"

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**Pond 5P: Subsurface Infiltration System**

Hydrograph



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Type III 24-hr 25-yr Rainfall=5.50"

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**Summary for Subcatchment 5S: SUB2D**

Runoff = 1.45 cfs @ 12.08 hrs, Volume= 4,710 cf, Depth= 4.47"

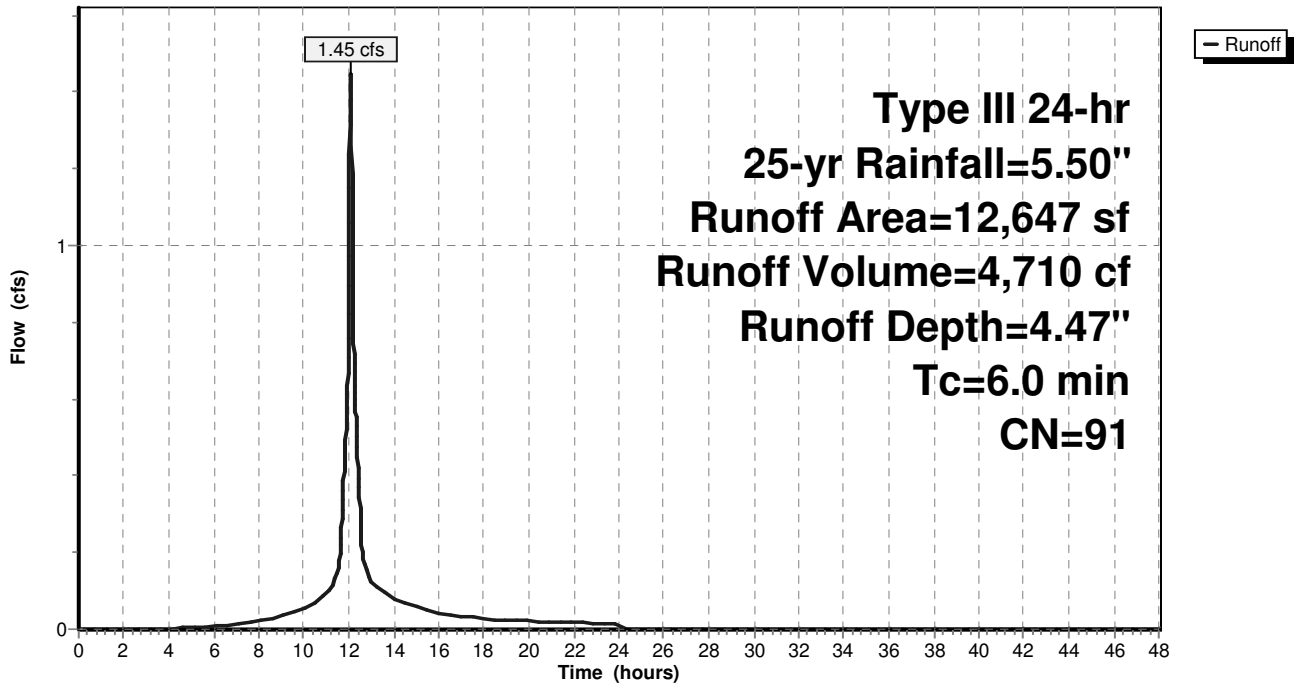
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-yr Rainfall=5.50"

	Area (sf)	CN	Description
*	10,322	98	Paved parking
	2,325	61	>75% Grass cover, Good, HSG B
	12,647	91	Weighted Average
	2,325		18.38% Pervious Area
	10,322		81.62% Impervious Area

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

**Subcatchment 5S: SUB2D**

Hydrograph



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Type III 24-hr 25-yr Rainfall=5.50"

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## Summary for Subcatchment 6S: SUB2E

Runoff = 0.96 cfs @ 12.09 hrs, Volume= 2,968 cf, Depth= 3.43"

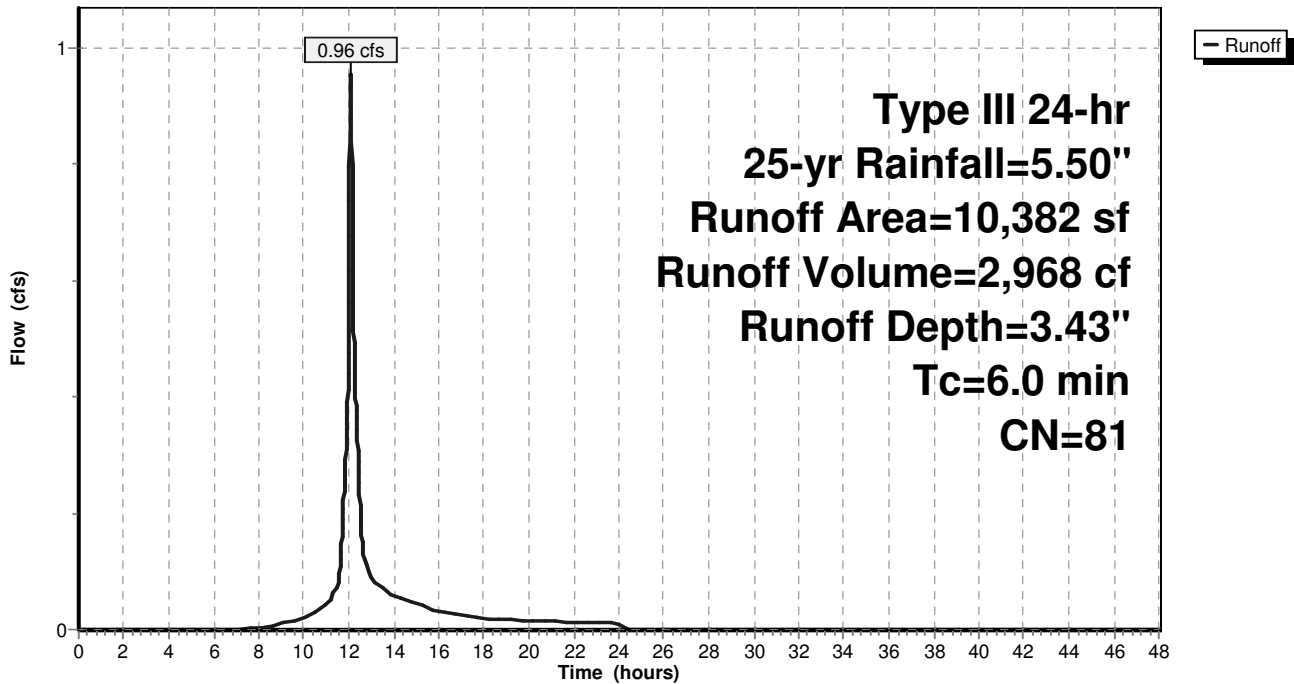
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-yr Rainfall=5.50"

	Area (sf)	CN	Description
*	5,707	98	Paved parking
	4,001	61	>75% Grass cover, Good, HSG B
	674	55	Woods, Good, HSG B
	10,382	81	Weighted Average
	4,675		45.03% Pervious Area
	5,707		54.97% Impervious Area

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

## Subcatchment 6S: SUB2E

Hydrograph



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Type III 24-hr 25-yr Rainfall=5.50"

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**Summary for Subcatchment 7S: SUB2F**

Runoff = 2.02 cfs @ 12.08 hrs, Volume= 6,703 cf, Depth= 4.69"

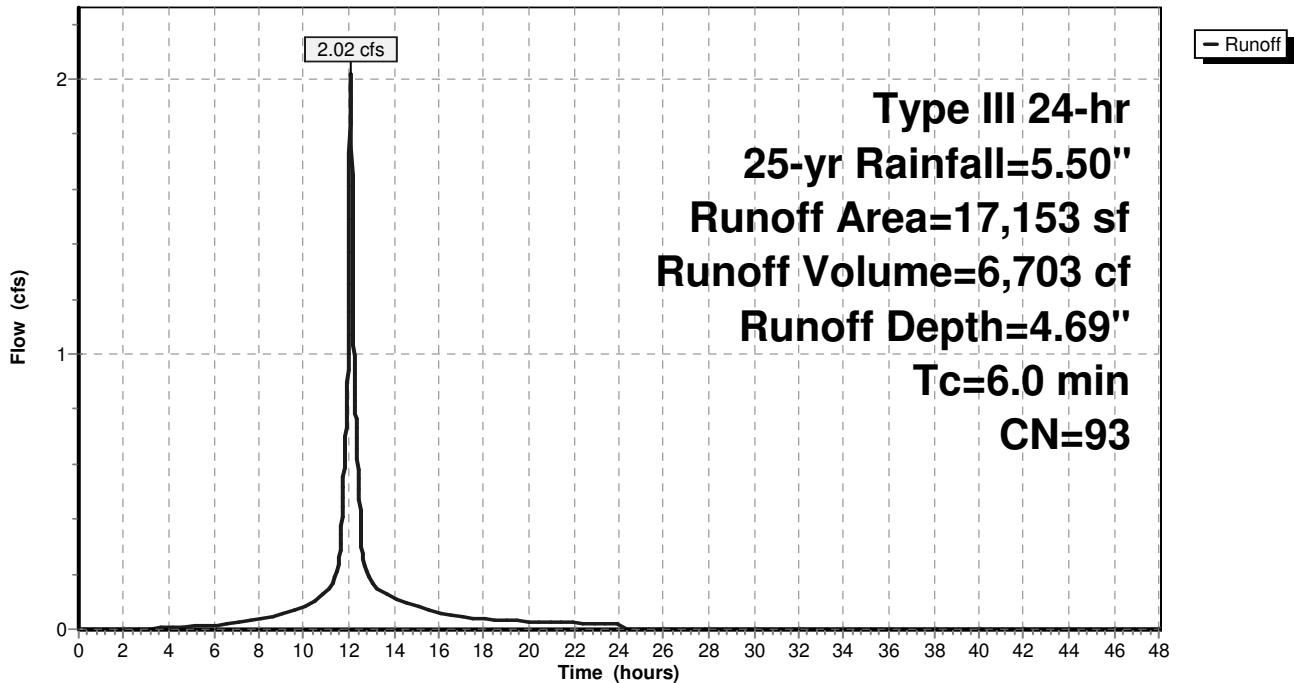
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-yr Rainfall=5.50"

	Area (sf)	CN	Description
*	14,816	98	Paved parking
	2,337	61	>75% Grass cover, Good, HSG B
	17,153	93	Weighted Average
	2,337		13.62% Pervious Area
	14,816		86.38% Impervious Area

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

**Subcatchment 7S: SUB2F**

Hydrograph



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Type III 24-hr 25-yr Rainfall=5.50"

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**Summary for Subcatchment 8S: SUB3A**

Runoff = 0.95 cfs @ 12.13 hrs, Volume= 3,230 cf, Depth= 2.59"

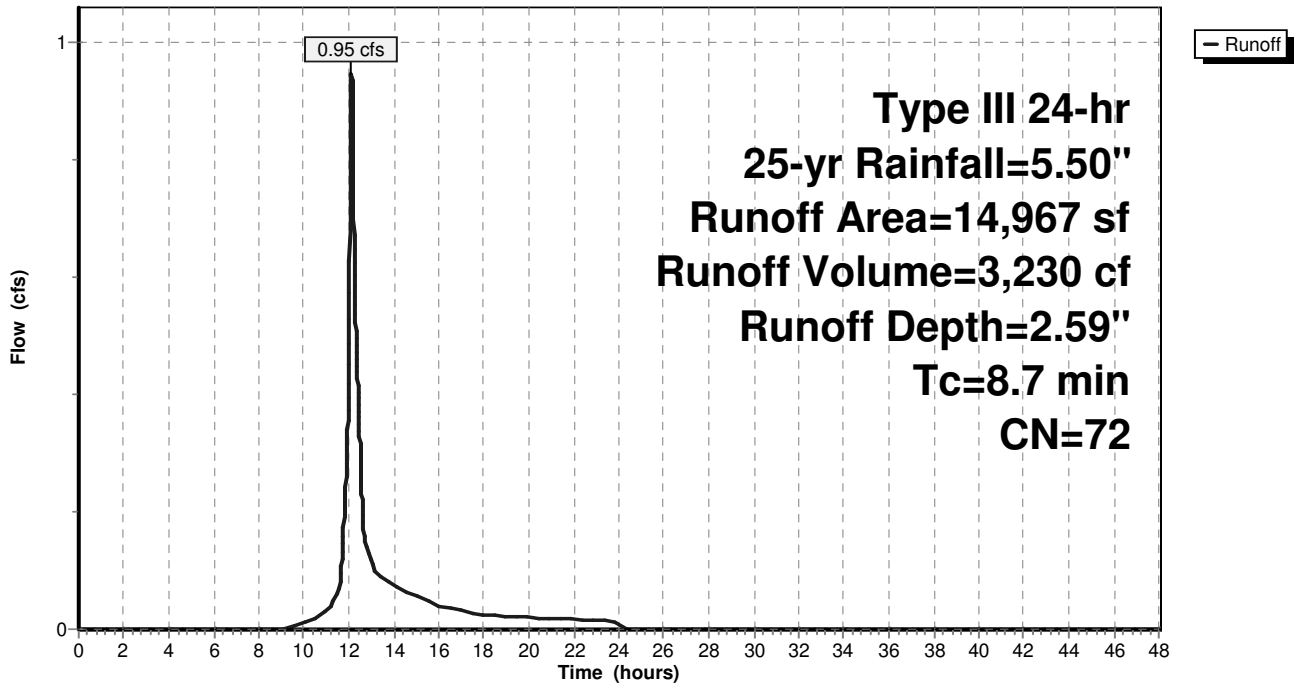
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-yr Rainfall=5.50"

	Area (sf)	CN	Description
*	4,541	98	Impervious
	10,426	61	>75% Grass cover, Good, HSG B
	14,967	72	Weighted Average
	10,426		69.66% Pervious Area
	4,541		30.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7					Direct Entry, NO CHANGE FROM EXISTING

**Subcatchment 8S: SUB3A**

Hydrograph



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Type III 24-hr 25-yr Rainfall=5.50"

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## Summary for Subcatchment 9S: SUB4

Runoff = 4.14 cfs @ 12.09 hrs, Volume= 13,273 cf, Depth= 4.25"

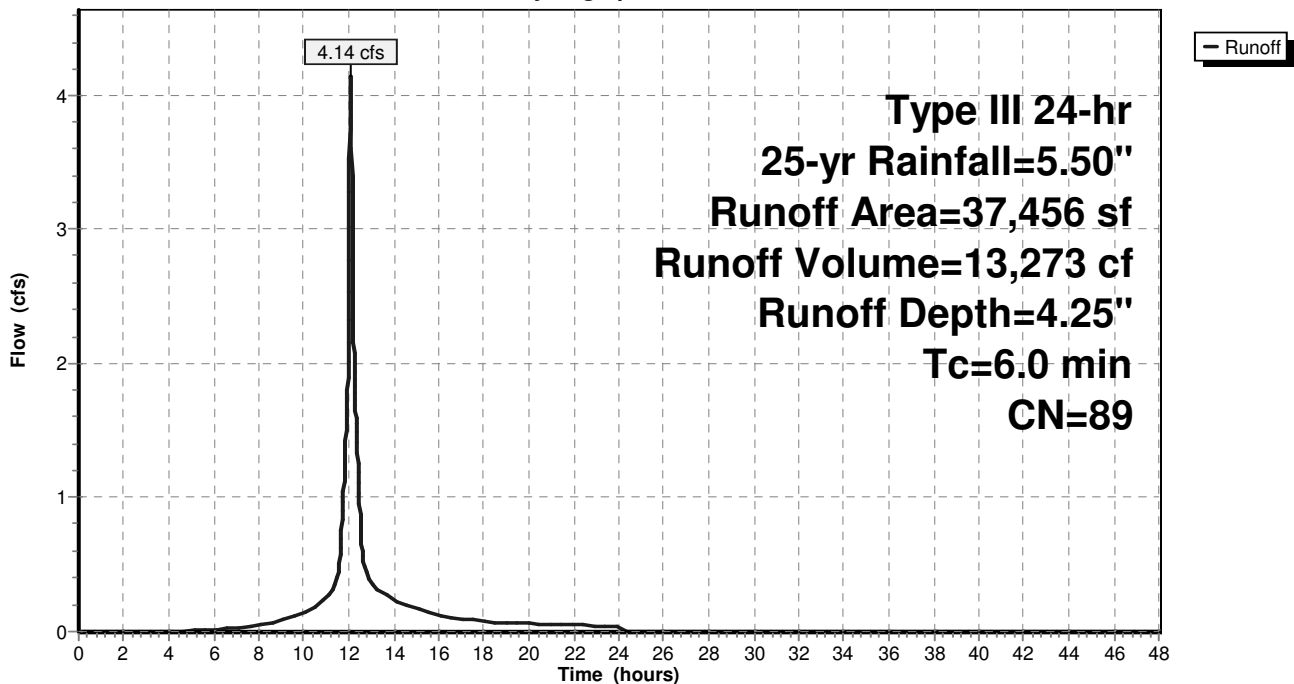
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-yr Rainfall=5.50"

	Area (sf)	CN	Description
*	5,435	98	Paved parking
*	22,782	98	Roofs
	9,239	61	>75% Grass cover, Good, HSG B
	37,456	89	Weighted Average
	9,239		24.67% Pervious Area
	28,217		75.33% Impervious Area

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

## Subcatchment 9S: SUB4

Hydrograph



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Type III 24-hr 25-yr Rainfall=5.50"

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**Summary for Subcatchment 10S: SUB5**

Runoff = 3.22 cfs @ 12.20 hrs, Volume= 13,637 cf, Depth= 1.76"

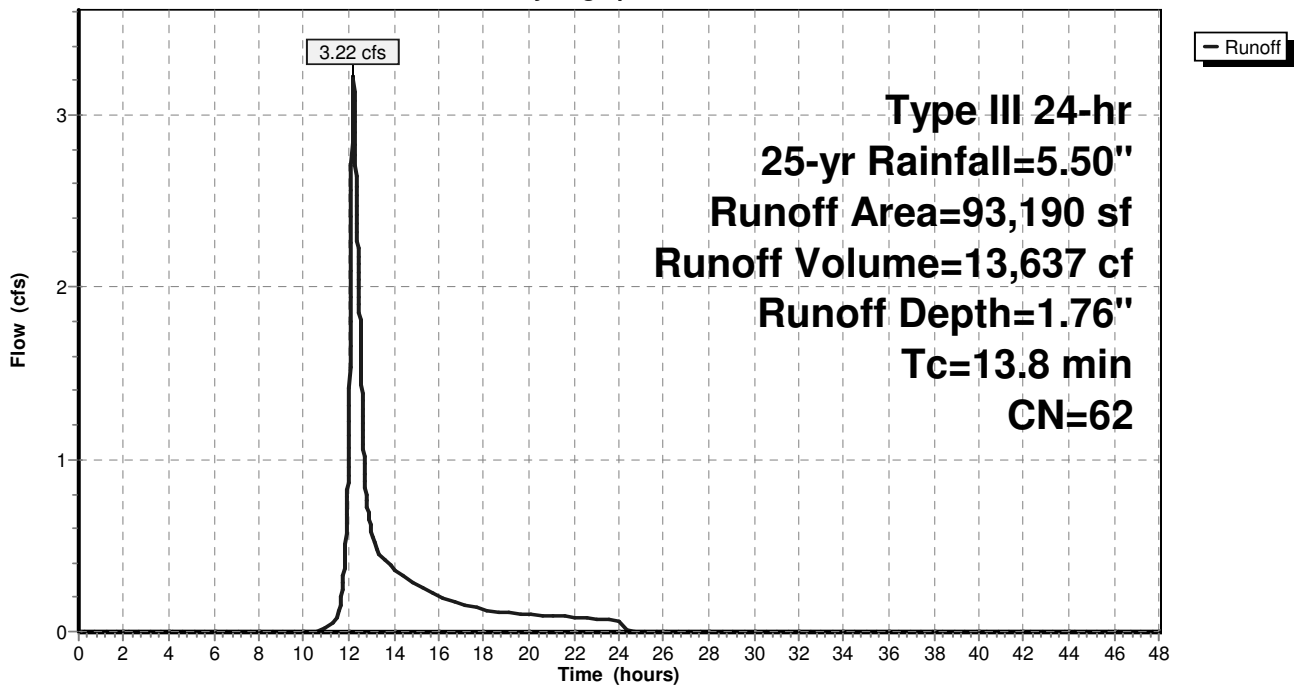
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-yr Rainfall=5.50"

	Area (sf)	CN	Description
*	7,678	98	Paved parking
	53,751	61	>75% Grass cover, Good, HSG B
	31,761	55	Woods, Good, HSG B
	93,190	62	Weighted Average
	85,512		91.76% Pervious Area
	7,678		8.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8					Direct Entry, NO CHANGE FROM EXISTING

**Subcatchment 10S: SUB5**

Hydrograph





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Type III 24-hr 25-yr Rainfall=5.50"

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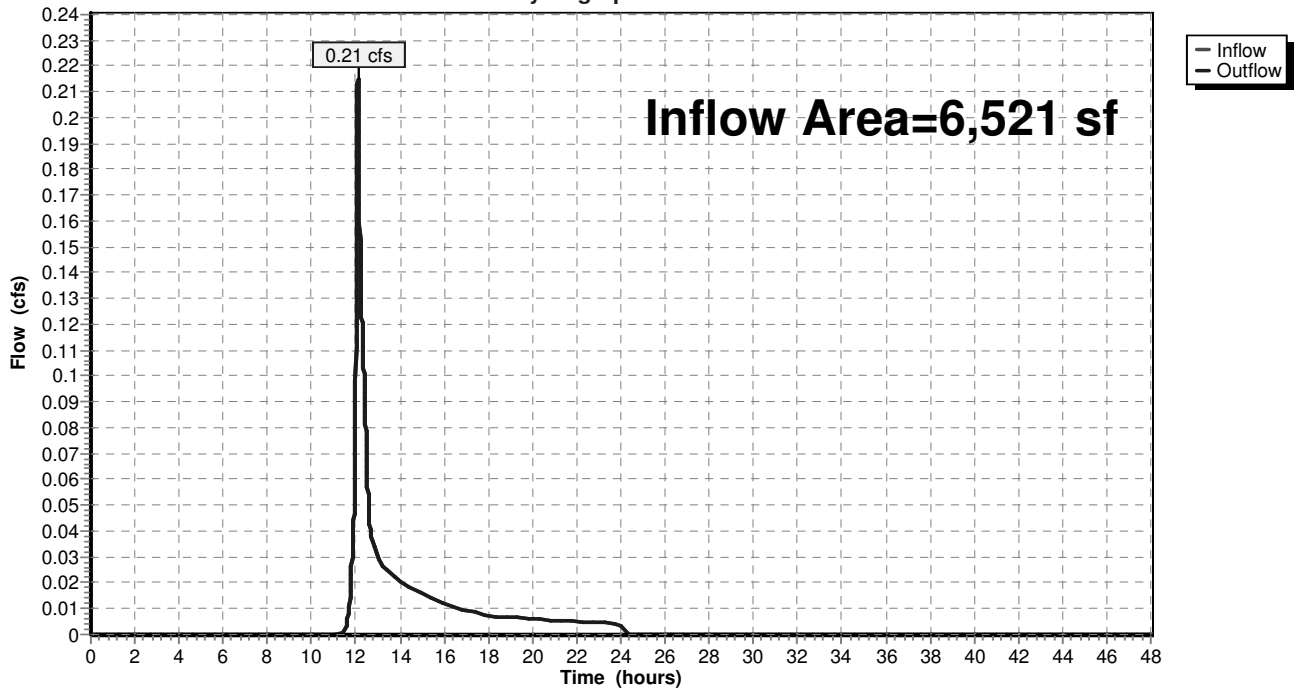
**Summary for Reach 12R: DP1-Northwest Property**

Inflow Area = 6,521 sf, 0.00% Impervious, Inflow Depth = 1.38" for 25-yr event  
Inflow = 0.21 cfs @ 12.10 hrs, Volume= 750 cf  
Outflow = 0.21 cfs @ 12.10 hrs, Volume= 750 cf, Atten= 0%, Lag= 0.0 min

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

**Reach 12R: DP1-Northwest Property**

Hydrograph



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Type III 24-hr 25-yr Rainfall=5.50"

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## Summary for Subcatchment 13S: SUB3B

Runoff = 1.12 cfs @ 12.08 hrs, Volume= 3,970 cf, Depth= 5.26"

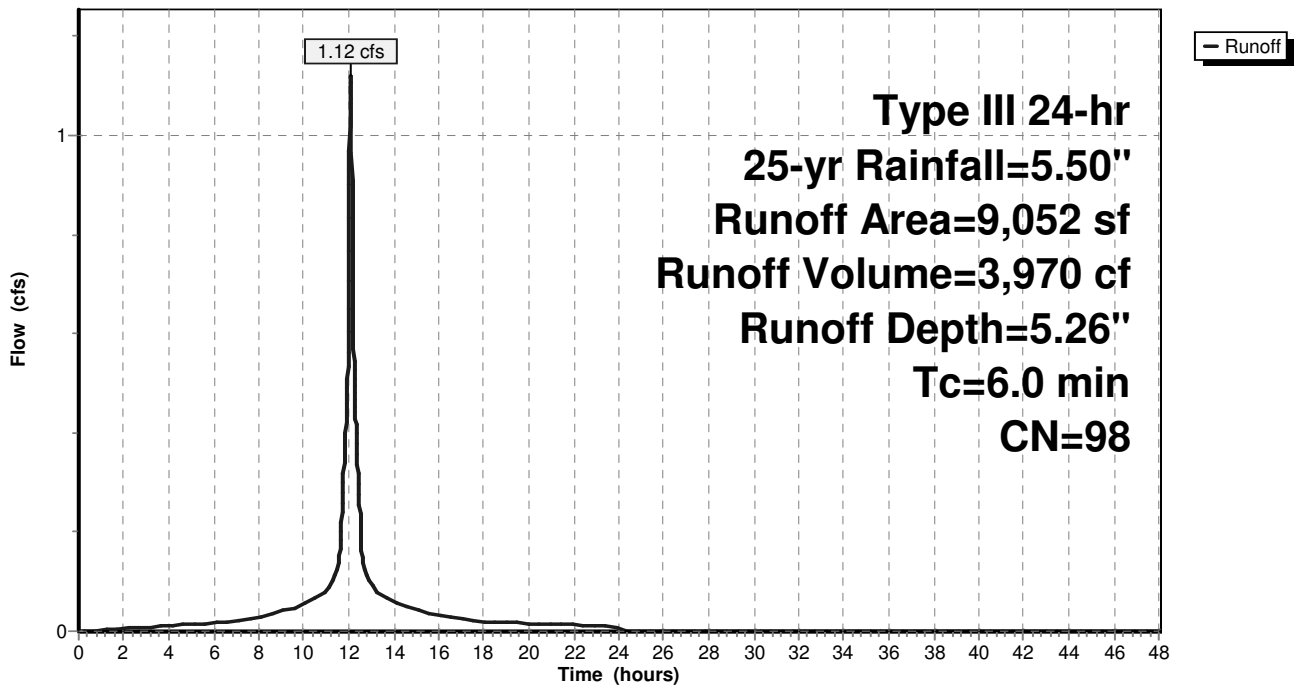
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-yr Rainfall=5.50"

Area (sf)	CN	Description
8,943	98	Roofs, HSG B
109	61	>75% Grass cover, Good, HSG B
9,052	98	Weighted Average
109		1.20% Pervious Area
8,943		98.80% Impervious Area

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

## Subcatchment 13S: SUB3B

Hydrograph



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Type III 24-hr 25-yr Rainfall=5.50"

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## Summary for Pond 14P: Infiltration Trench

Inflow Area = 9,052 sf, 98.80% Impervious, Inflow Depth = 5.26" for 25-yr event  
 Inflow = 1.12 cfs @ 12.08 hrs, Volume= 3,970 cf  
 Outflow = 1.09 cfs @ 12.10 hrs, Volume= 3,970 cf, Atten= 3%, Lag= 1.2 min  
 Discarded = 0.01 cfs @ 4.17 hrs, Volume= 1,119 cf  
 Primary = 1.08 cfs @ 12.10 hrs, Volume= 2,851 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
 Peak Elev= 101.54' @ 12.10 hrs Surf.Area= 458 sf Storage= 403 cf

Plug-Flow detention time= 84.8 min calculated for 3,970 cf (100% of inflow)  
 Center-of-Mass det. time= 84.7 min ( 831.2 - 746.5 )

Volume	Invert	Avail.Storage	Storage Description
#1	99.50'	605 cf	<b>Stone (Prismatic)</b> Listed below (Recalc) 1,603 cf Overall - 90 cf Embedded = 1,513 cf x 40.0% Voids
#2	101.00'	90 cf	<b>12.0" Round Pipe Storage</b> Inside #1 L= 114.5'
		695 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
99.50	458	0	0
103.00	458	1,603	1,603

Device	Routing	Invert	Outlet Devices
#1	Primary	101.00'	<b>12.0" Round Culvert</b> L= 52.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 101.00' / 100.20' S= 0.0154 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	99.50'	<b>1.020 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.01 cfs @ 4.17 hrs HW=99.54' (Free Discharge)  
 ↑**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

**Primary OutFlow** Max=1.07 cfs @ 12.10 hrs HW=101.54' (Free Discharge)  
 ↑**1=Culvert** (Inlet Controls 1.07 cfs @ 2.50 fps)

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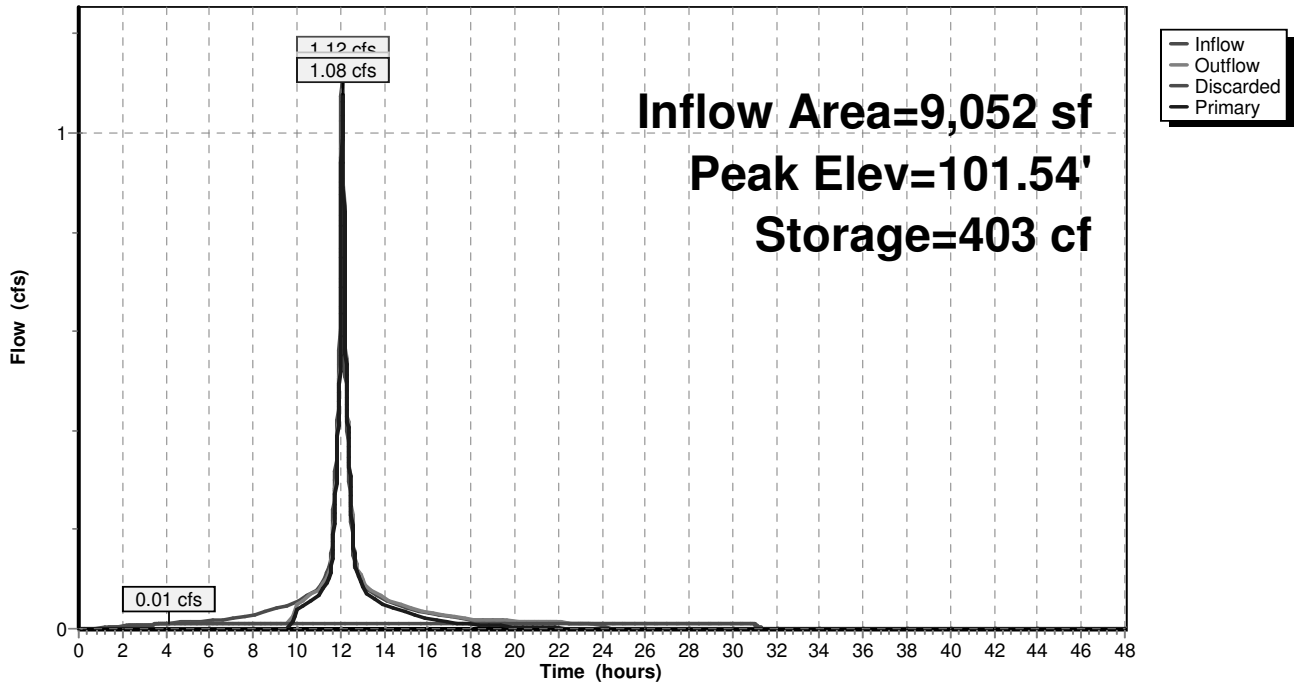
Proposed Conditions  
Type III 24-hr 25-yr Rainfall=5.50"

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**Pond 14P: Infiltration Trench**

Hydrograph



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Type III 24-hr 25-yr Rainfall=5.50"

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**Summary for Subcatchment 14S: SUB2G**

Runoff = 0.66 cfs @ 12.10 hrs, Volume= 2,182 cf, Depth= 1.68"

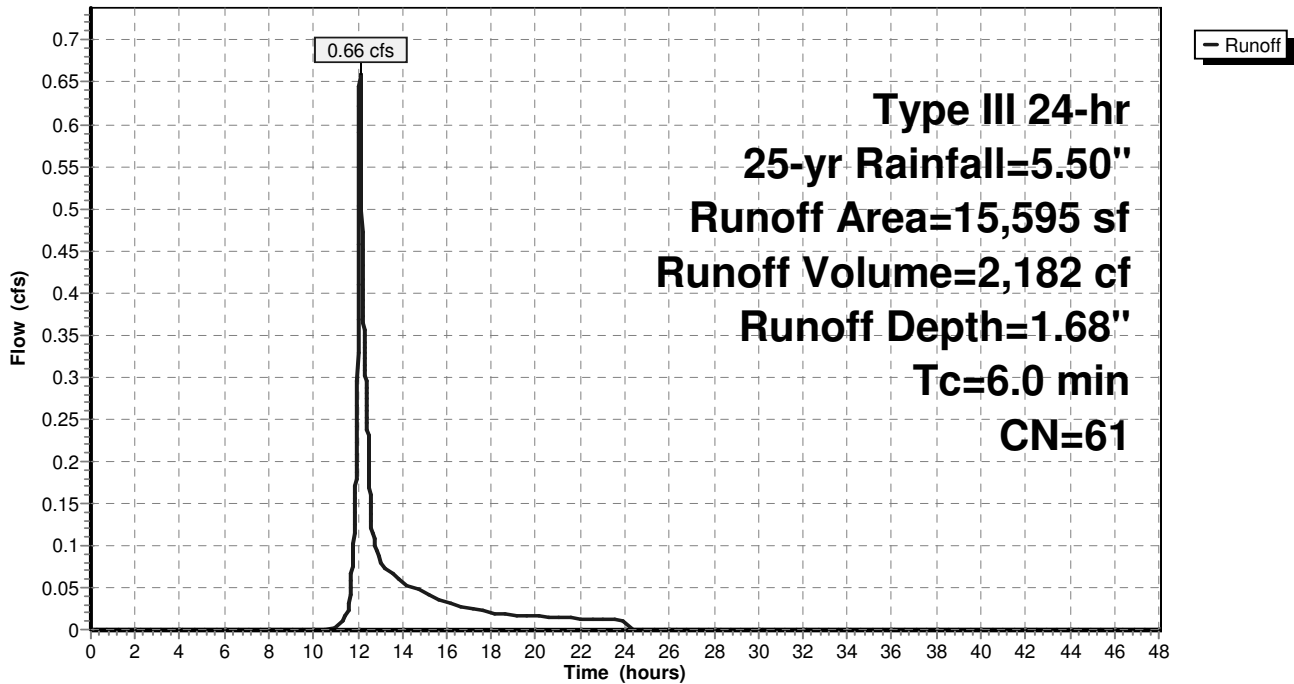
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-yr Rainfall=5.50"

Area (sf)	CN	Description
* 933	98	Paved parking
10,125	61	>75% Grass cover, Good, HSG B
4,537	55	Woods, Good, HSG B
15,595	61	Weighted Average
14,662		94.02% Pervious Area
933		5.98% Impervious Area

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

**Subcatchment 14S: SUB2G**

Hydrograph



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## Summary for Subcatchment 15S: SUB

Runoff = 0.31 cfs @ 12.08 hrs, Volume= 1,096 cf, Depth= 5.26"

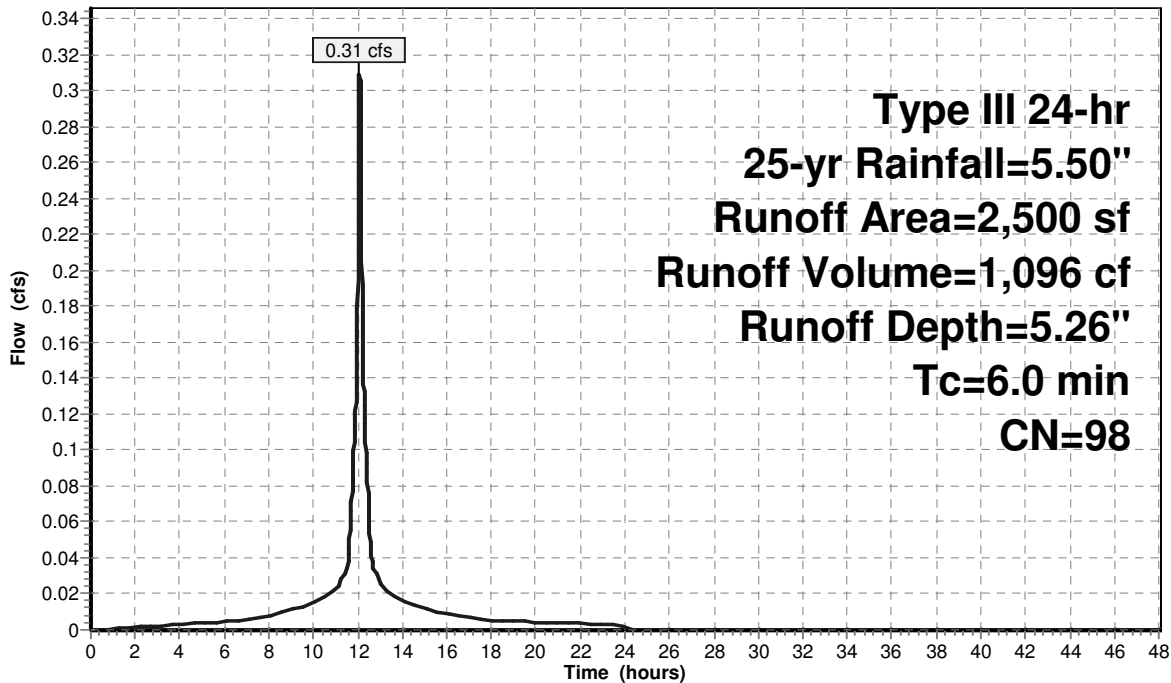
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-yr Rainfall=5.50"

Area (sf)	CN	Description
2,500	98	Roofs, HSG B
2,500		100.00% Impervious Area

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

## Subcatchment 15S: SUB

Hydrograph



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Type III 24-hr 25-yr Rainfall=5.50"

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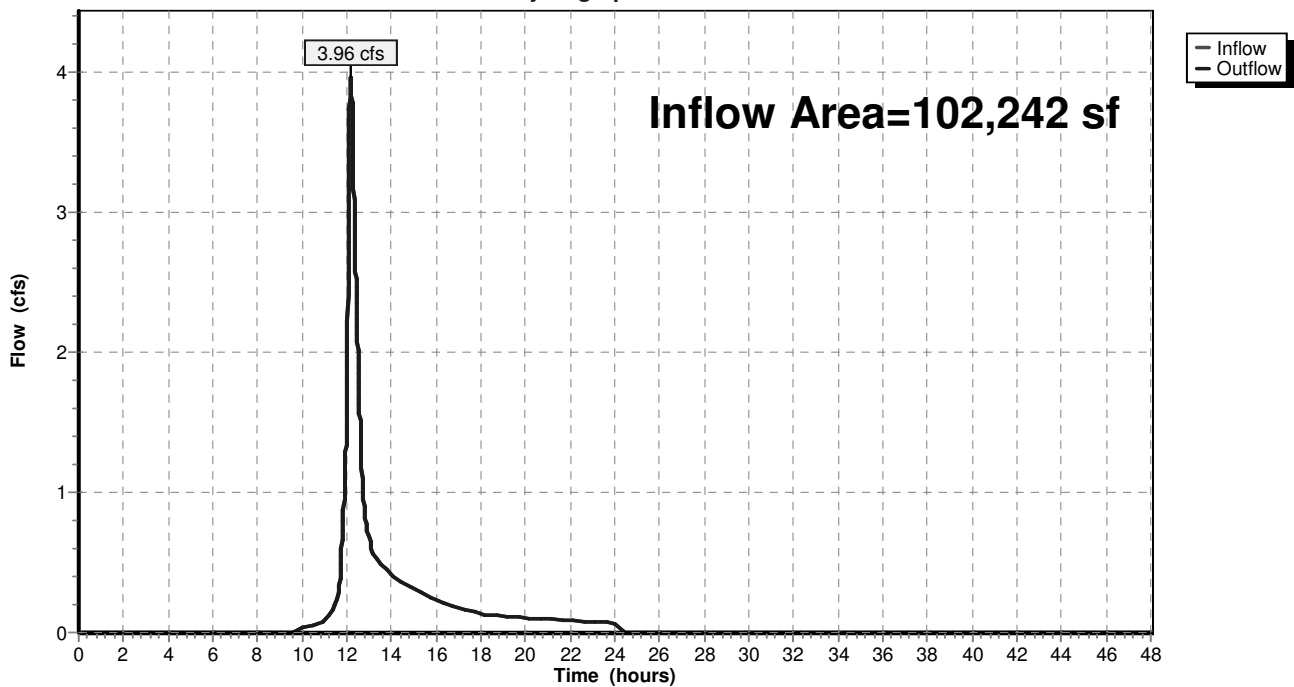
## Summary for Reach 16R: DP3-Eastern Property

Inflow Area = 102,242 sf, 16.26% Impervious, Inflow Depth = 1.94" for 25-yr event  
Inflow = 3.96 cfs @ 12.18 hrs, Volume= 16,488 cf  
Outflow = 3.96 cfs @ 12.18 hrs, Volume= 16,488 cf, Atten= 0%, Lag= 0.0 min

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

## Reach 16R: DP3-Eastern Property

Hydrograph



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Proposed Conditions  
Type III 24-hr 25-yr Rainfall=5.50"

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## Summary for Subcatchment 16S: SUB

Runoff = 4.89 cfs @ 12.08 hrs, Volume= 17,347 cf, Depth= 5.26"

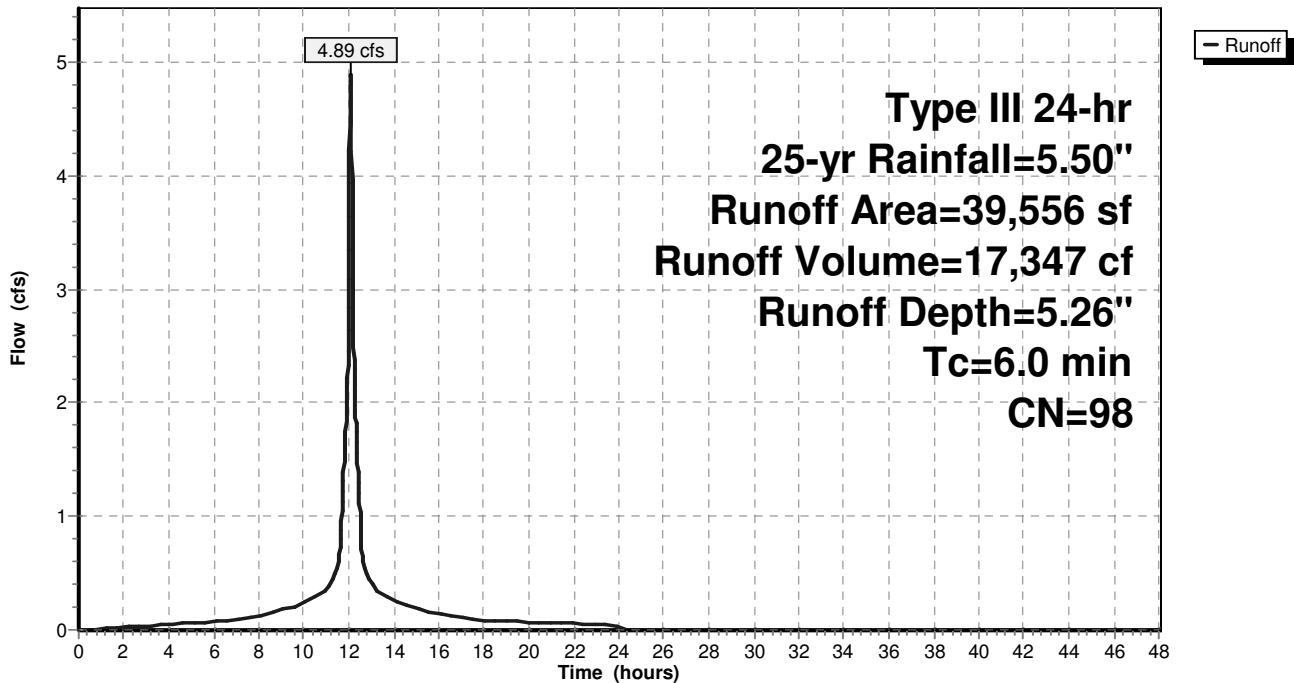
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-yr Rainfall=5.50"

Area (sf)	CN	Description
39,556	98	Roofs, HSG B
39,556		100.00% Impervious Area

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

## Subcatchment 16S: SUB

Hydrograph





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Proposed Conditions  
Type III 24-hr 25-yr Rainfall=5.50"

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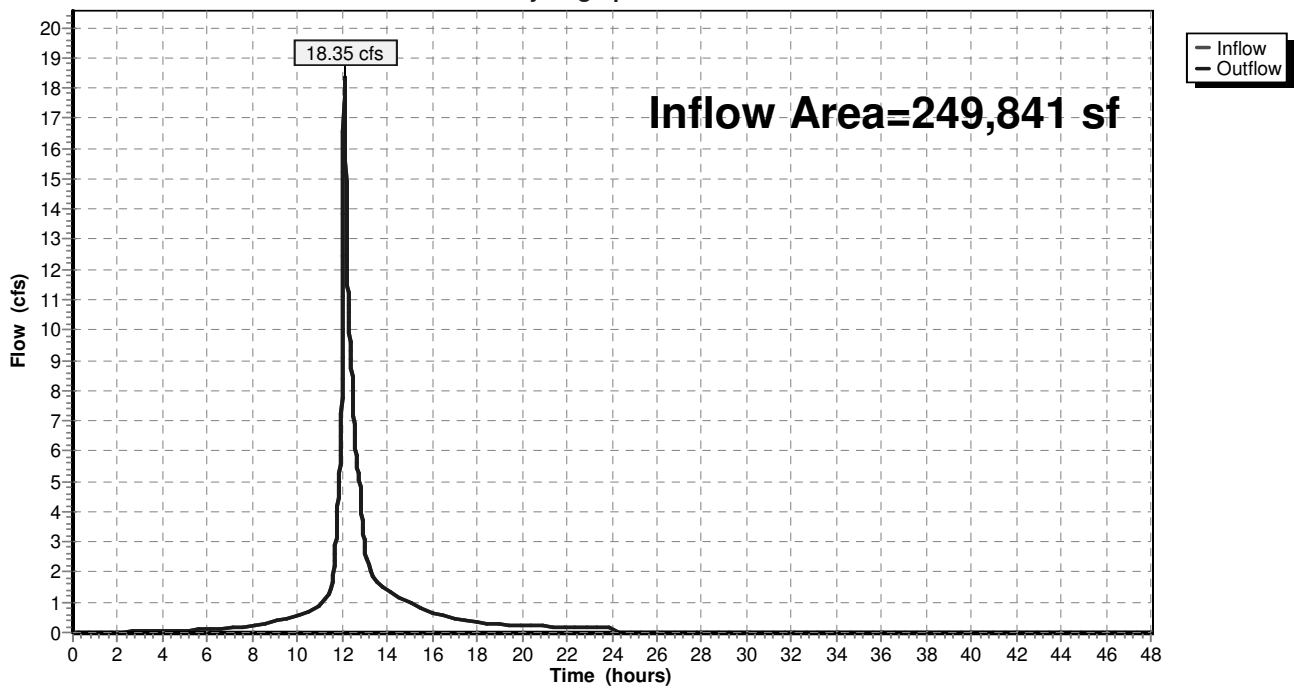
## Summary for Reach 17R: DP2-Wells Avenue

Inflow Area = 249,841 sf, 73.57% Impervious, Inflow Depth = 3.27" for 25-yr event  
Inflow = 18.35 cfs @ 12.09 hrs, Volume= 68,171 cf  
Outflow = 18.35 cfs @ 12.09 hrs, Volume= 68,171 cf, Atten= 0%, Lag= 0.0 min

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

## Reach 17R: DP2-Wells Avenue

Hydrograph



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Type III 24-hr 25-yr Rainfall=5.50"

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**Summary for Subcatchment 20S: SUB3B**

Runoff = 2.28 cfs @ 12.08 hrs, Volume= 7,547 cf, Depth= 4.69"

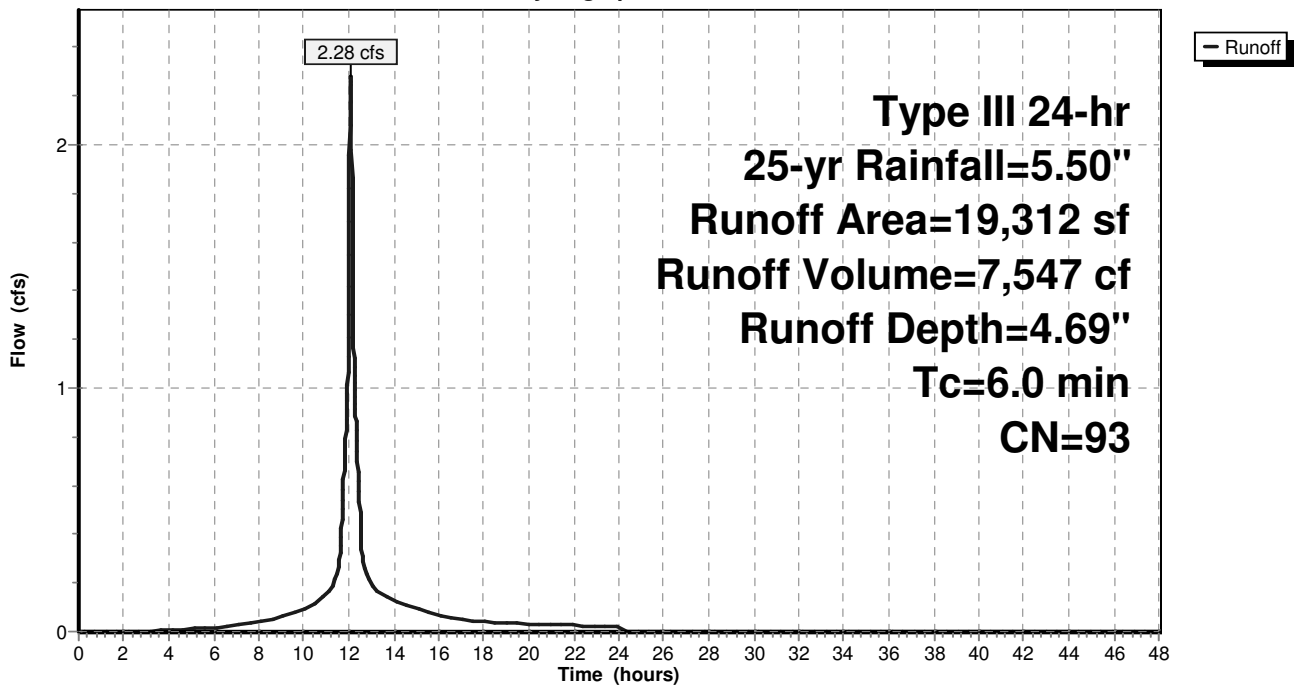
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-yr Rainfall=5.50"

	Area (sf)	CN	Description
*	14,089	98	Pavement
	2,823	61	>75% Grass cover, Good, HSG B
*	2,400	98	Pavement
<hr/>			
	19,312	93	Weighted Average
	2,823		14.62% Pervious Area
	16,489		85.38% Impervious Area

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

**Subcatchment 20S: SUB3B**

Hydrograph



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Type III 24-hr 25-yr Rainfall=5.50"

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## Summary for Subcatchment 21S: SUB

Runoff = 0.92 cfs @ 12.08 hrs, Volume= 2,979 cf, Depth= 4.36"

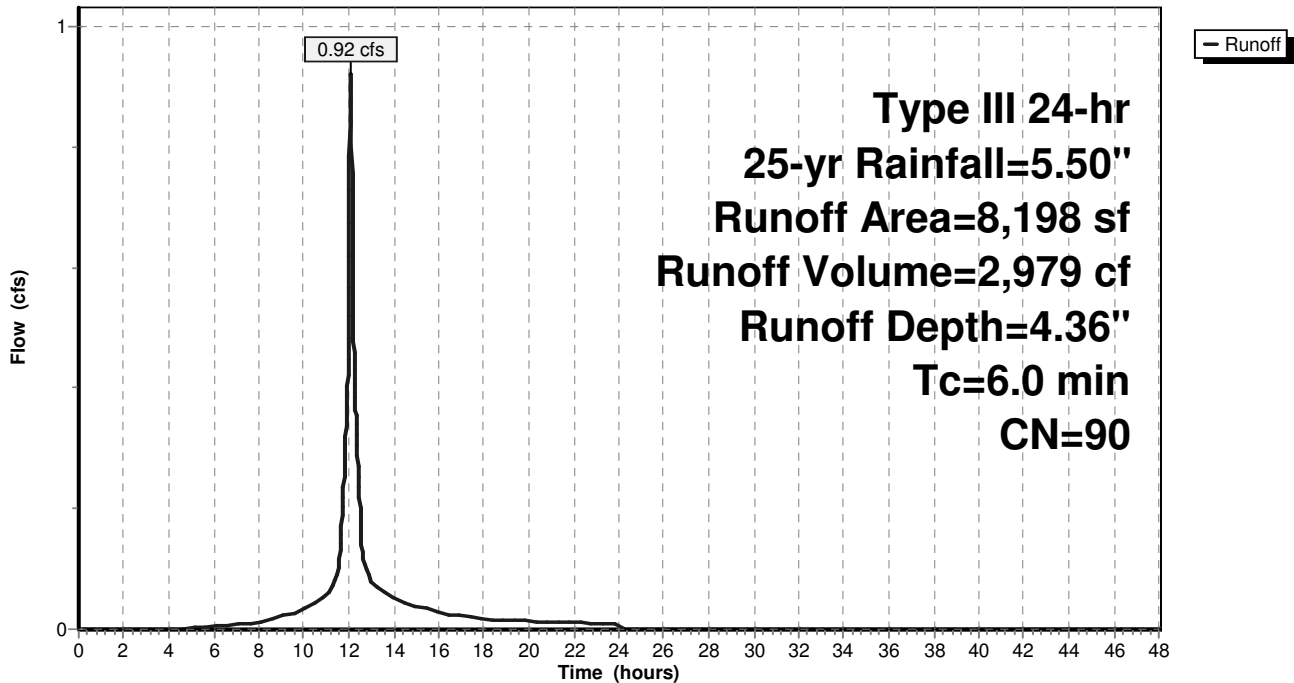
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-yr Rainfall=5.50"

Area (sf)	CN	Description
6,330	98	Paved parking, HSG B
1,868	61	>75% Grass cover, Good, HSG B
8,198	90	Weighted Average
1,868		22.79% Pervious Area
6,330		77.21% Impervious Area

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

## Subcatchment 21S: SUB

Hydrograph



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Type III 24-hr 100-yr Rainfall=6.60"

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

<b>Subcatchment 1S: SUB1</b>	Runoff Area=6,521 sf 0.00% Impervious Runoff Depth=2.05" Tc=6.0 min CN=57 Runoff=0.34 cfs 1,115 cf
<b>Subcatchment 2S: SUB2A</b>	Runoff Area=28,661 sf 77.18% Impervious Runoff Depth=5.43" Tc=6.0 min CN=90 Runoff=3.97 cfs 12,973 cf
<b>Subcatchment 3S: SUB2B</b>	Runoff Area=18,034 sf 89.00% Impervious Runoff Depth=5.89" Tc=6.0 min CN=94 Runoff=2.61 cfs 8,854 cf
<b>Subcatchment 4S: SUB2C</b>	Runoff Area=25,380 sf 63.98% Impervious Runoff Depth=4.76" Tc=6.0 min CN=84 Runoff=3.19 cfs 10,069 cf
<b>Pond 5P: Subsurface Infiltration System</b>	Peak Elev=102.29' Storage=16,377 cf Inflow=14.04 cfs 46,226 cf Discarded=0.19 cfs 20,364 cf Primary=4.95 cfs 25,862 cf Outflow=5.14 cfs 46,226 cf
<b>Subcatchment 5S: SUB2D</b>	Runoff Area=12,647 sf 81.62% Impervious Runoff Depth=5.55" Tc=6.0 min CN=91 Runoff=1.77 cfs 5,845 cf
<b>Subcatchment 6S: SUB2E</b>	Runoff Area=10,382 sf 54.97% Impervious Runoff Depth=4.43" Tc=6.0 min CN=81 Runoff=1.23 cfs 3,836 cf
<b>Subcatchment 7S: SUB2F</b>	Runoff Area=17,153 sf 86.38% Impervious Runoff Depth=5.78" Tc=6.0 min CN=93 Runoff=2.46 cfs 8,256 cf
<b>Subcatchment 8S: SUB3A</b>	Runoff Area=14,967 sf 30.34% Impervious Runoff Depth=3.49" Tc=8.7 min CN=72 Runoff=1.28 cfs 4,354 cf
<b>Subcatchment 9S: SUB4</b>	Runoff Area=37,456 sf 75.33% Impervious Runoff Depth=5.32" Tc=6.0 min CN=89 Runoff=5.11 cfs 16,600 cf
<b>Subcatchment 10S: SUB5</b>	Runoff Area=93,190 sf 8.24% Impervious Runoff Depth=2.51" Tc=13.8 min CN=62 Runoff=4.76 cfs 19,498 cf
<b>Reach 12R: DP1-Northwest Property</b>	Inflow=0.34 cfs 1,115 cf Outflow=0.34 cfs 1,115 cf
<b>Subcatchment 13S: SUB3B</b>	Runoff Area=9,052 sf 98.80% Impervious Runoff Depth=6.36" Tc=6.0 min CN=98 Runoff=1.35 cfs 4,799 cf
<b>Pond 14P: Infiltration Trench</b>	Peak Elev=101.60' Storage=419 cf Inflow=1.35 cfs 4,799 cf Discarded=0.01 cfs 1,143 cf Primary=1.30 cfs 3,656 cf Outflow=1.31 cfs 4,799 cf
<b>Subcatchment 14S: SUB2G</b>	Runoff Area=15,595 sf 5.98% Impervious Runoff Depth=2.42" Tc=6.0 min CN=61 Runoff=0.98 cfs 3,141 cf
<b>Subcatchment 15S: SUB</b>	Runoff Area=2,500 sf 100.00% Impervious Runoff Depth=6.36" Tc=6.0 min CN=98 Runoff=0.37 cfs 1,325 cf

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Type III 24-hr 100-yr Rainfall=6.60"

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### Reach 16R: DP3-Eastern Property

Inflow=5.66 cfs 23,154 cf  
Outflow=5.66 cfs 23,154 cf

### Subcatchment 16S: SUB

Runoff Area=39,556 sf 100.00% Impervious Runoff Depth=6.36"  
Tc=6.0 min CN=98 Runoff=5.88 cfs 20,969 cf

### Reach 17R: DP2-Wells Avenue

Inflow=22.61 cfs 88,862 cf  
Outflow=22.61 cfs 88,862 cf

### Subcatchment 20S: SUB3B

Runoff Area=19,312 sf 85.38% Impervious Runoff Depth=5.78"  
Tc=6.0 min CN=93 Runoff=2.77 cfs 9,295 cf

### Subcatchment 21S: SUB

Runoff Area=8,198 sf 77.21% Impervious Runoff Depth=5.43"  
Tc=6.0 min CN=90 Runoff=1.13 cfs 3,711 cf

**Total Runoff Area = 358,604 sf Runoff Volume = 134,638 cf Average Runoff Depth = 4.51"**  
**44.11% Pervious = 158,164 sf 55.89% Impervious = 200,440 sf**

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Type III 24-hr 100-yr Rainfall=6.60"

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## Summary for Subcatchment 1S: SUB1

Runoff = 0.34 cfs @ 12.10 hrs, Volume= 1,115 cf, Depth= 2.05"

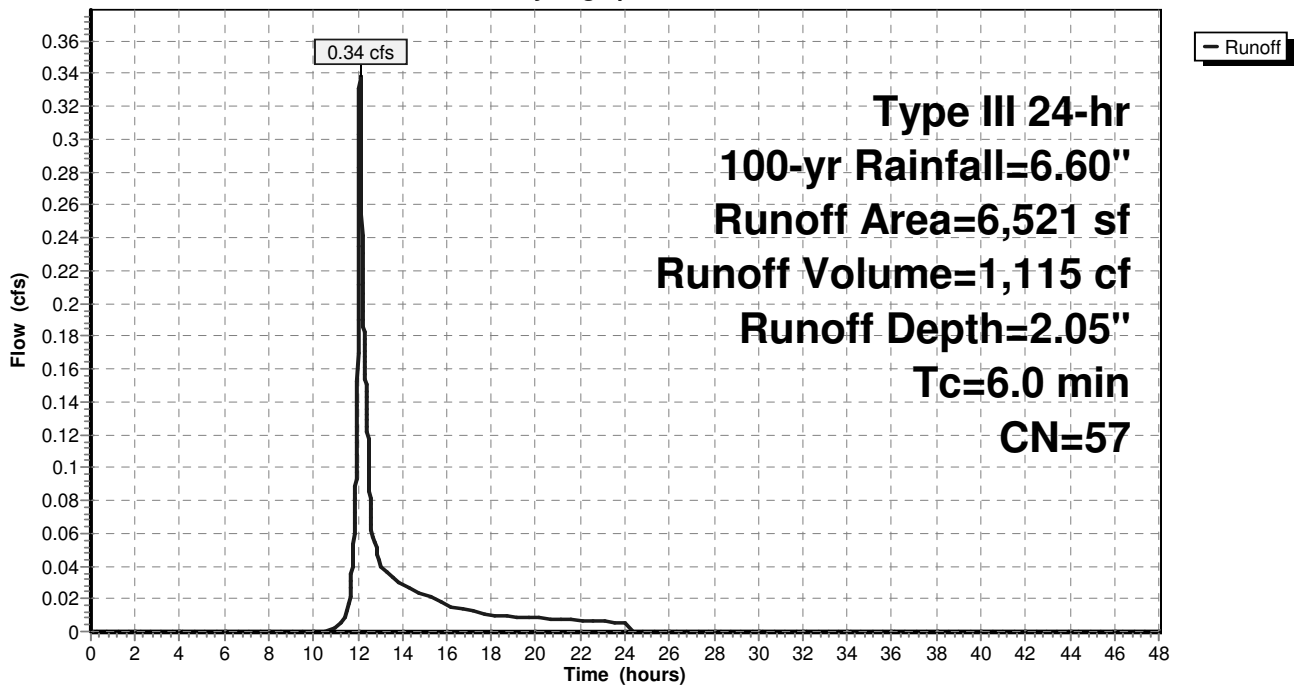
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-yr Rainfall=6.60"

Area (sf)	CN	Description
4,819	55	Woods, Good, HSG B
1,702	61	>75% Grass cover, Good, HSG B
6,521	57	Weighted Average
6,521		100.00% Pervious Area

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

## Subcatchment 1S: SUB1

Hydrograph



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Type III 24-hr 100-yr Rainfall=6.60"

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## Summary for Subcatchment 2S: SUB2A

Runoff = 3.97 cfs @ 12.08 hrs, Volume= 12,973 cf, Depth= 5.43"

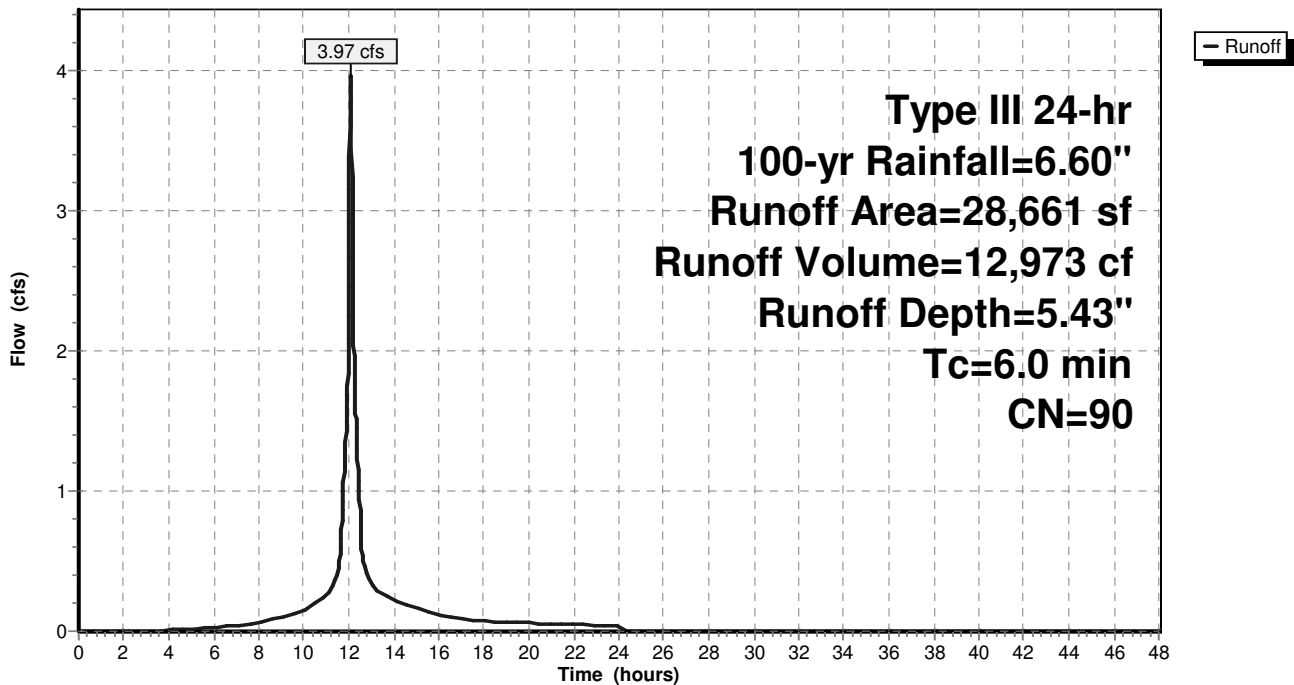
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-yr Rainfall=6.60"

	Area (sf)	CN	Description
*	22,121	98	Paved parking
	6,540	61	>75% Grass cover, Good, HSG B
	28,661	90	Weighted Average
	6,540		22.82% Pervious Area
	22,121		77.18% Impervious Area

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

## Subcatchment 2S: SUB2A

Hydrograph



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## Summary for Subcatchment 3S: SUB2B

Runoff = 2.61 cfs @ 12.08 hrs, Volume= 8,854 cf, Depth= 5.89"

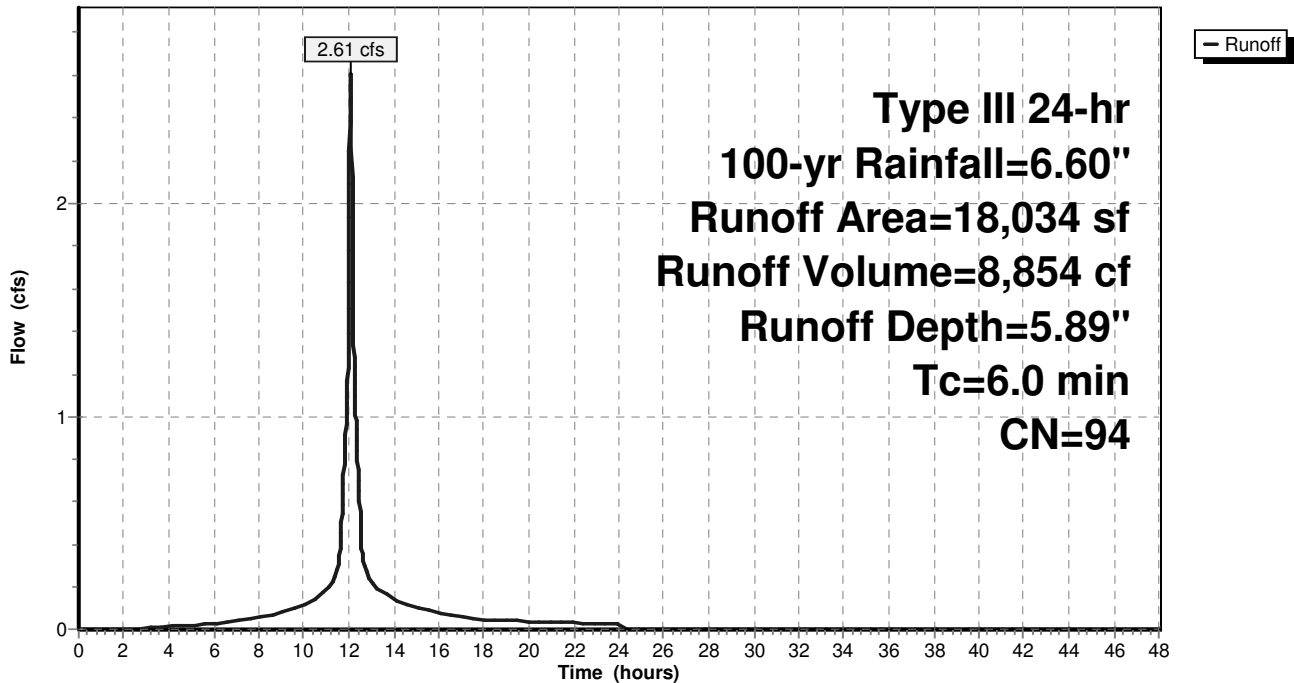
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-yr Rainfall=6.60"

	Area (sf)	CN	Description
*	16,050	98	Paved parking
	1,984	61	>75% Grass cover, Good, HSG B
	18,034	94	Weighted Average
	1,984		11.00% Pervious Area
	16,050		89.00% Impervious Area

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

## Subcatchment 3S: SUB2B

Hydrograph





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Type III 24-hr 100-yr Rainfall=6.60"

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## Summary for Subcatchment 4S: SUB2C

Runoff = 3.19 cfs @ 12.09 hrs, Volume= 10,069 cf, Depth= 4.76"

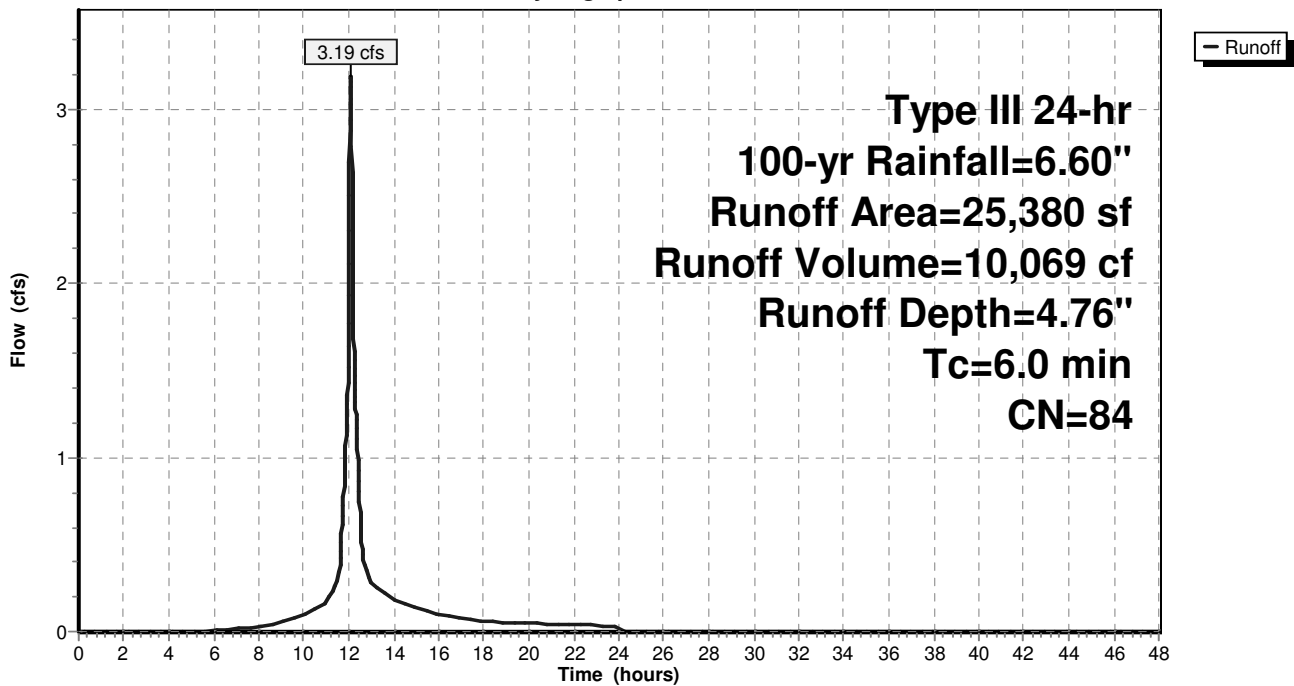
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-yr Rainfall=6.60"

	Area (sf)	CN	Description
*	16,237	98	Paved parking
	4,855	55	Woods, Good, HSG B
	4,288	61	>75% Grass cover, Good, HSG B
	25,380	84	Weighted Average
	9,143		36.02% Pervious Area
	16,237		63.98% Impervious Area

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

## Subcatchment 4S: SUB2C

Hydrograph



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## Summary for Pond 5P: Subsurface Infiltration System

Inflow Area = 102,085 sf, 78.10% Impervious, Inflow Depth = 5.43" for 100-yr event  
Inflow = 14.04 cfs @ 12.08 hrs, Volume= 46,226 cf  
Outflow = 5.14 cfs @ 12.34 hrs, Volume= 46,226 cf, Atten= 63%, Lag= 15.1 min  
Discarded = 0.19 cfs @ 7.74 hrs, Volume= 20,364 cf  
Primary = 4.95 cfs @ 12.34 hrs, Volume= 25,862 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2  
Peak Elev= 102.29' @ 12.34 hrs Surf.Area= 7,912 sf Storage= 16,377 cf

Plug-Flow detention time= 217.4 min calculated for 46,216 cf (100% of inflow)  
Center-of-Mass det. time= 217.5 min ( 996.8 - 779.3 )

Volume	Invert	Avail.Storage	Storage Description
#1A	98.80'	6,077 cf	<b>68.00'W x 116.36'L x 3.50'H Field A</b> 27,694 cf Overall - 10,330 cf Embedded = 17,363 cf x 35.0% Voids
#2A	99.30'	10,330 cf	<b>ADS StormTech SC-740</b> x 224 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 14 rows
		16,407 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	98.80'	<b>1.020 in/hr Exfiltration over Horizontal area</b>
#2	Primary	99.30'	<b>12.0" Round Culvert out of OCS</b> L= 95.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 99.30' / 98.40' S= 0.0095 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	100.40'	<b>5.0' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)

**Discarded OutFlow** Max=0.19 cfs @ 7.74 hrs HW=98.84' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.19 cfs)

**Primary OutFlow** Max=4.95 cfs @ 12.34 hrs HW=102.29' (Free Discharge)

↑**2=Culvert out of OCS** (Barrel Controls 4.95 cfs @ 6.30 fps)

↑**3=Sharp-Crested Rectangular Weir** (Passes 4.95 cfs of 39.24 cfs potential flow)

**Proposed HydroCAD**

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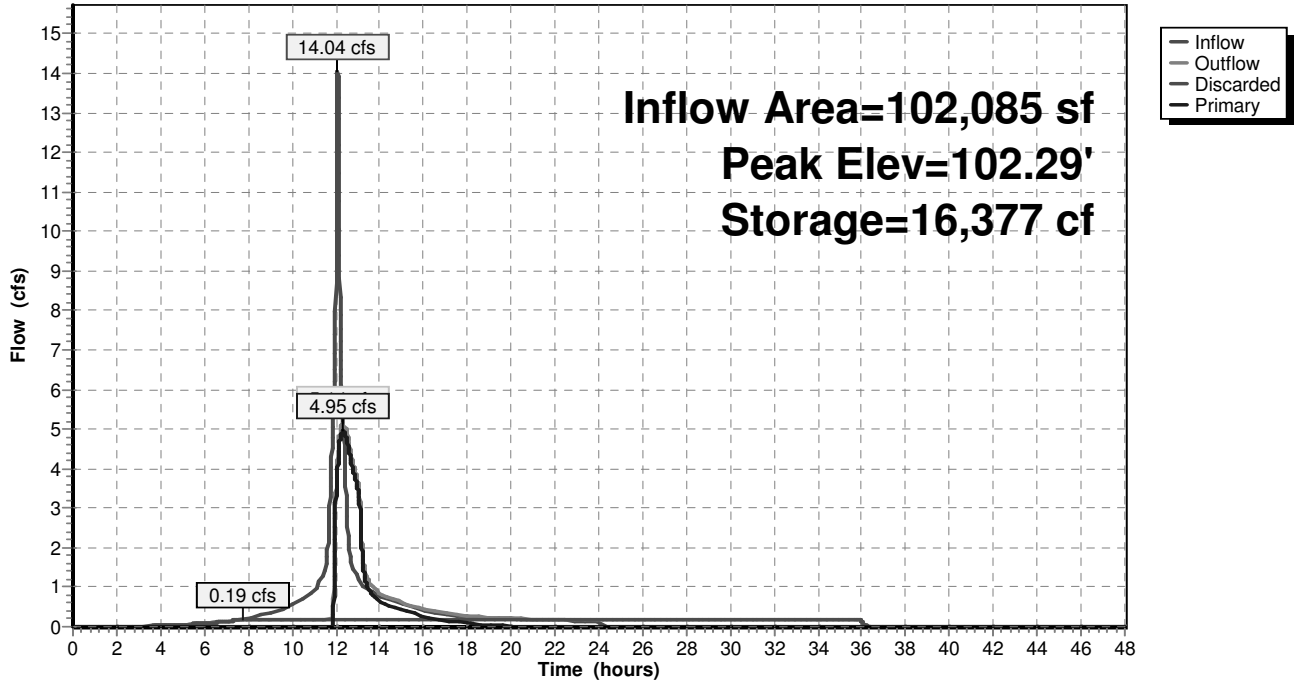
Proposed Conditions  
Type III 24-hr 100-yr Rainfall=6.60"

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**Pond 5P: Subsurface Infiltration System**

Hydrograph



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## Summary for Subcatchment 5S: SUB2D

Runoff = 1.77 cfs @ 12.08 hrs, Volume= 5,845 cf, Depth= 5.55"

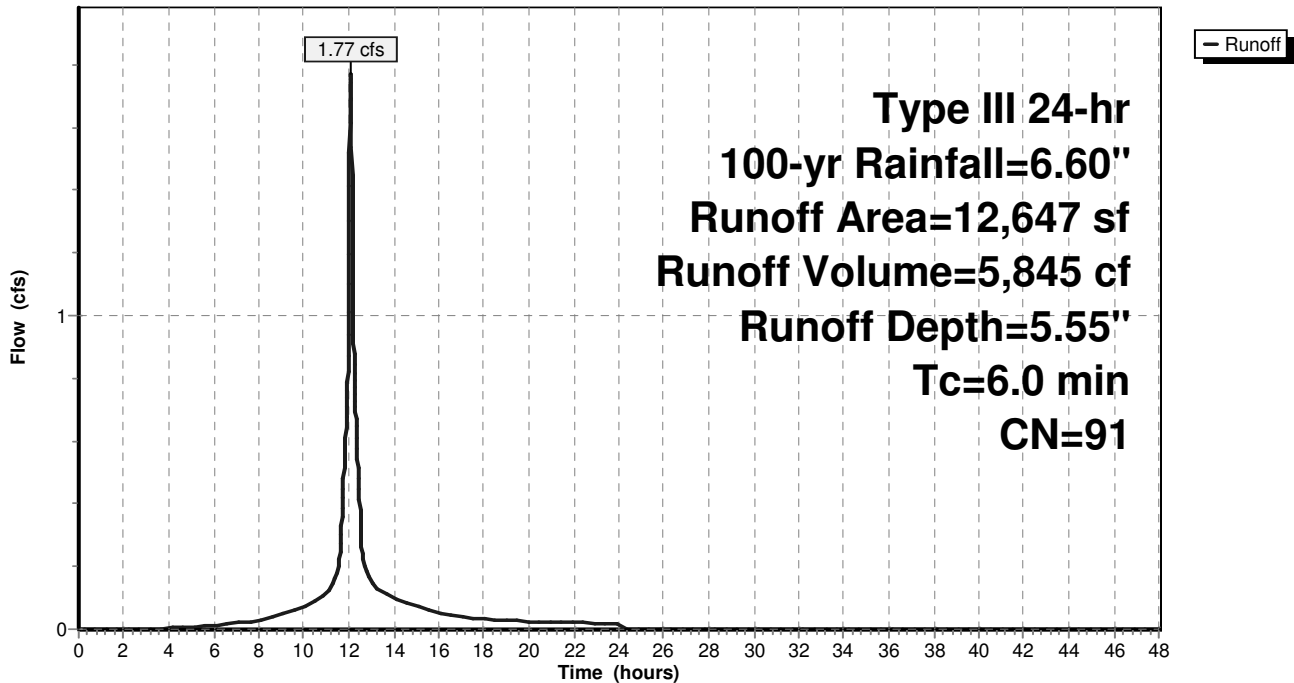
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-yr Rainfall=6.60"

	Area (sf)	CN	Description
*	10,322	98	Paved parking
	2,325	61	>75% Grass cover, Good, HSG B
	12,647	91	Weighted Average
	2,325		18.38% Pervious Area
	10,322		81.62% Impervious Area

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

## Subcatchment 5S: SUB2D

Hydrograph



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Type III 24-hr 100-yr Rainfall=6.60"

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## Summary for Subcatchment 6S: SUB2E

Runoff = 1.23 cfs @ 12.09 hrs, Volume= 3,836 cf, Depth= 4.43"

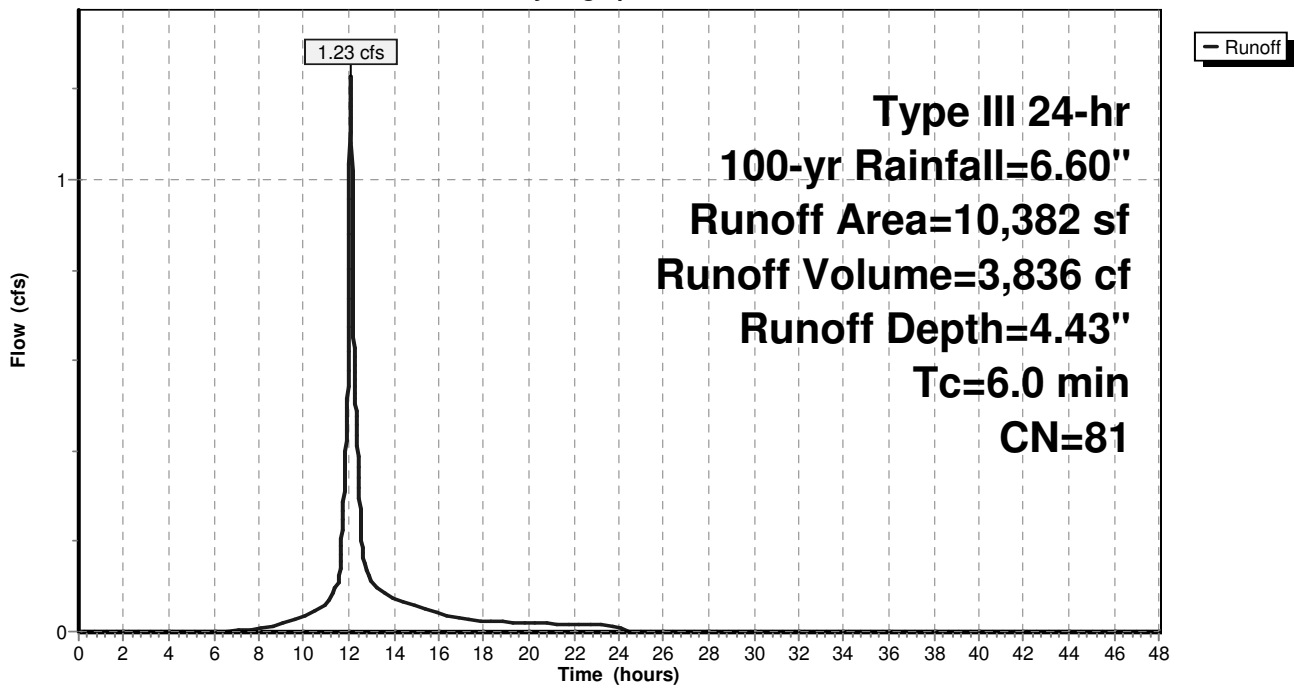
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-yr Rainfall=6.60"

	Area (sf)	CN	Description
*	5,707	98	Paved parking
	4,001	61	>75% Grass cover, Good, HSG B
	674	55	Woods, Good, HSG B
	10,382	81	Weighted Average
	4,675		45.03% Pervious Area
	5,707		54.97% Impervious Area

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

## Subcatchment 6S: SUB2E

Hydrograph



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Type III 24-hr 100-yr Rainfall=6.60"

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## Summary for Subcatchment 7S: SUB2F

Runoff = 2.46 cfs @ 12.08 hrs, Volume= 8,256 cf, Depth= 5.78"

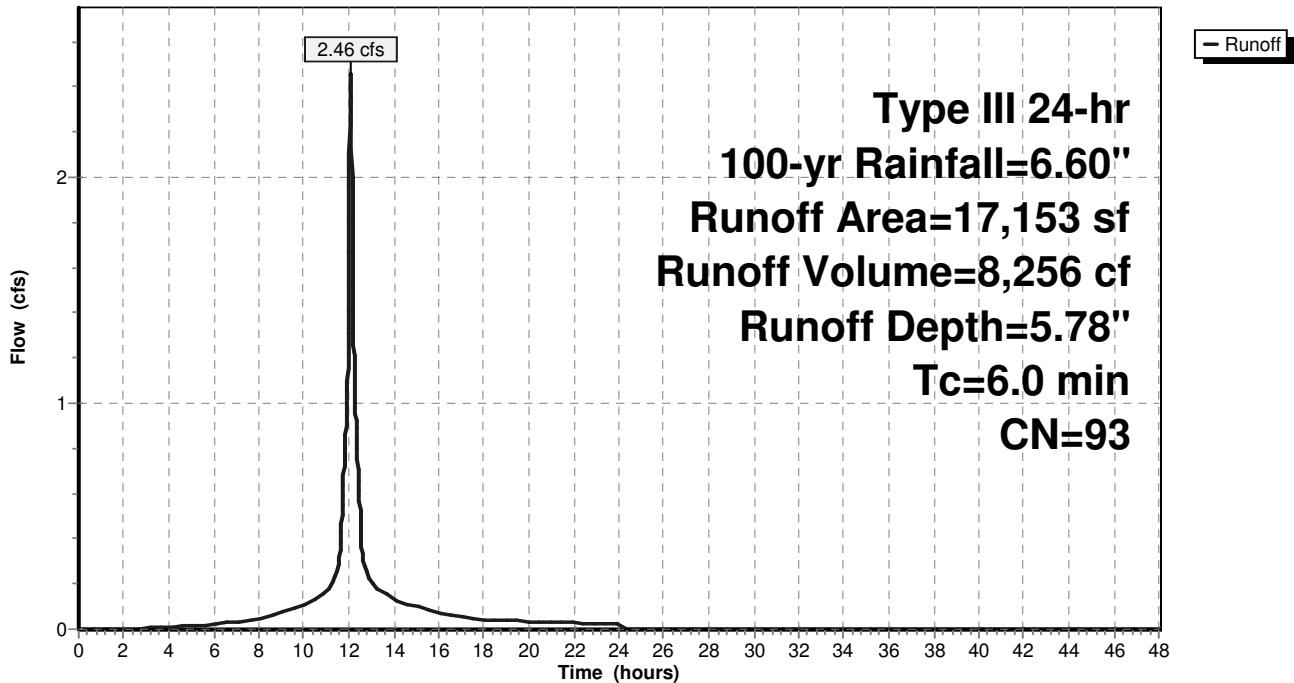
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-yr Rainfall=6.60"

	Area (sf)	CN	Description
*	14,816	98	Paved parking
	2,337	61	>75% Grass cover, Good, HSG B
	17,153	93	Weighted Average
	2,337		13.62% Pervious Area
	14,816		86.38% Impervious Area

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

## Subcatchment 7S: SUB2F

Hydrograph



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Type III 24-hr 100-yr Rainfall=6.60"

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## Summary for Subcatchment 8S: SUB3A

Runoff = 1.28 cfs @ 12.13 hrs, Volume= 4,354 cf, Depth= 3.49"

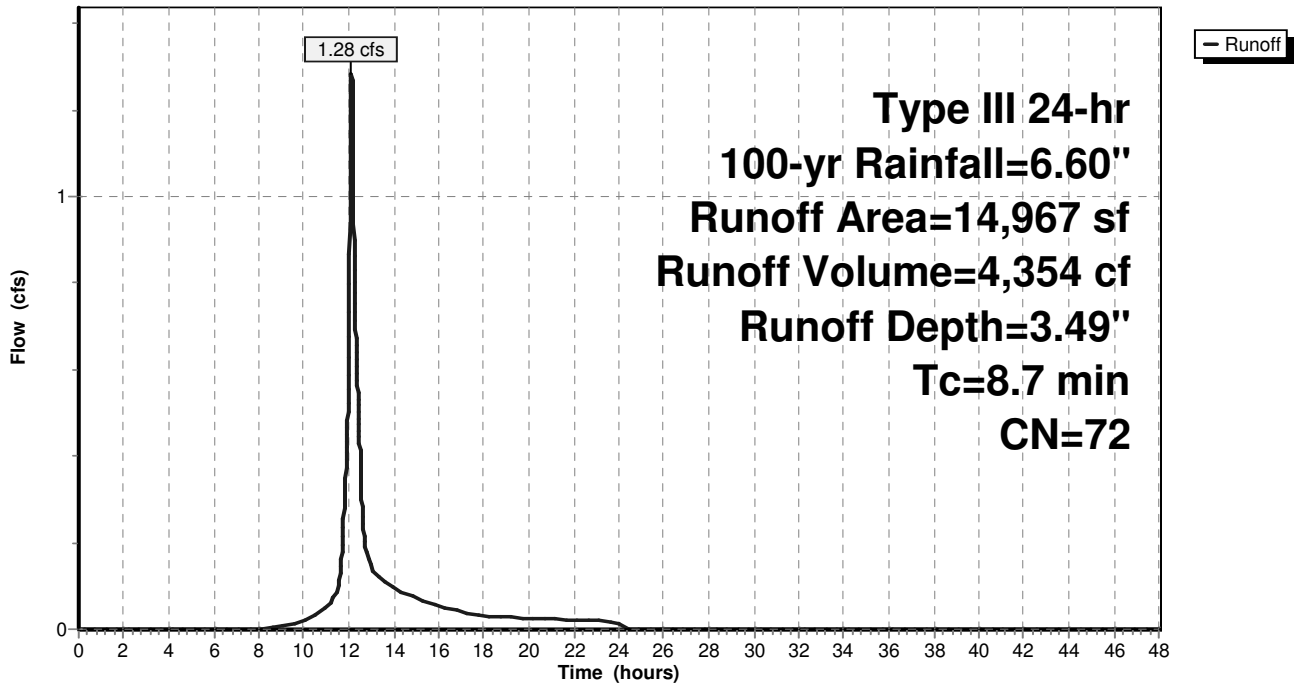
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-yr Rainfall=6.60"

	Area (sf)	CN	Description
*	4,541	98	Impervious
	10,426	61	>75% Grass cover, Good, HSG B
	14,967	72	Weighted Average
	10,426		69.66% Pervious Area
	4,541		30.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7					Direct Entry, NO CHANGE FROM EXISTING

## Subcatchment 8S: SUB3A

Hydrograph



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Proposed Conditions  
Type III 24-hr 100-yr Rainfall=6.60"

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## Summary for Subcatchment 9S: SUB4

Runoff = 5.11 cfs @ 12.08 hrs, Volume= 16,600 cf, Depth= 5.32"

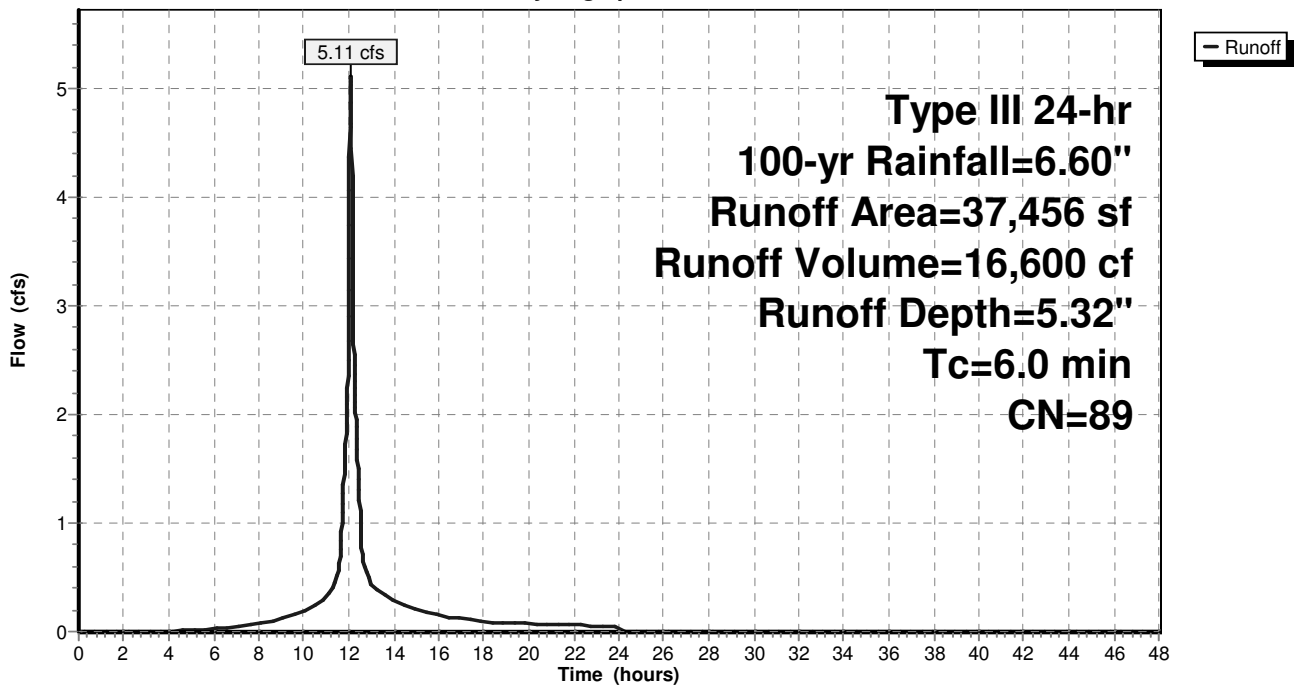
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-yr Rainfall=6.60"

	Area (sf)	CN	Description
*	5,435	98	Paved parking
*	22,782	98	Roofs
	9,239	61	>75% Grass cover, Good, HSG B
	37,456	89	Weighted Average
	9,239		24.67% Pervious Area
	28,217		75.33% Impervious Area

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

## Subcatchment 9S: SUB4

Hydrograph





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Type III 24-hr 100-yr Rainfall=6.60"

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## Summary for Subcatchment 10S: SUB5

Runoff = 4.76 cfs @ 12.20 hrs, Volume= 19,498 cf, Depth= 2.51"

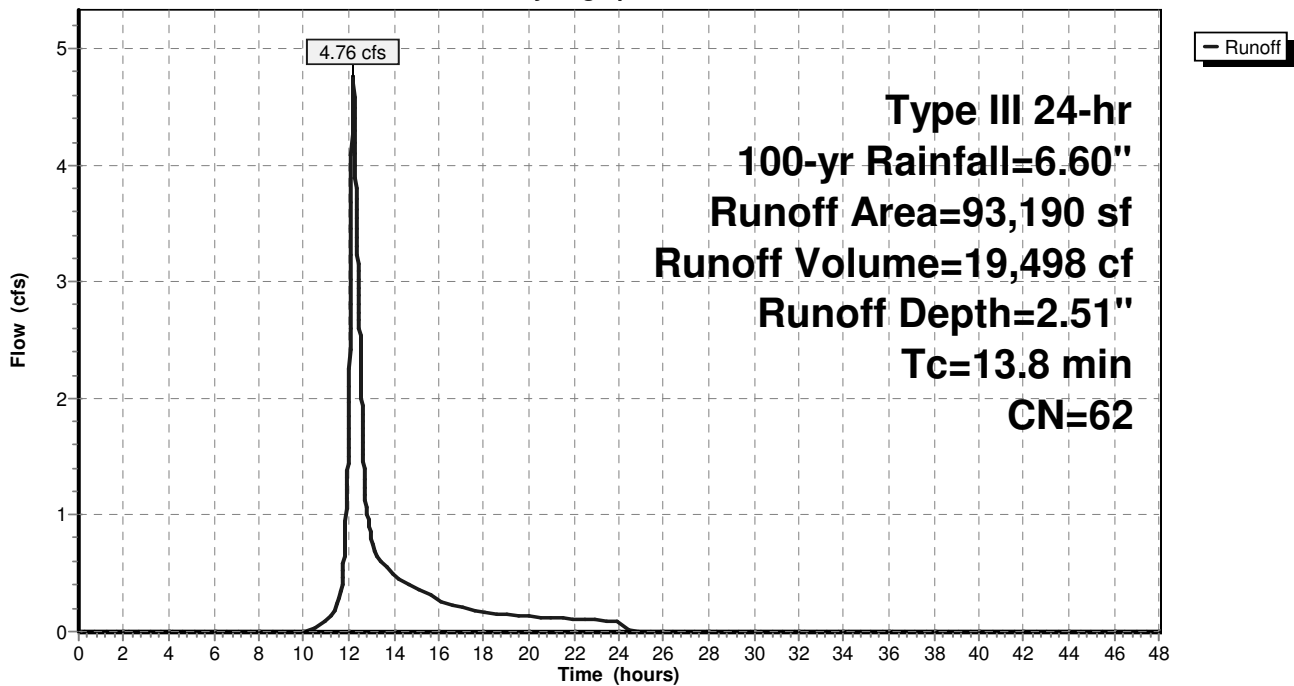
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-yr Rainfall=6.60"

	Area (sf)	CN	Description
*	7,678	98	Paved parking
	53,751	61	>75% Grass cover, Good, HSG B
	31,761	55	Woods, Good, HSG B
	93,190	62	Weighted Average
	85,512		91.76% Pervious Area
	7,678		8.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8					Direct Entry, NO CHANGE FROM EXISTING

## Subcatchment 10S: SUB5

Hydrograph



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Type III 24-hr 100-yr Rainfall=6.60"

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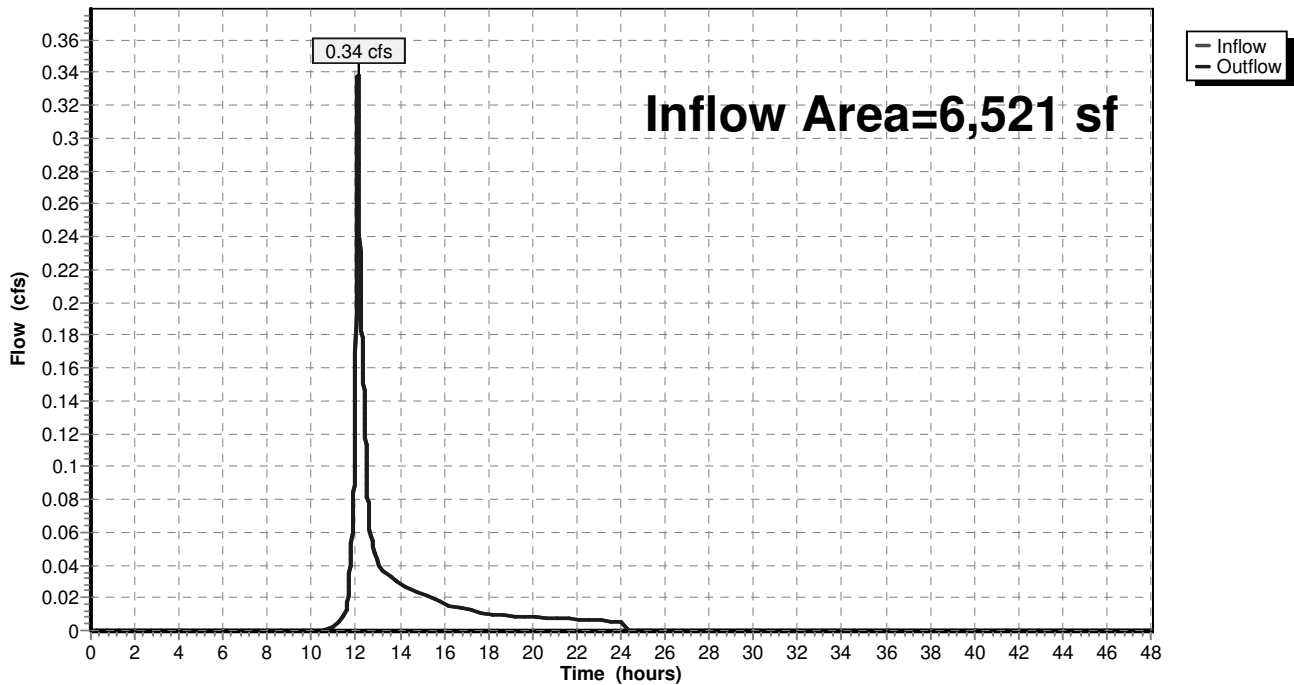
## Summary for Reach 12R: DP1-Northwest Property

Inflow Area = 6,521 sf, 0.00% Impervious, Inflow Depth = 2.05" for 100-yr event  
Inflow = 0.34 cfs @ 12.10 hrs, Volume= 1,115 cf  
Outflow = 0.34 cfs @ 12.10 hrs, Volume= 1,115 cf, Atten= 0%, Lag= 0.0 min

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

## Reach 12R: DP1-Northwest Property

Hydrograph



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Proposed Conditions  
Type III 24-hr 100-yr Rainfall=6.60"

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## Summary for Subcatchment 13S: SUB3B

Runoff = 1.35 cfs @ 12.08 hrs, Volume= 4,799 cf, Depth= 6.36"

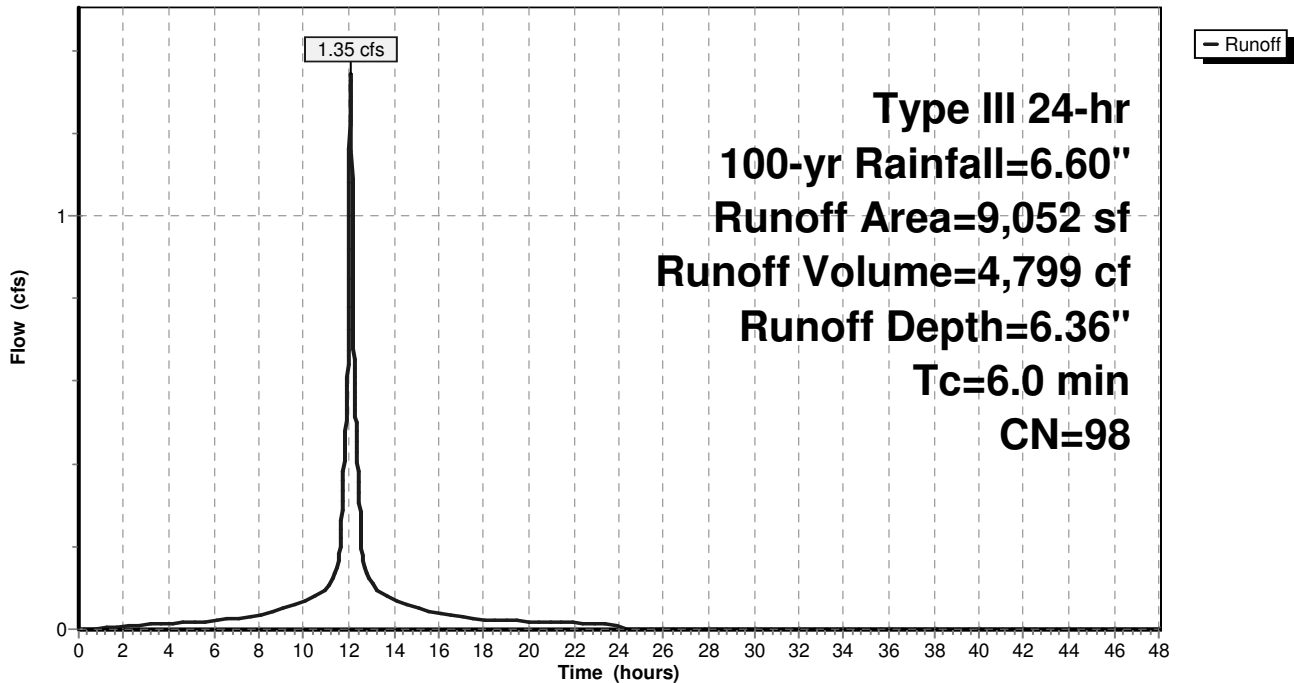
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-yr Rainfall=6.60"

Area (sf)	CN	Description
8,943	98	Roofs, HSG B
109	61	>75% Grass cover, Good, HSG B
9,052	98	Weighted Average
109		1.20% Pervious Area
8,943		98.80% Impervious Area

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

## Subcatchment 13S: SUB3B

Hydrograph



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## Summary for Pond 14P: Infiltration Trench

Inflow Area = 9,052 sf, 98.80% Impervious, Inflow Depth = 6.36" for 100-yr event  
 Inflow = 1.35 cfs @ 12.08 hrs, Volume= 4,799 cf  
 Outflow = 1.31 cfs @ 12.10 hrs, Volume= 4,799 cf, Atten= 3%, Lag= 1.1 min  
 Discarded = 0.01 cfs @ 3.22 hrs, Volume= 1,143 cf  
 Primary = 1.30 cfs @ 12.10 hrs, Volume= 3,656 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
 Peak Elev= 101.60' @ 12.10 hrs Surf.Area= 458 sf Storage= 419 cf

Plug-Flow detention time= 74.1 min calculated for 4,798 cf (100% of inflow)  
 Center-of-Mass det. time= 74.2 min ( 818.0 - 743.8 )

Volume	Invert	Avail.Storage	Storage Description
#1	99.50'	605 cf	<b>Stone (Prismatic)</b> Listed below (Recalc) 1,603 cf Overall - 90 cf Embedded = 1,513 cf x 40.0% Voids
#2	101.00'	90 cf	<b>12.0" Round Pipe Storage</b> Inside #1 L= 114.5'
		695 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
99.50	458	0	0
103.00	458	1,603	1,603

Device	Routing	Invert	Outlet Devices
#1	Primary	101.00'	<b>12.0" Round Culvert</b> L= 52.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 101.00' / 100.20' S= 0.0154 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	99.50'	<b>1.020 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.01 cfs @ 3.22 hrs HW=99.54' (Free Discharge)  
 ↑ **2=Exfiltration** (Exfiltration Controls 0.01 cfs)

**Primary OutFlow** Max=1.30 cfs @ 12.10 hrs HW=101.60' (Free Discharge)  
 ↑ **1=Culvert** (Inlet Controls 1.30 cfs @ 2.64 fps)

**Proposed HydroCAD**

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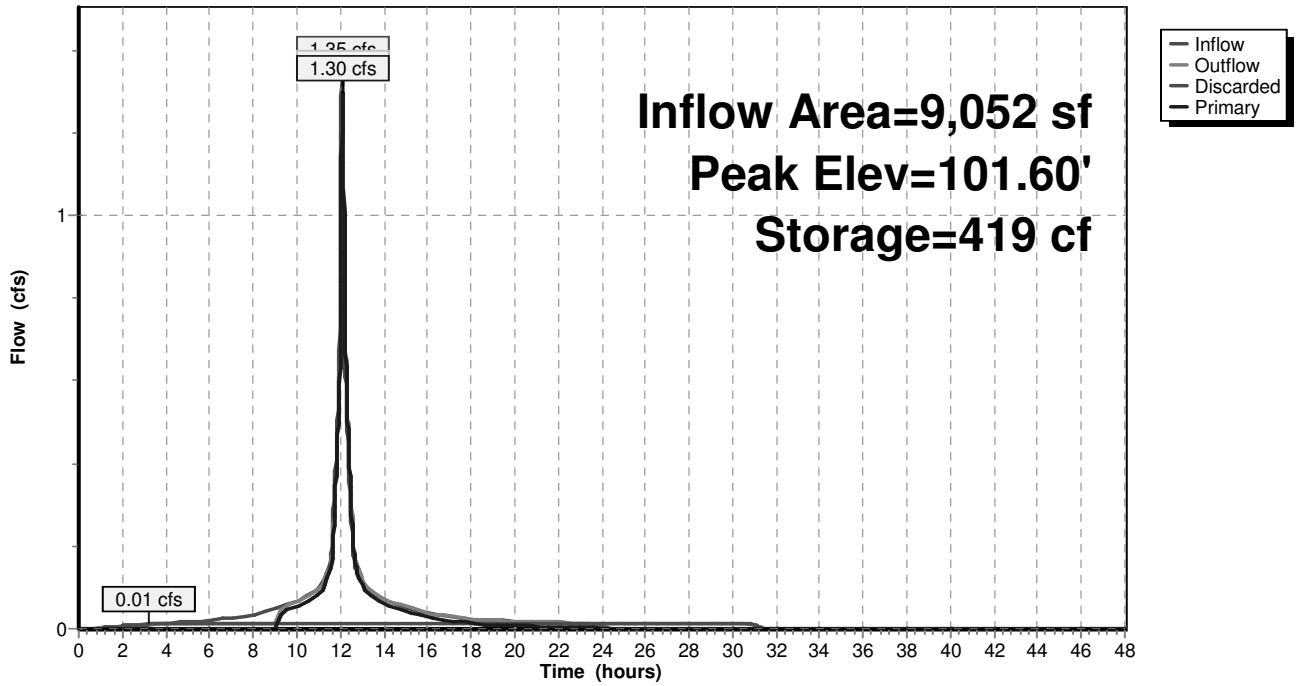
Proposed Conditions  
Type III 24-hr 100-yr Rainfall=6.60"

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**Pond 14P: Infiltration Trench**

Hydrograph



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Proposed Conditions  
Type III 24-hr 100-yr Rainfall=6.60"

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**Summary for Subcatchment 14S: SUB2G**

Runoff = 0.98 cfs @ 12.09 hrs, Volume= 3,141 cf, Depth= 2.42"

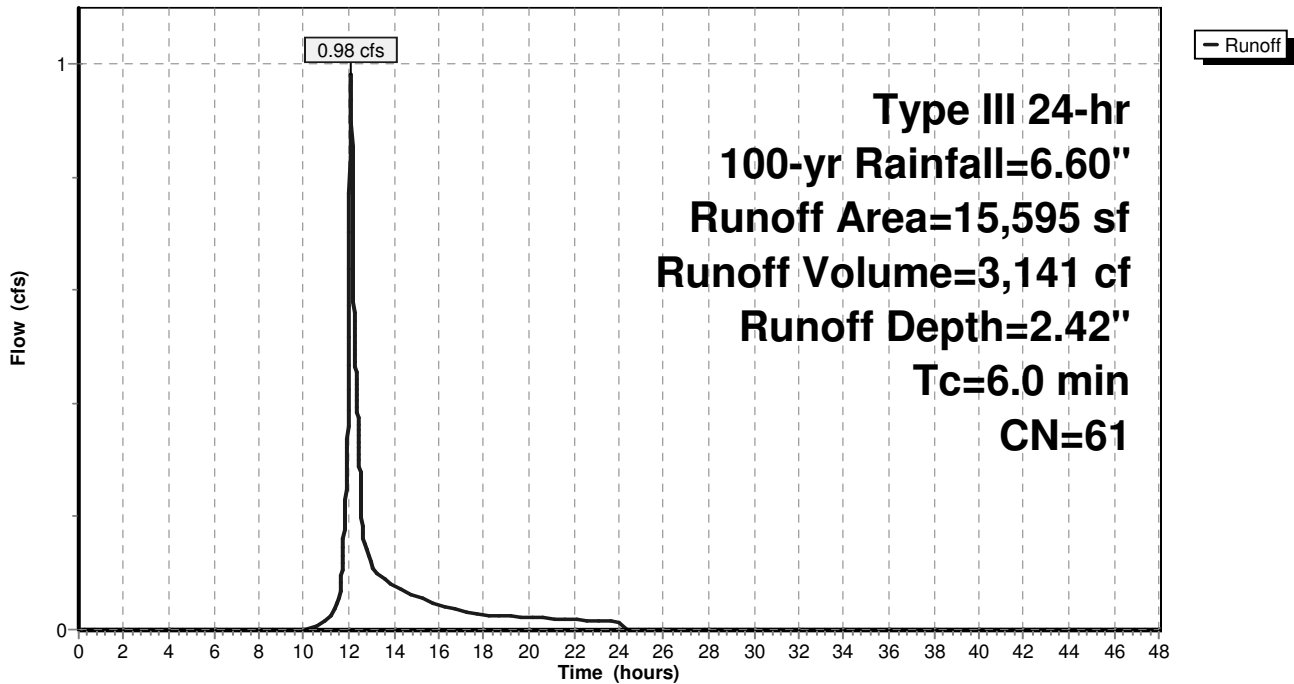
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-yr Rainfall=6.60"

Area (sf)	CN	Description
* 933	98	Paved parking
10,125	61	>75% Grass cover, Good, HSG B
4,537	55	Woods, Good, HSG B
15,595	61	Weighted Average
14,662		94.02% Pervious Area
933		5.98% Impervious Area

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

**Subcatchment 14S: SUB2G**

Hydrograph



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Proposed Conditions  
Type III 24-hr 100-yr Rainfall=6.60"

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## Summary for Subcatchment 15S: SUB

Runoff = 0.37 cfs @ 12.08 hrs, Volume= 1,325 cf, Depth= 6.36"

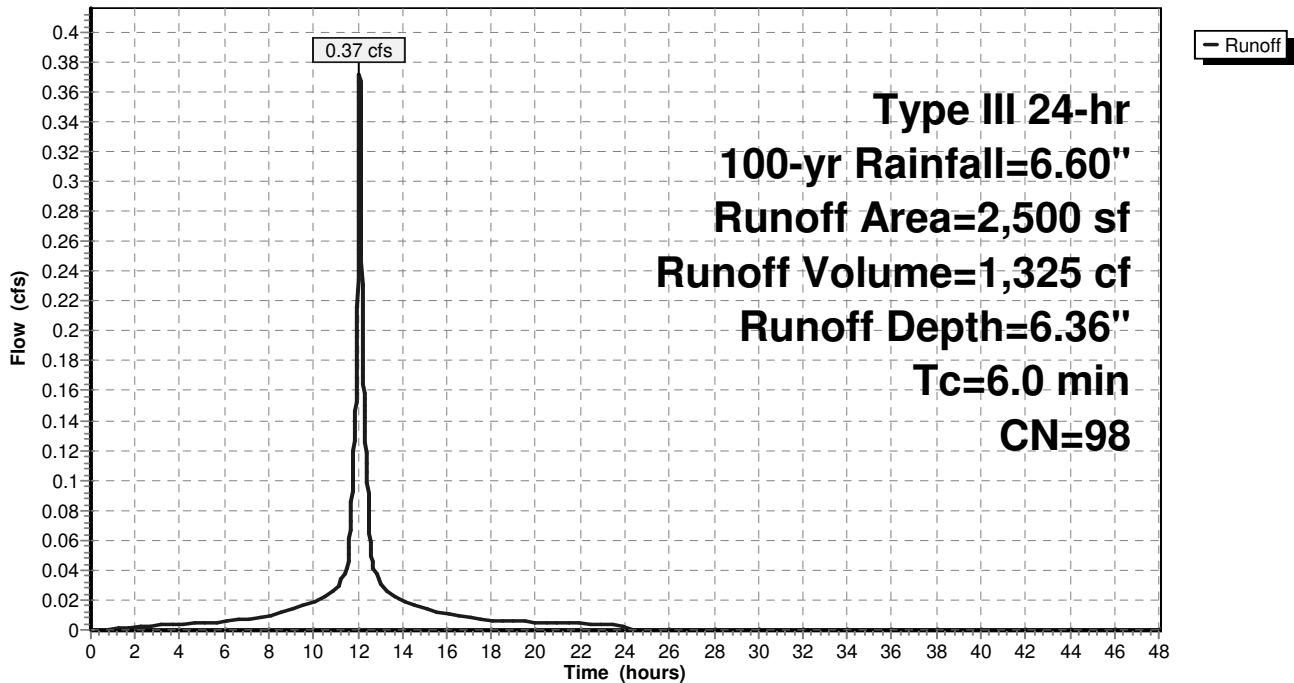
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-yr Rainfall=6.60"

Area (sf)	CN	Description
2,500	98	Roofs, HSG B
2,500		100.00% Impervious Area

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

## Subcatchment 15S: SUB

Hydrograph



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Type III 24-hr 100-yr Rainfall=6.60"

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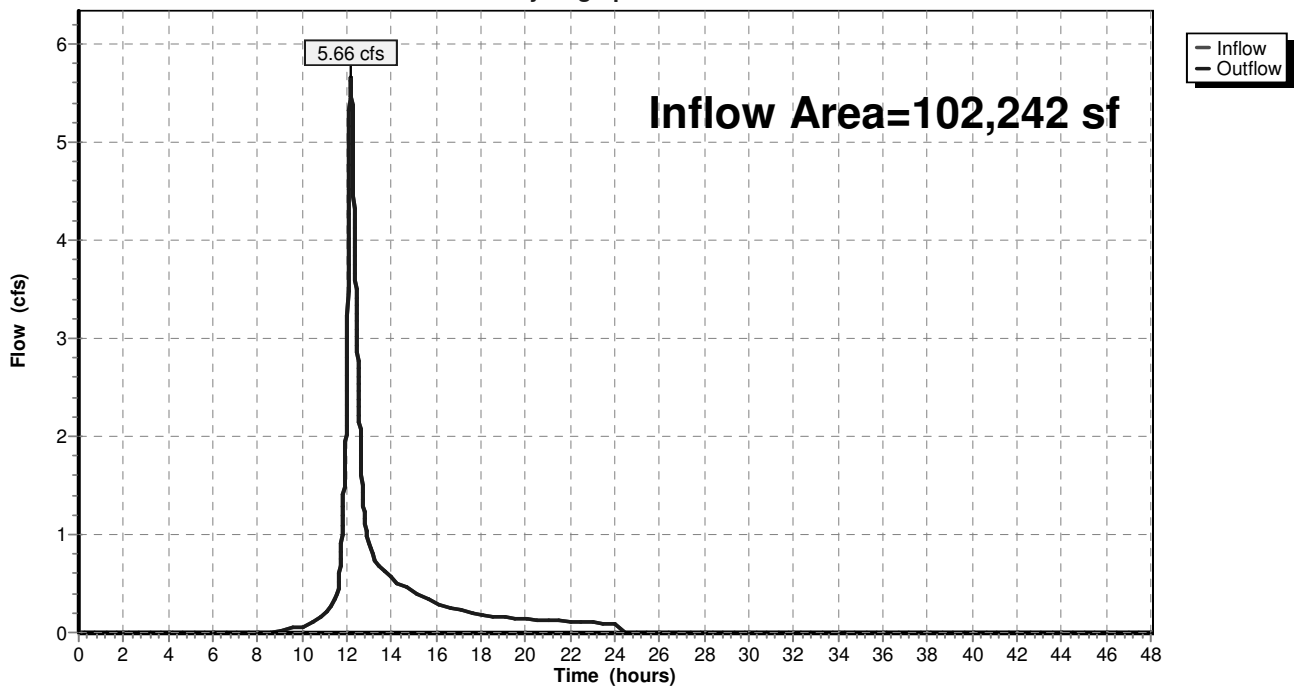
## Summary for Reach 16R: DP3-Eastern Property

Inflow Area = 102,242 sf, 16.26% Impervious, Inflow Depth = 2.72" for 100-yr event  
Inflow = 5.66 cfs @ 12.18 hrs, Volume= 23,154 cf  
Outflow = 5.66 cfs @ 12.18 hrs, Volume= 23,154 cf, Atten= 0%, Lag= 0.0 min

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

## Reach 16R: DP3-Eastern Property

Hydrograph





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Proposed Conditions  
Type III 24-hr 100-yr Rainfall=6.60"

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## Summary for Subcatchment 16S: SUB

Runoff = 5.88 cfs @ 12.08 hrs, Volume= 20,969 cf, Depth= 6.36"

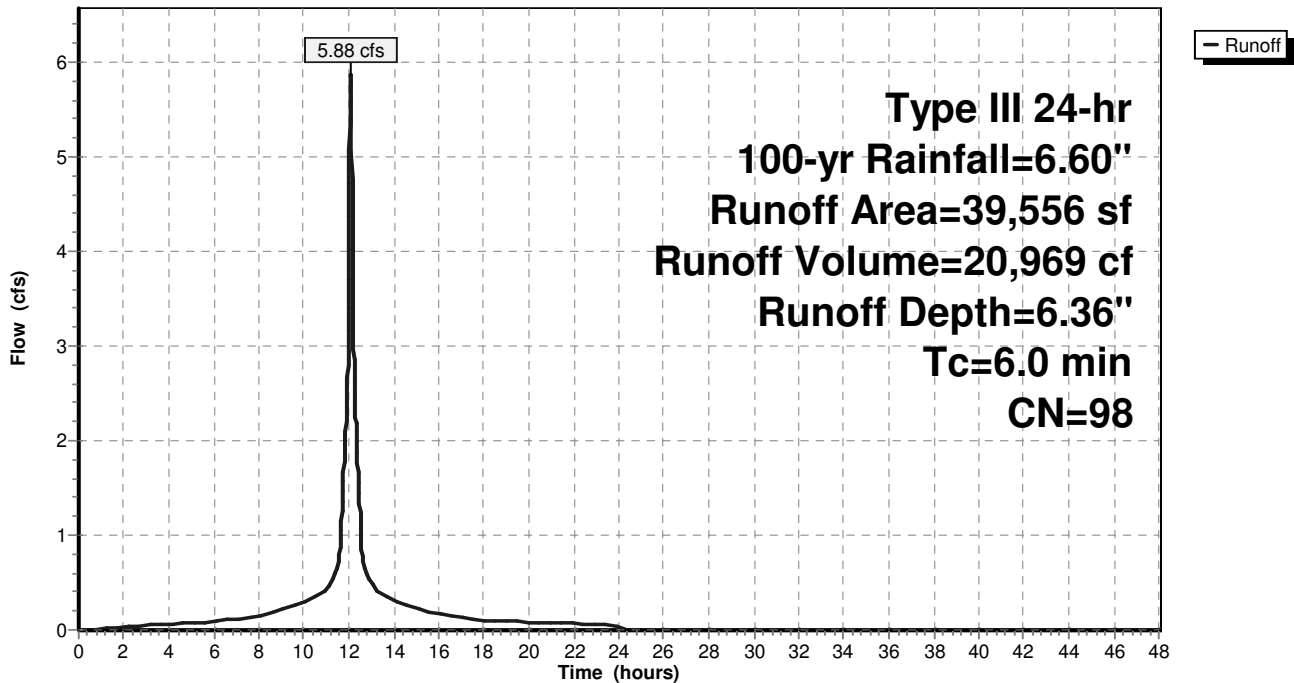
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-yr Rainfall=6.60"

Area (sf)	CN	Description
39,556	98	Roofs, HSG B
39,556		100.00% Impervious Area

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

## Subcatchment 16S: SUB

Hydrograph



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Type III 24-hr 100-yr Rainfall=6.60"

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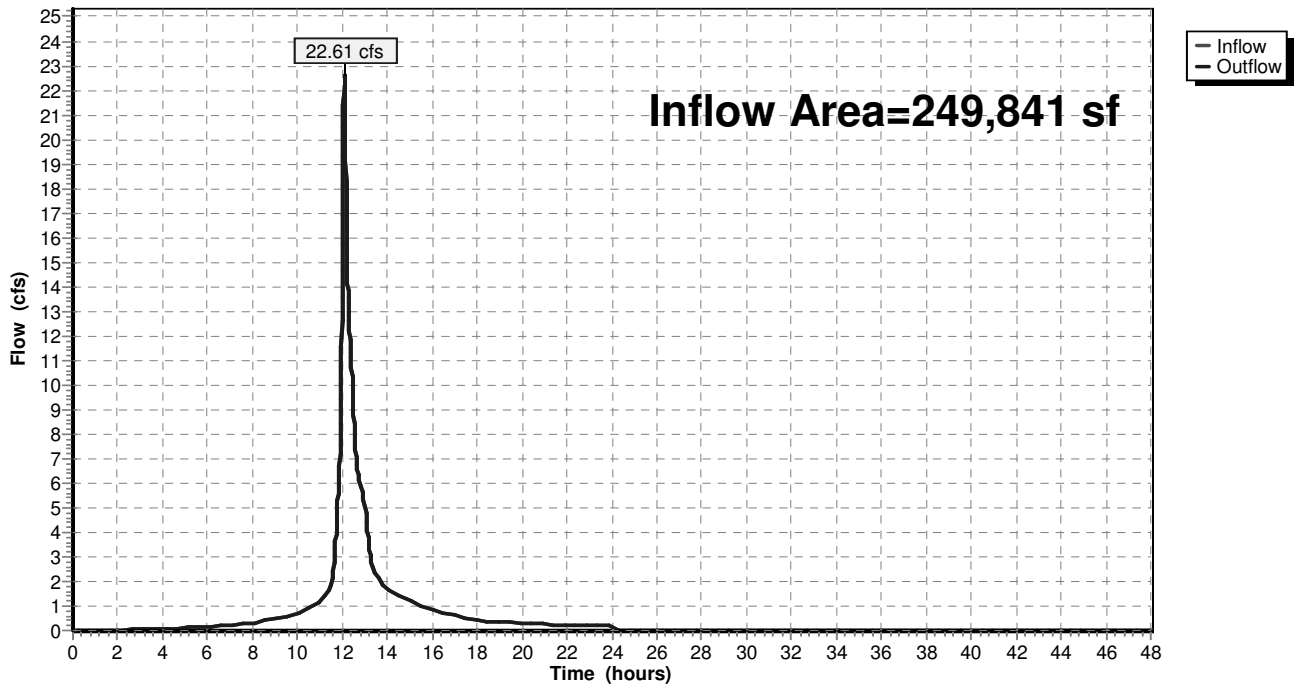
## Summary for Reach 17R: DP2-Wells Avenue

Inflow Area = 249,841 sf, 73.57% Impervious, Inflow Depth = 4.27" for 100-yr event  
Inflow = 22.61 cfs @ 12.09 hrs, Volume= 88,862 cf  
Outflow = 22.61 cfs @ 12.09 hrs, Volume= 88,862 cf, Atten= 0%, Lag= 0.0 min

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

## Reach 17R: DP2-Wells Avenue

Hydrograph



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Proposed Conditions  
Type III 24-hr 100-yr Rainfall=6.60"

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**Summary for Subcatchment 20S: SUB3B**

Runoff = 2.77 cfs @ 12.08 hrs, Volume= 9,295 cf, Depth= 5.78"

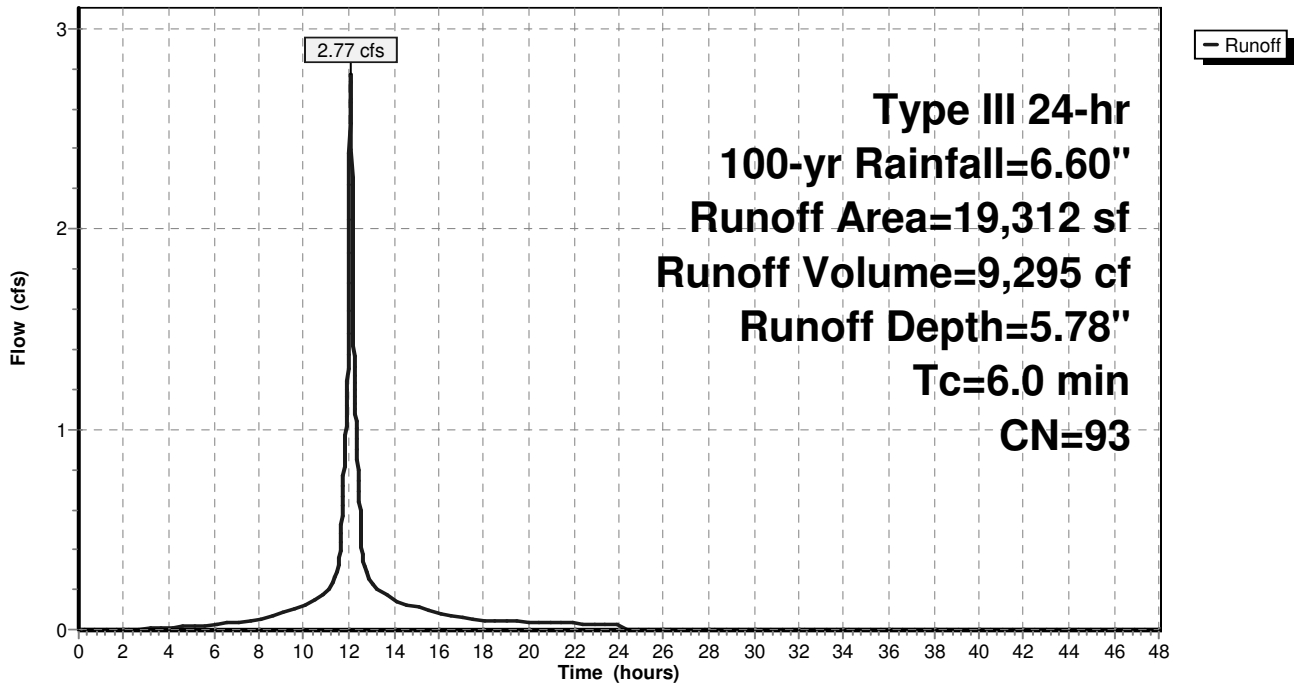
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-yr Rainfall=6.60"

	Area (sf)	CN	Description
*	14,089	98	Pavement
	2,823	61	>75% Grass cover, Good, HSG B
*	2,400	98	Pavement
	19,312	93	Weighted Average
	2,823		14.62% Pervious Area
	16,489		85.38% Impervious Area

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

**Subcatchment 20S: SUB3B**

Hydrograph



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Proposed Conditions  
Type III 24-hr 100-yr Rainfall=6.60"

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## Summary for Subcatchment 21S: SUB

Runoff = 1.13 cfs @ 12.08 hrs, Volume= 3,711 cf, Depth= 5.43"

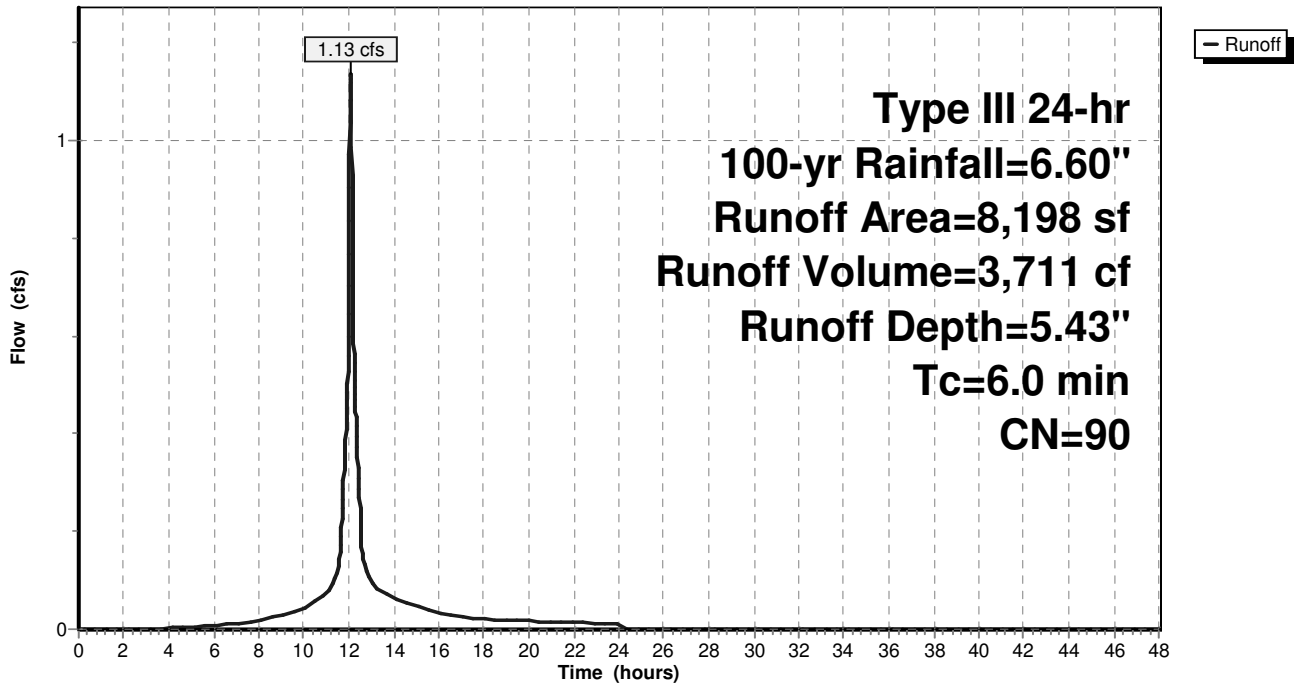
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-yr Rainfall=6.60"

Area (sf)	CN	Description
6,330	98	Paved parking, HSG B
1,868	61	>75% Grass cover, Good, HSG B
8,198	90	Weighted Average
1,868		22.79% Pervious Area
6,330		77.21% Impervious Area

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

## Subcatchment 21S: SUB

Hydrograph



**APPENDIX D**

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**Long-Term Pollution Prevention and Stormwater Operation and Maintenance Plan**

## **LONG-TERM POLLUTION PREVENTION PLAN AND STORMWATER OPERATION AND MAINTENANCE PLAN**

2 Wells Avenue, Newton, MA

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## 1.0 INTRODUCTION

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The purpose of this document is to specify the pollution prevention measures and stormwater management system operation and maintenance for the 2 Wells Avenue site. The Responsible Party indicated below shall implement the management practices outlined in this document and proactively conduct operations at the project site in an environmentally responsible manner. Compliance with this Manual does not in any way dismiss the responsible party, owner, property manager, or occupants from compliance with other applicable federal, state or local laws.

Responsible Party: TWO WELLS AVENUE, LLC  
145 Rosemary Street  
Needham, Massachusetts 02494

This Document has been prepared in compliance with City of Newton requirements and Standards 4 and 9 of the 2008 Massachusetts Department of Environmental Protection (MassDEP) Stormwater Management Standards, which state:

### Standard 4:

The Long Term Pollution Prevention Plan shall include the proper procedures for the following:

- Good housekeeping
- Storing materials and waste products inside or under cover
- Vehicle washing
- Routine inspections of stormwater best management practices
- Spill prevention and response
- Maintenance of lawns, gardens, and other landscaped areas
- Pet waste management
- Operation and management of septic systems
- Proper management of deicing chemicals and snow

### Standard 9:

The Long-Term Operation and Maintenance Plan shall at a minimum include:

- Stormwater management system(s) owner(s)
- The party or parties responsible for operation and maintenance, including how future property owners shall be notified of the presence of the stormwater management system and the requirement for operation and maintenance
- The routine and non-routine maintenance tasks to be undertaken after construction is complete and a schedule for implementing those tasks
- A plan that is drawn to scale and shows the location of all stormwater BMPs in each treatment train along with the discharge point
- A description of public safety features
- An estimated operations and maintenance budget

## **2.0 LONG-TERM POLLUTION PREVENTION PLAN**

---

The Responsible Party shall implement the following good housekeeping procedures at the project site to reduce the possibility of accidental releases and to reduce safety hazards.

### **2.1 Storage of Hazardous Materials**

To prevent leaks and spills, keep hazardous materials and waste products under cover or inside. Use drip pans or spill containment systems to prevent chemicals from entering the drainage system. Inspect storage areas for materials and waste products at least once per year to determine amount and type of the material on site, and if the material requires disposal.

Securely store liquid petroleum products and other liquid chemicals in federally- and state-approved containers. Restrict access to maintenance personnel and administrators.

### **2.2 Storage of Waste Products**

Collect and store all waste materials in securely lidded dumpster(s) or other secure containers as applicable to the material. Keep dumpster lids closed and the areas around them clean. Do not fill the dumpsters with liquid waste or hose them out. Sweep areas around the dumpster regularly and put the debris in the garbage, instead of sweeping or hosing it into the parking lot. Legally dispose of collected waste on a regular basis.

Segregate liquid wastes, including motor oil, antifreeze, solvents, and lubricants, from solid waste and recycle through hazardous waste disposal companies, whenever possible. Separate oil filters, batteries, tires, and metal filings from grinding and polishing metal parts from common trash items and recycle. These items are not trash and are illegal to dump. Contact a hazardous waste hauler for proper disposal to a hazardous waste collection center.

### **2.3 Spill Prevention and Response**

Implement spill response procedures for releases of significant materials such as fuels, oils, or chemical materials onto the ground or other area that could reasonably be expected to discharge to surface or groundwater.

- For minor spills, keep fifty (50) gallon spill control kits and Speedy Dry at all shop and work areas.
- Immediately contact applicable Federal, State, and local agencies for reportable quantities as required by law.
- Immediately perform applicable containment and cleanup procedures following a spill release.
- Promptly remove and dispose of all material collected during the response in accordance with Federal, State and local requirements. A licensed emergency response contractor may be required to assist in cleanup of releases depending on the amount of the release, and the ability of the Contractor to perform the required response.
- Reportable quantities of chemicals, fuels, or oils are established under the Clean Water Act and enforced through Massachusetts Department of Environmental Protection (DEP).

### **2.4 Minimize Soil Erosion**

Soil erosion facilitates mechanical transport of nutrients, pathogens, and organic matter to surface water bodies. Repair all areas where erosion is occurring throughout the project site. Stabilize bare soil with riprap, seed, mulch, or vegetation.

### **2.5 Maintenance of Lawns, Gardens, and other Landscaped Areas**

Dumping of lawn wastes, brush or leaves or other materials or debris is not permitted in any



Resource Area. Grass clippings, pruned branches and any other landscaped waste should be disposed of or composted in an appropriate location.

## **2.6 Management of Deicing Chemicals and Snow**

The qualified contractor selected for snow plowing and deicing shall be made fully aware of the requirements of this section.

No road salt (sodium chloride) shall be stored on-site. The use of magnesium chloride de-icing product with a 0.5 to 1.0 percent sodium chloride mix for snow and ice treatment is permitted. The product shall be stored in a locked room inside the building and shall be used at exterior stairs and walkways. The snow plow contractor shall adhere to these magnesium chloride use and storage requirements.

During typical snow plowing operations, snow shall be pushed to the designated snow removal areas noted on the Snow Storage Plan (Figure 2). Snow shall not be stockpiled in wetland resource areas or the 100-foot Buffer Zone, catch basins, or grass channels. In severe conditions where snow cannot be stockpiled on site, the snow shall be removed from the site and properly disposed of in accordance with DEP Guideline BRP601-01.

Before winter begins, the property owner and the contractor shall review snow plowing, deicing, and stockpiling procedures. Areas designated for stockpiling should be cleaned of any debris. Street and parking lot sweeping should be followed in accordance with the Operation and Maintenance Plan.

## **2.7 Coordination with other Permits and Requirements**

Certain conditions of other approvals affecting the long term management of the property shall be considered part of this Long Term Pollution Prevention Plan. The Owner shall become familiar with those documents and comply with the guidelines set forth in those documents.

## **3.0 STORMWATER MANAGEMENT SYSTEM OPERATION AND MAINTENANCE PLAN**

### **3.1 Introduction**

This Operation and Maintenance Plan (O&M Plan) for the 2 Wells Avenue site is required by the City of Newton Engineering Division and under Standard 9 of the 2008 MassDEP Stormwater Handbook to provide best management practices for implementing maintenance activities for the stormwater management system in a manner that minimizes impacts to wetland resource areas.

The Owner shall implement this O&M Plan and proactively conduct operations at the site in an environmentally responsible manner. Compliance with this O&M Plan does not in any way dismiss the Owner from compliance with other applicable Federal, State or local laws.

All stormwater best management practices (BMPs) shall be operated and maintained in accordance with the design plans and the Operation and Maintenance Plan approved by the issuing authority. The Owner shall:

- a. Maintain an operation and maintenance log for the last three years, including inspections, repairs, replacement and disposal (for disposal the log shall indicate the type of material and the disposal location). This is a rolling log in which the responsible party records all operation and maintenance activities for the past three years; and
- b. Make this log available to the City of Newton upon request.

### **3.2 Stormwater Operation and Maintenance Requirements**

Inspect and maintain the stormwater management system as directed below. Refer to the Stormwater Management System Location Map (Figure 1) for the location of each component of the system. Repairs to any component of the system shall be made as soon as possible to prevent any potential pollutants (including silt) from entering the resource areas.

#### Deep Sump and Hooded Catch Basins

Inspect catch basins four times per year, including after the foliage season. Other inspection and maintenance requirements include:

- Remove organic material, sediment and hydrocarbons four times per year or whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin.
- Always clean out catch basins after street sweeping. If any evidence of hydrocarbons is found during inspection, the material immediately remove using absorbent pads or other suitable measures and dispose of legally. Remove other accumulated debris as necessary.
- Transport and disposal of accumulated sediment off-site shall be in accordance with applicable local, state and federal guidelines and regulations.

#### Area Drains

Inspect area drains at least once per month and remove debris from the grate. Other inspection and maintenance requirements include:

- Clean out accumulated sediments at least once per year and more frequently as necessary.
- Transport and disposal of accumulated sediment off-site shall be in accordance with applicable local, state and federal guidelines and regulations.

#### Water Quality Units (Proprietary Separators)

Maintain water quality units according the recommendations set forth by the manufacturer. General inspection and maintenance procedures for proprietary devices are provided below:

- Inspect units following completion of construction, prior to being put into service.
- Inspect units at least twice per year following installation and no less than once per year thereafter.
- Inspect units immediately after any oil, fuel or chemical spill.
- All inspections shall include checking the oil level and sediment depth in the unit. Removal of sediments/oils shall occur per manufacturer recommendations.
- A licensed waste management company shall remove captured petroleum waste products from any oil, chemical or fuel spills and dispose.
- OSHA confined space entry protocols shall be followed if entry into the unit is required.

#### Tree Box Filter

The tree box filter shall be inspected twice per year during the first year after construction. In subsequent years, the swales shall be inspected annually and after rain events greater than 3 inches in 24 hours. Inspection and maintenance procedures for tree box filters are provided below:

- During and after storm events, the length of time standing water remains in the tree box filters shall be recorded:
  - If the time is greater than 72 hours, thoroughly inspect the basin for signs of clogging.
  - A corrective action plan shall be developed by a qualified professional to restore infiltrative function. Immediate action shall be taken to implement these corrective measures.
- Inspect and remove trash from surface of filter.
- Inspect surface of filter for erosion and repair as necessary. Remulch void areas.
- Remove and replace all dead and diseased trees that cannot be treated.

#### Biofiltration Swales

Biofiltration swales shall be inspected twice per year during the first year after construction. In subsequent years, the swales shall be inspected annually and after rain events greater than 3 inches in 24 hours. Inspection and maintenance procedures for drainage channels are provided below:

- Inspect the riprap on the channel bottom and side slopes for signs of erosion and formation of rills and gullies. Replace riprap as necessary.
- Remove accumulated trash and debris.
- Remove sediment as needed. Use hand methods (i.e. a person with a shovel) when cleaning to minimize disturbance to vegetation and underlying soils.
- Snow shall be cleared from swales within 24-hours of a snow storm event.

#### Subsurface Infiltration System

- Inspect subsurface infiltration system twice per year. Inspect the inlets and observation ports to determine if there is accumulated sediment within the system. Remove all debris and accumulated sediment that may clog the system.

### **3.3 Street Sweeping**

Perform street sweeping at least twice per year, whenever there is significant debris present on roads and parking lots. Street sweeping shall occur in the spring and fall. Sweepings must be handled and disposed of properly according to local and state regulations.

### **3.4 Repair of the Stormwater Management System**

The stormwater management system shall be maintained. The repair of any component of the

system shall be made as soon as possible to prevent any potential pollutants including silt from entering the resource areas or the existing closed drainage system.

### **3.5 Reporting**

The Owner shall maintain a record of drainage system inspections and maintenance (per this Plan) and submit maintenance records to the City of Newton upon request.

INSPECTION CHECKLIST (TREE BOX FILTER)		
<b>Location:</b> <b>Date:</b> <b>Time:</b> <b>Date Since Last Rain Event:</b>		<b>Inspector:</b> <b>Site Conditions:</b>
Inspection Items	Satisfactory (S) or Unsatisfactory (U)	Comments/Corrective Action
<b>Initial Inspection After Planting</b>		
Plants are stable, roots not exposed	S              U	
Surface is at design level	S              U	
Overflow bypass/inlet is functional	S              U	
<b>Debris Cleanup (2 times a year minimum, Spring &amp; Fall)</b>		
Litter, leaves, and dead vegetation removed from the system	S              U	
Prune perennial vegetation	S              U	
<b>Standing Water (1 time a year, After large storm events)</b>		
No evidence of standing water after 72 hours	S              U	
<b>Short Circuiting &amp; Erosion (1 time a year, After large storm events)</b>		
No evidence of animal burrows or other holes	S              U	
No evidence of erosion	S              U	
<b>Drought Conditions (As needed)</b>		
Water plants as needed	S              U	
Dead or dying plants	S              U	
<b>Overflow Bypass/Inlet Inspection (1 time a year, After large storm events)</b>		
No evidence of blockage or accumulated leaves	S              U	
Good condition, no need for repair	S              U	
<b>Vegetation Health (once every 3 years)</b>		
Dead or decaying plants removed from the system	S              U	
<b>Corrective Action Needed</b>		<b>Due Date</b>
1.		
2.		
3.		
4.		

<b>INSPECTION CHECKLIST (DEEP SUMP AND HOODED CATCH BASINS)</b>			
<b>Location:</b>		<b>Inspector:</b> <b>Site Conditions:</b>	
<b>Date:</b>	<b>Time:</b>		
<b>Date Since Last Rain Event:</b>			
<b>Inspection Items</b>	<b>Satisfactory (S) or Unsatisfactory (U)</b>	<b>Comments/Corrective Action</b>	
<b>Inspections (2 times a year minimum, Spring &amp; Fall)</b>			
Visual evidence of trash, debris or dumping	S U		
Dead animals or vegetation that could generate odors or gases and could cause complaints	S U		
Evidence of oil, gasoline, contaminants, or other pollutants	S U		
Condition of basin. Is there a safety, function, or design problem (need for repair)	S U		
Vegetation blocking more than 10% of the basin opening (lawn areas)	S U		
Trash and debris blocking more than 20% of grate surface inlet capacity	S U		
Missing grate, missing or broken grate members	S U		
Grout fillet is separated or cracked wider than ½ inch and longer than 1 foot at the joint of outlet pipe; evidence of soil entering through cracks	S U		
Trash or debris in the basin exceeds 50% of the sump depth from the bottom of basin to invert of the outlet pipe; less than 6 inches clearance from the debris surface to the invert of the outlet pipe	S U		
Sediment in the basin exceeds 50% of the sump depth from the bottom of basin to invert of the outlet pipe; less than 6 inches clearance from the debris surface to the invert of the outlet pipe	S U		
Trash or debris blocking outlet pipe	S U		
<b>Debris Cleanup (2 times a year minimum, Spring &amp; Fall)</b>			
Remove and legally dispose sediment, trash, and debris	S U		
Remove and legally dispose contaminants or pollutants	S U		
Repair catch basin (as necessary)	S U		
Replace catch basin castings (as necessary)			
<b>Controlling Run-On (2-4 times a year)</b>			
Adjacent vegetated areas show no signs of erosion and run-on to catch basin	S U		
<b>Corrective Action Needed</b>		<b>Due Date</b>	
1.			
2.			
3.			
4.			

INSPECTION CHECKLIST (SUBSURFACE INFILTRATION SYSTEM)		
<b>Location:</b> <b>Date:</b> <b>Time:</b> <b>Date Since Last Rain Event:</b>		<b>Inspector:</b> <b>Site Conditions:</b>
Inspection Items	Satisfactory (S) or Unsatisfactory (U)	Comments/Corrective Action
<b>Inspections (1 time a year, After large storm events)</b>		
Visual evidence of trash, debris or dumping	S              U	
Evidence of oil, gasoline, contaminants, or other pollutants in manhole sumps	S              U	
Condition of manholes. Is there a safety, function, or design problem (need for repair)	S              U	
Grout fillet is separated or cracked wider than ½ inch and longer than 1 foot at the joint of inlet/outlet pipes; evidence of soil entering through cracks	S              U	
Sediment observed in piping or manhole sumps	S              U	
Trash or debris blocking inlet/outlet pipe	S              U	
Condition of manhole frame and cover	S              U	
Manhole rungs are determined to be unsafe (missing rungs, misaligned, cracked)		
<b>Maintenance (1 time a year, After large storm events)</b>		
Remove and legally dispose sediment, trash, and debris	S              U	
Remove and legally dispose contaminants or pollutants	S              U	
Repair manholes (as necessary)	S              U	
Replace manhole castings (as necessary)		
<b>Corrective Action Needed</b>		<b>Due Date</b>
1.		
2.		
3.		
4.		

INSPECTION CHECKLIST (WATER QUALITY UNITS)		
<b>Location:</b> <b>Date:</b> _____ <b>Time:</b> _____ <b>Date Since Last Rain Event:</b> _____		<b>Inspector:</b> _____ <b>Site Conditions:</b> _____
<b>Inspection Items</b>	<b>Satisfactory (S) or Unsatisfactory (U)</b>	<b>Comments/Corrective Action</b>
<b>Inspections (2 times a year minimum, Spring &amp; Fall)</b>		
Visual evidence of trash, debris or dumping	S          U	
Evidence of oil, gasoline, contaminants, or other pollutants	S          U	
Condition of structure. Is there a safety, function, or design problem (need for repair)	S          U	
Condition of frame and cover	S          U	
Sediment in the basin exceeds manufacturer recommended levels	S          U	
Trash or debris blocking inlet/outlet pipe	S          U	
<b>Debris Cleanup (2 times a year minimum, Spring &amp; Fall)</b>		
Remove and legally dispose sediment, trash, and debris	S          U	
Remove and legally dispose contaminants or pollutants	S          U	
Repair structure (as necessary)	S          U	
Replace structure castings (as necessary)	S          U	
<b>Corrective Action Needed</b>		<b>Due Date</b>
1.		
2.		
3.		
4.		



<b>INSPECTION CHECKLIST (AREA DRAINS)</b>			
<b>Location:</b>		<b>Inspector:</b> <b>Site Conditions:</b>	
<b>Date:</b>	<b>Time:</b>		
<b>Date Since Last Rain Event:</b>			
<b>Inspection Items</b>	<b>Satisfactory (S) or Unsatisfactory (U)</b>	<b>Comments/Corrective Action</b>	
<b>Inspections (2 times a year minimum, Spring &amp; Fall)</b>			
Visual evidence of trash, debris or dumping	S U		
Dead animals or vegetation that could generate odors or gases and could cause complaints	S U		
Evidence of oil, gasoline, contaminants, or other pollutants	S U		
Condition of basin. Is there a safety, function, or design problem (need for repair)	S U		
Vegetation blocking more than 10% of the basin opening (lawn areas)	S U		
Trash and debris blocking more than 20% of grate surface inlet capacity	S U		
Missing grate, missing or broken grate members	S U		
Trash or debris in the basin exceeds 50% of the sump depth from the bottom of basin to invert of the outlet pipe; less than 6 inches clearance from the debris surface to the invert of the outlet pipe	S U		
Sediment in the basin exceeds 50% of the sump depth from the bottom of basin to invert of the outlet pipe; less than 6 inches clearance from the debris surface to the invert of the outlet pipe	S U		
Trash or debris blocking outlet pipe	S U		
<b>Debris Cleanup (2 times a year minimum, Spring &amp; Fall)</b>			
Remove and legally dispose sediment, trash, and debris	S U		
Remove and legally dispose contaminants or pollutants	S U		
Repair area drain (as necessary)	S U		
Replace area drain castings (as necessary)			
<b>Controlling Run-On (2-4 times a year)</b>			
Adjacent vegetated areas show no signs of erosion and run-on to area drain	S U		
<b>Corrective Action Needed</b>		<b>Due Date</b>	
1.			
2.			
3.			
4.			

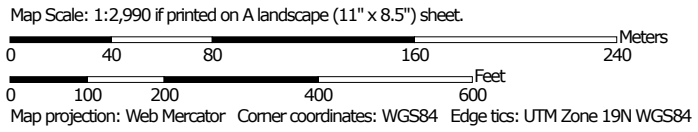
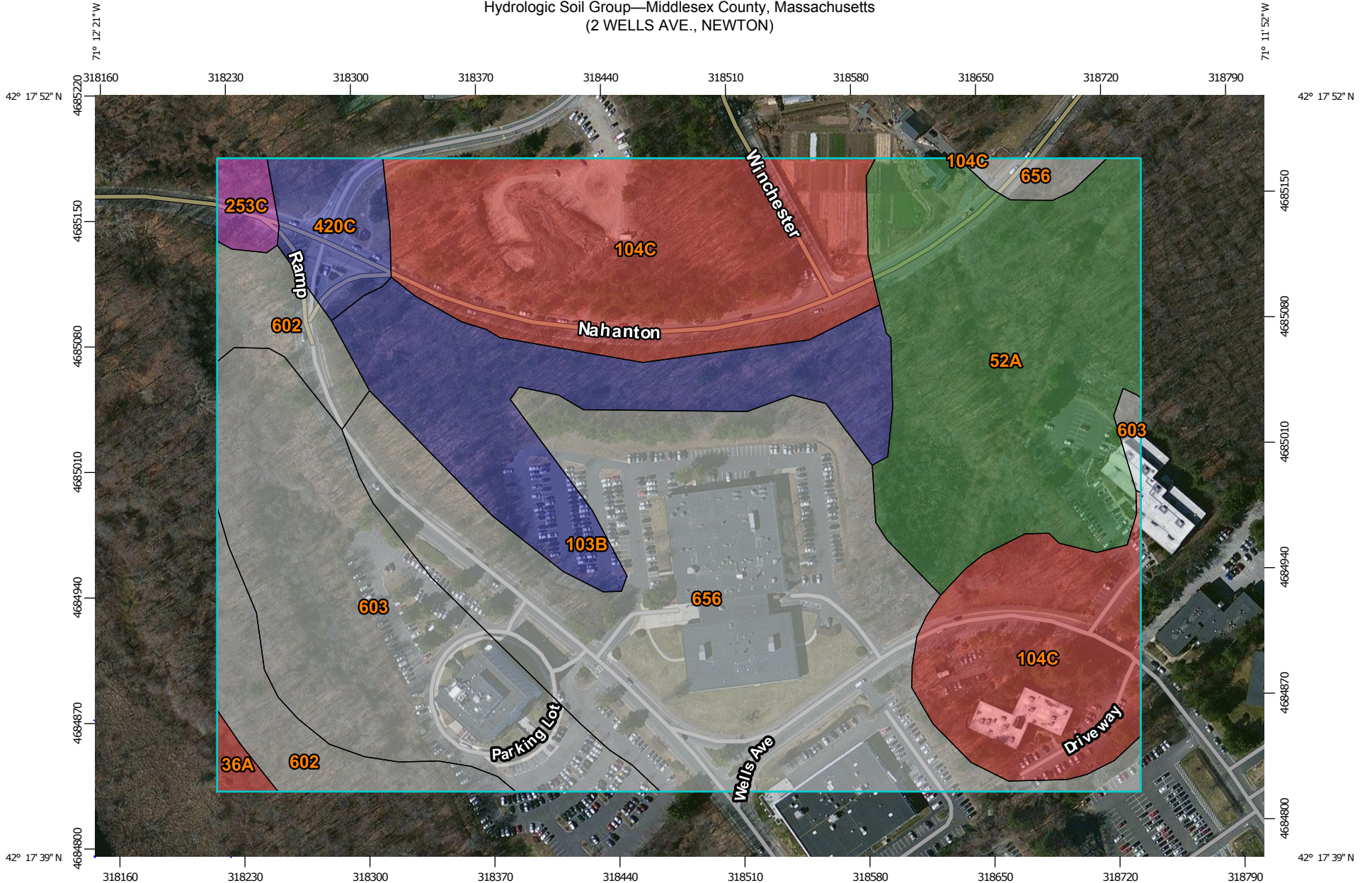
## **APPENDIX E**

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### **Soil Investigations**


NRCS Soil Maps and Descriptions  
Soil Test Pit Logs and Percolation Test Results

Hydrologic Soil Group—Middlesex County, Massachusetts  
(2 WELLS AVE., NEWTON)



## MAP LEGEND

### Area of Interest (AOI)









 Area of Interest (AOI)

### Soils

#### Soil Rating Polygons





-  A
-  A/D
-  B
-  B/D
-  C
-  C/D
-  D
-  Not rated or not available

#### Soil Rating Lines


-  A
-  A/D
-  B
-  B/D
-  C
-  C/D
-  D
-  Not rated or not available

#### Soil Rating Points






-  A
-  A/D
-  B
-  B/D

-  C
-  C/D
-  D
-  Not rated or not available


### Water Features

 Streams and Canals

### Transportation

-  Rails
-  Interstate Highways
-  US Routes
-  Major Roads
-  Local Roads

### Background

 Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

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

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

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

Source of Map: Natural Resources Conservation Service  
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>  
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: Middlesex County, Massachusetts  
Survey Area Data: Version 13, Dec 17, 2013

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

Date(s) aerial images were photographed: Mar 30, 2011—May 1, 2011

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.

## Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Middlesex County, Massachusetts (MA017)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
36A	Saco mucky silt loam, 0 to 1 percent slopes	D	0.2	0.4%
52A	Freetown muck, 0 to 1 percent slopes	A/D	7.5	16.6%
103B	Charlton-Hollis-Rock outcrop complex, 3 to 8 percent slopes	B	4.6	10.1%
104C	Hollis-Rock outcrop-Charlton complex, 3 to 15 percent slopes	D	10.3	22.8%
253C	Hinckley loamy sand, 8 to 15 percent slopes	A	0.4	0.9%
420C	Canton fine sandy loam, 8 to 15 percent slopes	B	1.2	2.6%
602	Urban land		2.5	5.4%
603	Urban land, wet substratum		6.4	14.1%
656	Udorthents-Urban land complex		12.3	27.2%
<b>Totals for Area of Interest</b>			<b>45.3</b>	<b>100.0%</b>



## Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

## Rating Options

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff:* None Specified

*Tie-break Rule:* Higher



Commonwealth of Massachusetts

City/Town of

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

A. Facility Information

Two Wells Avenue LLC C/O BAL Management LLC

Owner Name

2 Wells Avenue

Street Address

Newton

City

MA

State

Map/Lot #

02459

Zip Code

B. Site Information

1. (Check one) [X] New Construction [ ] Upgrade [ ] Repair

2. Soil Survey Available? [X] Yes [ ] No

Charlton-Hollis-Rock / Udorthents-Urban land Complex

Soil Name

If yes: USGA Source 103B/656 Soil Map Unit

Rocky Shallow Depth the groundwater

Soil Limitations

3. Surficial Geological Report Available? [X] Yes [ ] No

Glacio - Fluvial Deposits

Geologic/Parent Material

If yes: 2006/USGS Year Published/Source 1" =250k' Publication Scale Map Unit

Glacial Outwash and Drift that includes outwash, eskers, kames

Landform

4. Flood Rate Insurance Map

Above the 500-year flood boundary? [X] Yes [ ] No

Within the 500-year flood boundary? [ ] Yes [X] No

Within the 100-year flood boundary? [ ] Yes [X] No

Within a velocity zone? [ ] Yes [X] No

5. Wetland Area: Wetlands Conservancy Program Map

07/14

Month/Year

N/A Map Unit DEP 12k Map (Charles River Easterly Wetland Area) Name

6. Current Water Resource Conditions (USGS):

Range: [ ] Above Normal [X] Normal [ ] Below Normal

7. Other references reviewed:



Commonwealth of Massachusetts

City/Town of

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

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

Deep Observation Hole Number: #1 Date: 8/26/2014 Time: 7:45 am Weather: Sunny (75 degrees)

1. Location

Ground Elevation at Surface of Hole: tbd Location (identify on plan): Test Hole #1 (See Attached Plan)

2. Land Use: Parking Lot (e.g., woodland, agricultural field, vacant lot, etc.) None Apparent Surface Stones: 3% Slope (%) Middle of parking lot flat area

3. Distances from: Open Water Body: 1000\* feet Drainage Way: NA feet Possible Wet Area: 500' feet Property Line: 150' feet Drinking Water Well: NA feet Other: NA feet

4. Parent Material: Sand, Gravel, Silt Unsuitable Materials Present: [X] Yes [ ] No If Yes: [ ] Disturbed Soil [X] Fill Material [ ] Impervious Layer(s) [ ] Weathered/Fractured Rock [ ] Bedrock

5. Groundwater Observed: [ ] Yes [X] No If yes: NA Depth Weeping from Pit NA Depth Standing Water in Hole Estimated Depth to High Groundwater: 70" down inches tbd elevation

\* -Charles River





Commonwealth of Massachusetts

City/Town of

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

**C. On-Site Review** (continued)

Test Hole #1

Deep Observation Hole Number: \_\_\_\_\_

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
3"-0"	PAVE	NA				NA					
0-14"	FILL	10YR5/6				Sandy Loam	2%	0%	Massive	Friable	
14"-28"	Buried A	10YR5/2				Sandy Loam	3%	1%	Granular	Friable	
28"-38"	Buried B	10YR5/8				Sandy Loam	4%	2%	Massive	Friable	
38"-62"	C1	10YR5/4				Loamy Sand*1	30%	10%	Massive	Friable	
62"-114"	C2	10YR5/4	70"	Con- 10YR5/8	5%	Loamy Sand*2	30%	4%	Massive	Friable	
114"-118"	C3	10YR6/3	↓	↓	↓	Silty Loamy Sand*3	4%	1%	Massive	Friable	

Additional Notes:

\*1 Many round stones, very coarse, close to a Sand.

\*2 - Fewer Stones Close to a Sand

\*3 - Very Fine, Still a lot of Grit, Close to Sandy Loam



Commonwealth of Massachusetts

City/Town of

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

C. On-Site Review (continued)

Deep Observation Hole Number: \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_ Weather \_\_\_\_\_

1. Location

Ground Elevation at Surface of Hole: \_\_\_\_\_ Location (identify on plan): \_\_\_\_\_

2. Land Use \_\_\_\_\_ (e.g., woodland, agricultural field, vacant lot, etc.) Surface Stones \_\_\_\_\_ Slope (%) \_\_\_\_\_

Vegetation \_\_\_\_\_ Landform \_\_\_\_\_ Position on Landscape (attach sheet) \_\_\_\_\_

3. Distances from: Open Water Body \_\_\_\_\_ feet Drainage Way \_\_\_\_\_ feet Possible Wet Area \_\_\_\_\_ feet

Property Line \_\_\_\_\_ feet Drinking Water Well \_\_\_\_\_ feet Other \_\_\_\_\_ feet

4. Parent Material: \_\_\_\_\_ Unsuitable Materials Present:  Yes  No

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

5. Groundwater Observed:  Yes  No If yes: Depth Weeping from Pit \_\_\_\_\_ Depth Standing Water in Hole \_\_\_\_\_

Estimated Depth to High Groundwater: \_\_\_\_\_ inches \_\_\_\_\_ elevation



**Commonwealth of Massachusetts**

City/Town of \_\_\_\_\_

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

**C. On-Site Review** (continued)

Deep Observation Hole Number: \_\_\_\_\_

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			

Additional Notes:

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Commonwealth of Massachusetts

City/Town of

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

D. Determination of High Groundwater Elevation

1. Method Used:

Depth observed standing water in observation hole

A. \_\_\_\_\_  
inches

B. \_\_\_\_\_  
inches

Depth weeping from side of observation hole

A. 115\*\*  
inches

B. \_\_\_\_\_  
inches

Depth to soil redoximorphic features (mottles)

A. 70"  
inches

B. \_\_\_\_\_  
inches

Groundwater adjustment (USGS methodology)

A. \_\_\_\_\_  
inches

B. \_\_\_\_\_  
inches

2.

Index Well Number \_\_\_\_\_

Reading Date \_\_\_\_\_

Index Well Level \_\_\_\_\_

Adjustment Factor \_\_\_\_\_

Adjusted Groundwater Level \_\_\_\_\_

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material N/A

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

Yes  No

b. If yes, at what depth was it observed?

Upper boundary: \_\_\_\_\_  
inches

Lower boundary: \_\_\_\_\_  
inches

\* Very slight, bucket teeth were moist.



Commonwealth of Massachusetts

City/Town of

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

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**F. Certification**

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

\_\_\_\_\_  
Signature of Soil Evaluator

[Justin Richardson / SE13688](#)

\_\_\_\_\_  
Typed or Printed Name of Soil Evaluator / License #

\_\_\_\_\_  
Date

[April 23, 2013](#)

\_\_\_\_\_  
Date of Soil Evaluator Exam

\_\_\_\_\_  
Name of Board of Health Witness

\_\_\_\_\_  
Board of Health

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



**Commonwealth of Massachusetts**

City/Town of

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

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## **Field Diagrams**

Use this sheet for field diagrams:

[SEE ATTACHED SKETCH](#)



Commonwealth of Massachusetts

City/Town of

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

A. Facility Information

Two Wells Avenue LLC C/O BAL Management LLC

Owner Name

2 Wells Avenue

Street Address

Newton

City

MA

State

Map/Lot #

02459

Zip Code

B. Site Information

- (Check one)  New Construction  Upgrade  Repair
- Soil Survey Available?  Yes  No  
 If yes: USGA 103B/656  
 Source Soil Map Unit  
Charlton-Hollis-Rock / Udorthents-Urban land Complex Rocky Shallow Depth the groundwater  
 Soil Name Soil Limitations
- Surficial Geological Report Available?  Yes  No  
 If yes: 2006/USGS 1" =250k'  
 Year Published/Source Publication Scale Map Unit  
Glacio - Fluvial Deposits Glacial Outwash and Drift that includes outwash, eskers, kames  
 Geologic/Parent Material Landform
- Flood Rate Insurance Map  
 Above the 500-year flood boundary?  Yes  No Within the 100-year flood boundary?  Yes  No  
 Within the 500-year flood boundary?  Yes  No Within a velocity zone?  Yes  No
- Wetland Area: Wetlands Conservancy Program Map N/A DEP 12k Map (Charles River  
 Map Unit Name 07/14 Easterly Wetland Area)
- Current Water Resource Conditions (USGS): 07/14 Range:  Above Normal  Normal  Below Normal  
 Month/Year
- Other references reviewed: \_\_\_\_\_



Commonwealth of Massachusetts

City/Town of

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

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

Deep Observation Hole Number: #2 Date: 8/26/2014 Time: 8:10 am Weather: Sunny (75 degrees)

1. Location

Ground Elevation at Surface of Hole: tbd Location (identify on plan): Test Hole #2 (See Attached Plan)

2. Land Use: Grassed edge of Woodland (e.g., woodland, agricultural field, vacant lot, etc.) Grassed on the Edge of Tree line Vegetation Outwash Landform ledge outcrop at top of hill Surface Stones 10% Slope (%) top of ridge running north/south Position on Landscape (attach sheet)

3. Distances from: Open Water Body 1000\* feet Drainage Way NA feet Possible Wet Area 500' feet Property Line 75' feet Drinking Water Well NA feet Other NA feet

4. Parent Material: Sand, Gravel, Silt Unsuitable Materials Present: Yes No

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

5. Groundwater Observed: Yes No If yes: Depth Weeping from Pit NA Depth Standing Water in Hole NA Estimated Depth to High Groundwater: NA inches tbd elevation

\* -Charles River





**Commonwealth of Massachusetts**

City/Town of \_\_\_\_\_

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

**C. On-Site Review** (continued)

Test Hole #2

Deep Observation Hole Number: \_\_\_\_\_

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0"-3"	A	10YR3/2				NA	2%	0%	Granular	Friable	
3"-3'"	BEDROCK	NA				Rock					

Additional Notes:

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Commonwealth of Massachusetts

City/Town of

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

C. On-Site Review (continued)

Deep Observation Hole Number: \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_ Weather \_\_\_\_\_

1. Location

Ground Elevation at Surface of Hole: \_\_\_\_\_ Location (identify on plan): \_\_\_\_\_

2. Land Use \_\_\_\_\_ (e.g., woodland, agricultural field, vacant lot, etc.) Surface Stones \_\_\_\_\_ Slope (%) \_\_\_\_\_

Vegetation \_\_\_\_\_ Landform \_\_\_\_\_ Position on Landscape (attach sheet) \_\_\_\_\_

3. Distances from: Open Water Body \_\_\_\_\_ feet Drainage Way \_\_\_\_\_ feet Possible Wet Area \_\_\_\_\_ feet

Property Line \_\_\_\_\_ feet Drinking Water Well \_\_\_\_\_ feet Other \_\_\_\_\_ feet

4. Parent Material: \_\_\_\_\_ Unsuitable Materials Present:  Yes  No

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

5. Groundwater Observed:  Yes  No If yes: Depth Weeping from Pit \_\_\_\_\_ Depth Standing Water in Hole \_\_\_\_\_

Estimated Depth to High Groundwater: \_\_\_\_\_ inches \_\_\_\_\_ elevation



**Commonwealth of Massachusetts**

City/Town of \_\_\_\_\_

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

**C. On-Site Review** (continued)

Deep Observation Hole Number: \_\_\_\_\_

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			

Additional Notes:

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Commonwealth of Massachusetts

City/Town of

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

D. Determination of High Groundwater Elevation

1. Method Used:

Depth observed standing water in observation hole

A. \_\_\_\_\_  
inches

B. \_\_\_\_\_  
inches

Depth weeping from side of observation hole

A. \_\_\_\_\_  
inches

B. \_\_\_\_\_  
inches

Depth to soil redoximorphic features (mottles)

A. \_\_\_\_\_  
inches

B. \_\_\_\_\_  
inches

Groundwater adjustment (USGS methodology)

A. \_\_\_\_\_  
inches

B. \_\_\_\_\_  
inches

2.

Index Well Number \_\_\_\_\_

Reading Date \_\_\_\_\_

Index Well Level \_\_\_\_\_

Adjustment Factor \_\_\_\_\_

Adjusted Groundwater Level \_\_\_\_\_

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material **NA**

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

Yes  No

b. If yes, at what depth was it observed?

Upper boundary: \_\_\_\_\_  
inches

Lower boundary: \_\_\_\_\_  
inches



**Commonwealth of Massachusetts**

City/Town of

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

---

**F. Certification**

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

\_\_\_\_\_  
Signature of Soil Evaluator

[Justin Richardson / SE13688](#)

\_\_\_\_\_  
Typed or Printed Name of Soil Evaluator / License #

\_\_\_\_\_  
Date

[April 23, 2013](#)

\_\_\_\_\_  
Date of Soil Evaluator Exam

\_\_\_\_\_  
Name of Board of Health Witness

\_\_\_\_\_  
Board of Health

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



**Commonwealth of Massachusetts**

City/Town of

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

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### **Field Diagrams**

Use this sheet for field diagrams:

[SEE ATTACHED SKETCH](#)



Commonwealth of Massachusetts

City/Town of

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

A. Facility Information

Two Wells Avenue LLC C/O BAL Management LLC

Owner Name

2 Wells Avenue

Street Address

Newton

City

MA

State

Map/Lot #

02459

Zip Code

B. Site Information

- (Check one)  New Construction  Upgrade  Repair
- Soil Survey Available?  Yes  No
 

If yes: USGA 103B/656  
Source Soil Map Unit  
Rocky Shallow Depth the groundwater

Soil Name: Charlton-Hollis-Rock / Udorthents-Urban land Complex  
Soil Limitations
- Surficial Geological Report Available?  Yes  No
 

If yes: 2006/USGS 1" =250k'   
Year Published/Source Publication Scale Map Unit  
Glacial Outwash and Drift that includes outwash, eskers, kames

Soil Name: Glacio - Fluvial Deposits  
Geologic/Parent Material Landform
- Flood Rate Insurance Map
 

Above the 500-year flood boundary?  Yes  No Within the 100-year flood boundary?  Yes  No

Within the 500-year flood boundary?  Yes  No Within a velocity zone?  Yes  No
- Wetland Area: Wetlands Conservancy Program Map N/A DEP 12k Map (Charles River  
Map Unit Name Easterly Wetland Area
- Current Water Resource Conditions (USGS): 07/14 Range:  Above Normal  Normal  Below Normal  
Month/Year
- Other references reviewed: \_\_\_\_\_



Commonwealth of Massachusetts

City/Town of

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

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

Deep Observation Hole Number: #3 Date: 8/26/2014 Time: 8:20 am Weather: Sunny (75 degrees)

1. Location

Ground Elevation at Surface of Hole: tbd Location (identify on plan): Test Hole #3 (See Attached Plan)

2. Land Use: Grassed edge of Woodland (e.g., woodland, agricultural field, vacant lot, etc.) Surface Stones: ledge outcrop at top of hill Slope (%): 10% Grassed on the Edge of Tree line Vegetation: Outwash Landform: top of ridge running north/south Position on Landscape (attach sheet)

3. Distances from: Open Water Body: 1000\* feet Drainage Way: NA feet Possible Wet Area: 500' feet Property Line: 90' feet Drinking Water Well: NA feet Other: NA feet

4. Parent Material: Sand, Gravel, Silt Unsuitable Materials Present: [ ] Yes [X] No

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

5. Groundwater Observed: [ ] Yes [X] No If yes: NA Depth Weeping from Pit NA Depth Standing Water in Hole Estimated Depth to High Groundwater: NA inches tbd elevation

\* -Charles River





**Commonwealth of Massachusetts**

City/Town of \_\_\_\_\_

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

**C. On-Site Review** (continued)

Test Hole #3

Deep Observation Hole Number: \_\_\_\_\_

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0"-10"	A	10YR3/2				Sandy Loam	2%	0%	Massive	Friable	
10"-20"	B	10YR5/8				Sandy Loam	3%	1%	Granular	Friable	
20"-20"	Bedrock	NA				Rock					

Additional Notes:

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Commonwealth of Massachusetts

City/Town of

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

C. On-Site Review (continued)

Deep Observation Hole Number: \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_ Weather \_\_\_\_\_

1. Location

Ground Elevation at Surface of Hole: \_\_\_\_\_ Location (identify on plan): \_\_\_\_\_

2. Land Use \_\_\_\_\_ (e.g., woodland, agricultural field, vacant lot, etc.) Surface Stones \_\_\_\_\_ Slope (%) \_\_\_\_\_

Vegetation \_\_\_\_\_ Landform \_\_\_\_\_ Position on Landscape (attach sheet) \_\_\_\_\_

3. Distances from: Open Water Body \_\_\_\_\_ feet Drainage Way \_\_\_\_\_ feet Possible Wet Area \_\_\_\_\_ feet

Property Line \_\_\_\_\_ feet Drinking Water Well \_\_\_\_\_ feet Other \_\_\_\_\_ feet

4. Parent Material: \_\_\_\_\_ Unsuitable Materials Present:  Yes  No

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

5. Groundwater Observed:  Yes  No If yes: Depth Weeping from Pit \_\_\_\_\_ Depth Standing Water in Hole \_\_\_\_\_

Estimated Depth to High Groundwater: \_\_\_\_\_ inches \_\_\_\_\_ elevation



**Commonwealth of Massachusetts**

City/Town of \_\_\_\_\_

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

**C. On-Site Review** (continued)

Deep Observation Hole Number: \_\_\_\_\_

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			

Additional Notes:

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Commonwealth of Massachusetts

City/Town of

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

D. Determination of High Groundwater Elevation

1. Method Used:

- Depth observed standing water in observation hole      A. \_\_\_\_\_ inches      B. \_\_\_\_\_ inches
- Depth weeping from side of observation hole      A. \_\_\_\_\_ inches      B. \_\_\_\_\_ inches
- Depth to soil redoximorphic features (mottles)      A. \_\_\_\_\_ inches      B. \_\_\_\_\_ inches
- Groundwater adjustment (USGS methodology)      A. \_\_\_\_\_ inches      B. \_\_\_\_\_ inches

2.

Index Well Number \_\_\_\_\_ Reading Date \_\_\_\_\_ Index Well Level \_\_\_\_\_

Adjustment Factor \_\_\_\_\_ Adjusted Groundwater Level \_\_\_\_\_

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material NA

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

- Yes       No

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



Commonwealth of Massachusetts

City/Town of

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

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**F. Certification**

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

\_\_\_\_\_  
Signature of Soil Evaluator

[Justin Richardson / SE13688](#)

\_\_\_\_\_  
Typed or Printed Name of Soil Evaluator / License #

\_\_\_\_\_  
Date

[April 23, 2013](#)

\_\_\_\_\_  
Date of Soil Evaluator Exam

\_\_\_\_\_  
Name of Board of Health Witness

\_\_\_\_\_  
Board of Health

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



**Commonwealth of Massachusetts**

City/Town of

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

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### **Field Diagrams**

Use this sheet for field diagrams:

[SEE ATTACHED SKETCH](#)



Commonwealth of Massachusetts

City/Town of

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

A. Facility Information

Two Wells Avenue LLC C/O BAL Management LLC

Owner Name

2 Wells Avenue

Street Address

Newton

City

MA

State

Map/Lot #

02459

Zip Code

B. Site Information

1. (Check one) [X] New Construction [ ] Upgrade [ ] Repair

2. Soil Survey Available? [X] Yes [ ] No

If yes: USGA Source 103B/656 Soil Map Unit

Charlton-Hollis-Rock / Udorthents-Urban land Complex

Soil Name

Rocky Shallow Depth the groundwater

Soil Limitations

3. Surficial Geological Report Available? [X] Yes [ ] No

If yes: 2006/USGS Year Published/Source 1" =250k' Publication Scale Map Unit

Glacio - Fluvial Deposits

Geologic/Parent Material

Glacial Outwash and Drift that includes outwash, eskers, kames

Landform

4. Flood Rate Insurance Map

Above the 500-year flood boundary? [X] Yes [ ] No

Within the 100-year flood boundary? [ ] Yes [X] No

Within the 500-year flood boundary? [ ] Yes [X] No

Within a velocity zone? [ ] Yes [X] No

5. Wetland Area: Wetlands Conservancy Program Map

N/A Map Unit DEP 12k Map (Charles River Easterly Wetland Area)

6. Current Water Resource Conditions (USGS): 07/14

Month/Year

Range: [ ] Above Normal [X] Normal [ ] Below Normal

7. Other references reviewed:



Commonwealth of Massachusetts

City/Town of

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

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

Deep Observation Hole Number: #4 Date: 8/26/2014 Time: 8:30 am Weather: Sunny (75 degrees)

1. Location

Ground Elevation at Surface of Hole: tbd Location (identify on plan): Test Hole #4 (See Attached Plan)

2. Land Use: On the edge of wooded area and open area (e.g., woodland, agricultural field, vacant lot, etc.) Some large trees and grass Vegetation ledge outcrop at top of hill Surface Stones toe of ridge, low point edge of parking lot Position on Landscape (attach sheet) Slope (%) 3%

3. Distances from: Open Water Body 1000\* feet Drainage Way NA feet Possible Wet Area 500' feet Property Line 150' feet Drinking Water Well NA feet Other NA feet

4. Parent Material: Sand, Gravel, Silt Unsuitable Materials Present: [X] Yes [ ] No

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

5. Groundwater Observed: [X] Yes [ ] No If yes: 115" Depth Weeping from Pit 120" Depth Standing Water in Hole Estimated Depth to High Groundwater: 90" (\*1) inches tbd elevation

\* -Charles River

\*1 - Seasonal High Ground water appeared to be in the fill layer. It was difficult to determine because mottles were not completely developed.





Commonwealth of Massachusetts

City/Town of

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

**C. On-Site Review** (continued)

Test Hole #4

Deep Observation Hole Number: \_\_\_\_\_

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
3"-0"	O	NA				NA					
0-84"	FILL	10YR6/6				Sandy Loam	2%	0%	Massive	Friable	
84"-102"	Buried A	10YR2/2	90"	Con- 10YR5/8	5%	Sandy Loam	3%	1%	Granular	Friable	
102"-114"	Buried B	10YR3/4	↓	↓	↓	Sandy Loam	4%	2%	Massive	Friable	
114"-126"	C	10YR6/3	↓	↓	↓	Silty Loamy Sand*	10%	1%	Massive	Friable	

Additional Notes:

\* - Very Fine, Still a lot of Grit, Close to Sandy Loam



Commonwealth of Massachusetts

City/Town of

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

C. On-Site Review (continued)

Deep Observation Hole Number: \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_ Weather \_\_\_\_\_

1. Location

Ground Elevation at Surface of Hole: \_\_\_\_\_ Location (identify on plan): \_\_\_\_\_

2. Land Use \_\_\_\_\_ (e.g., woodland, agricultural field, vacant lot, etc.) Surface Stones \_\_\_\_\_ Slope (%) \_\_\_\_\_

Vegetation \_\_\_\_\_ Landform \_\_\_\_\_ Position on Landscape (attach sheet) \_\_\_\_\_

3. Distances from: Open Water Body \_\_\_\_\_ feet Drainage Way \_\_\_\_\_ feet Possible Wet Area \_\_\_\_\_ feet

Property Line \_\_\_\_\_ feet Drinking Water Well \_\_\_\_\_ feet Other \_\_\_\_\_ feet

4. Parent Material: \_\_\_\_\_ Unsuitable Materials Present:  Yes  No

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

5. Groundwater Observed:  Yes  No If yes: Depth Weeping from Pit \_\_\_\_\_ Depth Standing Water in Hole \_\_\_\_\_

Estimated Depth to High Groundwater: \_\_\_\_\_ inches \_\_\_\_\_ elevation



**Commonwealth of Massachusetts**

City/Town of \_\_\_\_\_

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

**C. On-Site Review** (continued)

Deep Observation Hole Number: \_\_\_\_\_

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			

Additional Notes:

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Commonwealth of Massachusetts

City/Town of

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

D. Determination of High Groundwater Elevation

1. Method Used:

- Depth observed standing water in observation hole      A. 120" \_\_\_\_\_ inches      B. \_\_\_\_\_ inches
- Depth weeping from side of observation hole      A. 115" \_\_\_\_\_ inches      B. \_\_\_\_\_ inches
- Depth to soil redoximorphic features (mottles)      A. 100" \_\_\_\_\_ inches      B. \_\_\_\_\_ inches
- Groundwater adjustment (USGS methodology)      A. \_\_\_\_\_ inches      B. \_\_\_\_\_ inches

2.

Index Well Number \_\_\_\_\_ Reading Date \_\_\_\_\_ Index Well Level \_\_\_\_\_

Adjustment Factor \_\_\_\_\_ Adjusted Groundwater Level \_\_\_\_\_

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material N/A

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

- Yes       No

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



Commonwealth of Massachusetts

City/Town of

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

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## F. Certification

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

\_\_\_\_\_  
Signature of Soil Evaluator

[Justin Richardson / SE13688](#)

\_\_\_\_\_  
Typed or Printed Name of Soil Evaluator / License #

\_\_\_\_\_  
Date

[April 23, 2013](#)

\_\_\_\_\_  
Date of Soil Evaluator Exam

\_\_\_\_\_  
Name of Board of Health Witness

\_\_\_\_\_  
Board of Health

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



**Commonwealth of Massachusetts**

City/Town of

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

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### **Field Diagrams**

Use this sheet for field diagrams:

[SEE ATTACHED SKETCH](#)



Commonwealth of Massachusetts

City/Town of

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

A. Facility Information

Two Wells Avenue LLC C/O BAL Management LLC

Owner Name

2 Wells Avenue

Street Address

Newton

City

MA

State

Map/Lot #

02459

Zip Code

B. Site Information

1. (Check one) [X] New Construction [ ] Upgrade [ ] Repair

2. Soil Survey Available? [X] Yes [ ] No

If yes: USGA Source 103B/656 Soil Map Unit

Charlton-Hollis-Rock / Udorthents-Urban land Complex

Soil Name

Rocky Shallow Depth the groundwater

Soil Limitations

3. Surficial Geological Report Available? [X] Yes [ ] No

If yes: 2006/USGS Year Published/Source 1" =250k' Publication Scale Map Unit

Glacio - Fluvial Deposits

Geologic/Parent Material

Glacial Outwash and Drift that includes outwash, eskers, kames

Landform

4. Flood Rate Insurance Map

Above the 500-year flood boundary? [X] Yes [ ] No

Within the 100-year flood boundary? [ ] Yes [X] No

Within the 500-year flood boundary? [ ] Yes [X] No

Within a velocity zone? [ ] Yes [X] No

5. Wetland Area: Wetlands Conservancy Program Map

N/A Map Unit DEP 12k Map (Charles River Easterly Wetland Area)

07/14

6. Current Water Resource Conditions (USGS):

Range: [ ] Above Normal [X] Normal [ ] Below Normal

Month/Year

7. Other references reviewed:



Commonwealth of Massachusetts

City/Town of

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

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

Deep Observation Hole Number: #5 Date: 8/26/2014 Time: 10:10 am Weather: Sunny (85 degrees)

1. Location

Ground Elevation at Surface of Hole: tbd Location (identify on plan): Test Hole #5 (See Attached Plan)

2. Land Use: Parking Lot (e.g., woodland, agricultural field, vacant lot, etc.) none Vegetation: none Landform: Outwash Surface Stones: ledge outcrop at top of hill Slope (%): 3% Position on Landscape (attach sheet): Middle of parking lot flat area

3. Distances from: Open Water Body: 1000\* feet Drainage Way: NA feet Possible Wet Area: 500' feet Property Line: 100' feet Drinking Water Well: NA feet Other: NA feet

4. Parent Material: Sand, Gravel, Silt Unsuitable Materials Present: [X] Yes [ ] No

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

5. Groundwater Observed: [ ] Yes [X] No If yes: NA Depth Weeping from Pit NA Depth Standing Water in Hole Estimated Depth to High Groundwater: 84" down inches tbd elevation

\* -Charles River





**Commonwealth of Massachusetts**

City/Town of \_\_\_\_\_

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

**C. On-Site Review** (continued)

Test Hole #5

Deep Observation Hole Number: \_\_\_\_\_

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
3"-0"	PAVE	NA				NA					
0-32"	FILL	10YR4/4				Sandy Loam	2%	0%	Massive	Friable	
32"-77"	C1	10YR6/3				Loamy Sand*1	30%	10%	Massive	Friable	
77"-120"	C2	10YR6/3	84"	Con- 10YR5/8	5%	Silty Loamy Sand*2	20%	2%	Massive	Friable	
120"-136"	C3	10YR5/3	↓	↓	↓	Sandy Loam	10%	5%	Massive	Friable	

Additional Notes:

\*1 - Many round stones, very coarse, close to a Sand.

\*2 - Very Fine, Still a lot of Grit, Close to Sandy Loam



Commonwealth of Massachusetts

City/Town of

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

C. On-Site Review (continued)

Deep Observation Hole Number: \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_ Weather \_\_\_\_\_

1. Location

Ground Elevation at Surface of Hole: \_\_\_\_\_ Location (identify on plan): \_\_\_\_\_

2. Land Use \_\_\_\_\_ (e.g., woodland, agricultural field, vacant lot, etc.) Surface Stones \_\_\_\_\_ Slope (%) \_\_\_\_\_

Vegetation \_\_\_\_\_ Landform \_\_\_\_\_ Position on Landscape (attach sheet) \_\_\_\_\_

3. Distances from: Open Water Body \_\_\_\_\_ feet Drainage Way \_\_\_\_\_ feet Possible Wet Area \_\_\_\_\_ feet

Property Line \_\_\_\_\_ feet Drinking Water Well \_\_\_\_\_ feet Other \_\_\_\_\_ feet

4. Parent Material: \_\_\_\_\_ Unsuitable Materials Present:  Yes  No

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

5. Groundwater Observed:  Yes  No If yes: Depth Weeping from Pit \_\_\_\_\_ Depth Standing Water in Hole \_\_\_\_\_

Estimated Depth to High Groundwater: \_\_\_\_\_ inches \_\_\_\_\_ elevation



**Commonwealth of Massachusetts**

City/Town of \_\_\_\_\_

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

**C. On-Site Review** (continued)

Deep Observation Hole Number: \_\_\_\_\_

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			

Additional Notes:

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Commonwealth of Massachusetts

City/Town of

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

D. Determination of High Groundwater Elevation

1. Method Used:

Depth observed standing water in observation hole

A. \_\_\_\_\_  
inches

B. \_\_\_\_\_  
inches

Depth weeping from side of observation hole

A. \_\_\_\_\_  
inches

B. \_\_\_\_\_  
inches

Depth to soil redoximorphic features (mottles)

A. 84"  
inches

B. \_\_\_\_\_  
inches

Groundwater adjustment (USGS methodology)

A. \_\_\_\_\_  
inches

B. \_\_\_\_\_  
inches

2.

Index Well Number \_\_\_\_\_

Reading Date \_\_\_\_\_

Index Well Level \_\_\_\_\_

Adjustment Factor \_\_\_\_\_

Adjusted Groundwater Level \_\_\_\_\_

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material N/A

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

Yes  No

b. If yes, at what depth was it observed?

Upper boundary: \_\_\_\_\_  
inches

Lower boundary: \_\_\_\_\_  
inches



Commonwealth of Massachusetts

City/Town of

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

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**F. Certification**

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

\_\_\_\_\_  
Signature of Soil Evaluator

[Justin Richardson / SE13688](#)

\_\_\_\_\_  
Typed or Printed Name of Soil Evaluator / License #

\_\_\_\_\_  
Date

[April 23, 2013](#)

\_\_\_\_\_  
Date of Soil Evaluator Exam

\_\_\_\_\_  
Name of Board of Health Witness

\_\_\_\_\_  
Board of Health

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



**Commonwealth of Massachusetts**

City/Town of

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

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### **Field Diagrams**

Use this sheet for field diagrams:

[SEE ATTACHED SKETCH](#)



Commonwealth of Massachusetts

City/Town of

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

A. Facility Information

Two Wells Avenue LLC C/O BAL Management LLC

Owner Name

2 Wells Avenue

Street Address

Newton

City

MA

State

Map/Lot #

02459

Zip Code

B. Site Information

1. (Check one) [X] New Construction [ ] Upgrade [ ] Repair

2. Soil Survey Available? [X] Yes [ ] No

Charlton-Hollis-Rock / Udorthents-Urban land Complex

Soil Name

If yes: USGA Source 103B/656 Soil Map Unit

Rocky Shallow Depth the groundwater

Soil Limitations

3. Surficial Geological Report Available? [X] Yes [ ] No

Glacio - Fluvial Deposits

Geologic/Parent Material

If yes: 2006/USGS Year Published/Source 1" =250k' Publication Scale sand and gravel with Map Unit

Glacial Outwash and Drift that includes outwash, eskers, kames

Landform

4. Flood Rate Insurance Map

Above the 500-year flood boundary? [X] Yes [ ] No

Within the 500-year flood boundary? [ ] Yes [X] No

Within the 100-year flood boundary? [ ] Yes [X] No

Within a velocity zone? [ ] Yes [X] No

5. Wetland Area: Wetlands Conservancy Program Map

07/14

Month/Year

N/A Map Unit DEP 12k Map (Charles River Easterly Wetland Area) Name

6. Current Water Resource Conditions (USGS):

Range: [ ] Above Normal [X] Normal [ ] Below Normal

7. Other references reviewed:



Commonwealth of Massachusetts

City/Town of

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

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

Deep Observation Hole Number: #6 Date: 8/26/2014 Time: 12:30 pm Weather: Sunny (90 degrees)

1. Location

Ground Elevation at Surface of Hole: tbd Location (identify on plan): Test Hole #6 (See Attached Plan)

2. Land Use: woodland (e.g., woodland, agricultural field, vacant lot, etc.) Large trees with low brush Vegetation bedrock outcrop showing Surface Stones 5% Slope (%) bottom of slope Position on Landscape (attach sheet)

3. Distances from: Open Water Body 1000\* feet Drainage Way NA feet Possible Wet Area 500' feet Property Line 30' feet Drinking Water Well NA feet Other NA feet

4. Parent Material: Sand, Gravel, Silt Unsuitable Materials Present: [X] Yes [ ] No

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

5. Groundwater Observed: [ ] Yes [X] No If yes: NA Depth Weeping from Pit NA Depth Standing Water in Hole Estimated Depth to High Groundwater: NA inches NA elevation

\* -Charles River





Commonwealth of Massachusetts

City/Town of

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

**C. On-Site Review** (continued)

Test Hole #6

Deep Observation Hole Number: \_\_\_\_\_

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
3"-0"	O	NA				NA					
0-3"	A	10YR3/2				Sandy Loam	2%	0%	Granular	Friable	
3"-54"	B	10YR6/6	25"	Con- 10YR5/8	5%	Sandy Loam	5%	2%	Massive	Friable	
56"-60"	C	10YR7/3	↓	↓	↓	Silty Sandy Loam	5%	1%	Massive	Friable	
60"-60"	Bedrock					Rock					

Additional Notes:

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Commonwealth of Massachusetts

City/Town of

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

C. On-Site Review (continued)

Deep Observation Hole Number: \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_ Weather \_\_\_\_\_

1. Location

Ground Elevation at Surface of Hole: \_\_\_\_\_ Location (identify on plan): \_\_\_\_\_

2. Land Use \_\_\_\_\_ (e.g., woodland, agricultural field, vacant lot, etc.) Surface Stones \_\_\_\_\_ Slope (%) \_\_\_\_\_

Vegetation \_\_\_\_\_ Landform \_\_\_\_\_ Position on Landscape (attach sheet) \_\_\_\_\_

3. Distances from: Open Water Body \_\_\_\_\_ feet Drainage Way \_\_\_\_\_ feet Possible Wet Area \_\_\_\_\_ feet

Property Line \_\_\_\_\_ feet Drinking Water Well \_\_\_\_\_ feet Other \_\_\_\_\_ feet

4. Parent Material: \_\_\_\_\_ Unsuitable Materials Present:  Yes  No

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

5. Groundwater Observed:  Yes  No If yes: Depth Weeping from Pit \_\_\_\_\_ Depth Standing Water in Hole \_\_\_\_\_

Estimated Depth to High Groundwater: \_\_\_\_\_ inches \_\_\_\_\_ elevation



**Commonwealth of Massachusetts**

City/Town of \_\_\_\_\_

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

**C. On-Site Review** (continued)

Deep Observation Hole Number: \_\_\_\_\_

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			

Additional Notes:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



Commonwealth of Massachusetts

City/Town of

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

D. Determination of High Groundwater Elevation

1. Method Used:

Depth observed standing water in observation hole

A. \_\_\_\_\_  
inches

B. \_\_\_\_\_  
inches

Depth weeping from side of observation hole

A. \_\_\_\_\_  
inches

B. \_\_\_\_\_  
inches

Depth to soil redoximorphic features (mottles)

A. 25"  
inches

B. \_\_\_\_\_  
inches

Groundwater adjustment (USGS methodology)

A. \_\_\_\_\_  
inches

B. \_\_\_\_\_  
inches

2.

Index Well Number \_\_\_\_\_

Reading Date \_\_\_\_\_

Index Well Level \_\_\_\_\_

Adjustment Factor \_\_\_\_\_

Adjusted Groundwater Level \_\_\_\_\_

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material N/A

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

Yes  No

b. If yes, at what depth was it observed?

Upper boundary: \_\_\_\_\_  
inches

Lower boundary: \_\_\_\_\_  
inches



Commonwealth of Massachusetts

City/Town of

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

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**F. Certification**

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

\_\_\_\_\_  
Signature of Soil Evaluator

[Justin Richardson / SE13688](#)

\_\_\_\_\_  
Typed or Printed Name of Soil Evaluator / License #

\_\_\_\_\_  
Date

[April 23, 2013](#)

\_\_\_\_\_  
Date of Soil Evaluator Exam

\_\_\_\_\_  
Name of Board of Health Witness

\_\_\_\_\_  
Board of Health

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



**Commonwealth of Massachusetts**

City/Town of

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

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### **Field Diagrams**

Use this sheet for field diagrams:

[SEE ATTACHED SKETCH](#)



Commonwealth of Massachusetts

City/Town of

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

A. Facility Information

Two Wells Avenue LLC C/O BAL Management LLC

Owner Name

2 Wells Avenue

Street Address

Newton

City

MA

State

Map/Lot #

02459

Zip Code

B. Site Information

1. (Check one) [X] New Construction [ ] Upgrade [ ] Repair

2. Soil Survey Available? [X] Yes [ ] No

Charlton-Hollis-Rock / Udorthents-Urban land Complex

Soil Name

If yes: USGA Source 103B/656 Soil Map Unit

Rocky Shallow Depth the groundwater

Soil Limitations

3. Surficial Geological Report Available? [X] Yes [ ] No

Glacio - Fluvial Deposits

Geologic/Parent Material

If yes: 2006/USGS Year Published/Source 1" =250k' Publication Scale Map Unit

Glacial Outwash and Drift that includes outwash, eskers, kames

Landform

4. Flood Rate Insurance Map

Above the 500-year flood boundary? [X] Yes [ ] No

Within the 500-year flood boundary? [ ] Yes [X] No

Within the 100-year flood boundary? [ ] Yes [X] No

Within a velocity zone? [ ] Yes [X] No

5. Wetland Area: Wetlands Conservancy Program Map

07/14

Month/Year

N/A Map Unit Name DEP 12k Map (Charles River Easterly Wetland Area)

6. Current Water Resource Conditions (USGS):

Range: [ ] Above Normal [X] Normal [ ] Below Normal

7. Other references reviewed:



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City/Town of

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

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

Deep Observation Hole Number: #7 Date: 8/26/2014 Time: 1:20 pm Weather: Sunny (90 degrees)

1. Location

Ground Elevation at Surface of Hole: tbd Location (identify on plan): Test Hole #7 (See Attached Plan)

2. Land Use: Woodland (e.g., woodland, agricultural field, vacant lot, etc.) larger trees with some low brush Vegetation: bedrock outcrop visible Surface Stones: 10% Slope (%): Outwash Landform: toe of slope Position on Landscape (attach sheet)

3. Distances from: Open Water Body: 1000\* feet Drainage Way: NA feet Possible Wet Area: 500' feet Property Line: 150' feet Drinking Water Well: NA feet Other: NA feet

4. Parent Material: Sand, Gravel, Silt Unsuitable Materials Present: [ ] Yes [X] No

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

5. Groundwater Observed: [ ] Yes [X] No If yes: NA Depth Weeping from Pit NA Depth Standing Water in Hole Estimated Depth to High Groundwater: NA inches tbd elevation

\* -Charles River





**Commonwealth of Massachusetts**

City/Town of \_\_\_\_\_

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

**C. On-Site Review** (continued)

Test Hole #7

Deep Observation Hole Number: \_\_\_\_\_

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0"-8"	A	10YR3/2				Sandy Loam	2%	0%	Massive	Friable	
8"-24"	B	10YR5/8				Sandy Loam	3%	1%	Granular	Friable	
24"-24"	Bedrock	NA				Rock					

Additional Notes:

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Commonwealth of Massachusetts

City/Town of

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

C. On-Site Review (continued)

Deep Observation Hole Number: \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_ Weather \_\_\_\_\_

1. Location

Ground Elevation at Surface of Hole: \_\_\_\_\_ Location (identify on plan): \_\_\_\_\_

2. Land Use \_\_\_\_\_ (e.g., woodland, agricultural field, vacant lot, etc.) Surface Stones \_\_\_\_\_ Slope (%) \_\_\_\_\_

Vegetation \_\_\_\_\_ Landform \_\_\_\_\_ Position on Landscape (attach sheet) \_\_\_\_\_

3. Distances from: Open Water Body \_\_\_\_\_ feet Drainage Way \_\_\_\_\_ feet Possible Wet Area \_\_\_\_\_ feet

Property Line \_\_\_\_\_ feet Drinking Water Well \_\_\_\_\_ feet Other \_\_\_\_\_ feet

4. Parent Material: \_\_\_\_\_ Unsuitable Materials Present:  Yes  No

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

5. Groundwater Observed:  Yes  No If yes: Depth Weeping from Pit \_\_\_\_\_ Depth Standing Water in Hole \_\_\_\_\_

Estimated Depth to High Groundwater: \_\_\_\_\_ inches \_\_\_\_\_ elevation



Commonwealth of Massachusetts

City/Town of

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

C. On-Site Review (continued)

Deep Observation Hole Number: \_\_\_\_\_

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			

Additional Notes:

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Commonwealth of Massachusetts

City/Town of

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

D. Determination of High Groundwater Elevation

1. Method Used:

- Depth observed standing water in observation hole      A. \_\_\_\_\_ inches      B. \_\_\_\_\_ inches
- Depth weeping from side of observation hole      A. \_\_\_\_\_ inches      B. \_\_\_\_\_ inches
- Depth to soil redoximorphic features (mottles)      A. \_\_\_\_\_ inches      B. \_\_\_\_\_ inches
- Groundwater adjustment (USGS methodology)      A. \_\_\_\_\_ inches      B. \_\_\_\_\_ inches

2.

Index Well Number \_\_\_\_\_ Reading Date \_\_\_\_\_ Index Well Level \_\_\_\_\_

Adjustment Factor \_\_\_\_\_ Adjusted Groundwater Level \_\_\_\_\_

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material NA

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

- Yes       No

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



Commonwealth of Massachusetts

City/Town of

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

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**F. Certification**

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

\_\_\_\_\_  
Signature of Soil Evaluator

[Justin Richardson / SE13688](#)

\_\_\_\_\_  
Typed or Printed Name of Soil Evaluator / License #

\_\_\_\_\_  
Date

[April 23, 2013](#)

\_\_\_\_\_  
Date of Soil Evaluator Exam

\_\_\_\_\_  
Name of Board of Health Witness

\_\_\_\_\_  
Board of Health

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



Commonwealth of Massachusetts

City/Town of

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

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### Field Diagrams

Use this sheet for field diagrams:

[SEE ATTACHED SKETCH](#)



Commonwealth of Massachusetts

City/Town of

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

A. Facility Information

Two Wells Avenue LLC C/O BAL Management LLC

Owner Name

2 Wells Avenue

Street Address

Newton

City

MA

State

Map/Lot #

02459

Zip Code

B. Site Information

1. (Check one) [X] New Construction [ ] Upgrade [ ] Repair

2. Soil Survey Available? [X] Yes [ ] No

If yes: USGA Source 103B/656 Soil Map Unit

Charlton-Hollis-Rock / Udorthents-Urban land Complex

Soil Name

Rocky Shallow Depth the groundwater

Soil Limitations

3. Surficial Geological Report Available? [X] Yes [ ] No

If yes: 2006/USGS Year Published/Source 1" =250k' Publication Scale Map Unit

Glacio - Fluvial Deposits

Geologic/Parent Material

Glacial Outwash and Drift that includes outwash, eskers, kames

Landform

4. Flood Rate Insurance Map

Above the 500-year flood boundary? [X] Yes [ ] No

Within the 100-year flood boundary? [ ] Yes [X] No

Within the 500-year flood boundary? [ ] Yes [X] No

Within a velocity zone? [ ] Yes [X] No

5. Wetland Area: Wetlands Conservancy Program Map

N/A Map Unit Name DEP 12k Map (Charles River Easterly Wetland Area)

07/14

6. Current Water Resource Conditions (USGS): Month/Year

Range: [ ] Above Normal [X] Normal [ ] Below Normal

7. Other references reviewed:



Commonwealth of Massachusetts

City/Town of

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

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

Deep Observation Hole Number: #8 Date: 8/26/2014 Time: 2:20 pm Weather: Sunny (90 degrees)

1. Location

Ground Elevation at Surface of Hole: tbd Location (identify on plan): Test Hole #8 (See Attached Plan)

2. Land Use: Woodland (e.g., woodland, agricultural field, vacant lot, etc.) larger trees with some low brush Vegetation Bedrock Outcrop Apparent Surface Stones Top of Ridge Landform Top of Slope Position on Landscape (attach sheet) 10% Slope (%)

3. Distances from: Open Water Body 1000\* feet Drainage Way NA feet Possible Wet Area 500' feet Property Line 150' feet Drinking Water Well NA feet Other NA feet

4. Parent Material: Sand, Gravel, Silt Unsuitable Materials Present: [ ] Yes [X] No If Yes: [ ] Disturbed Soil [ ] Fill Material [ ] Impervious Layer(s) [ ] Weathered/Fractured Rock [X] Bedrock

5. Groundwater Observed: [ ] Yes [X] No If yes: NA Depth Weeping from Pit NA Depth Standing Water in Hole Estimated Depth to High Groundwater: NA inches elevation

\* -Charles River





**Commonwealth of Massachusetts**

City/Town of \_\_\_\_\_

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

**C. On-Site Review** (continued)

Test Hole #8

Deep Observation Hole Number: \_\_\_\_\_

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0"-9"	A	10YR3/2				Sandy Loam	2%	0%	Massive	Friable	
9"-27"	B	10YR5/8				Sandy Loam	3%	1%	Granular	Friable	
27"-27"	Bedrock	NA				Rock					

Additional Notes:

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Commonwealth of Massachusetts

City/Town of

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

C. On-Site Review (continued)

Deep Observation Hole Number: \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_ Weather \_\_\_\_\_

1. Location

Ground Elevation at Surface of Hole: \_\_\_\_\_ Location (identify on plan): \_\_\_\_\_

2. Land Use \_\_\_\_\_ (e.g., woodland, agricultural field, vacant lot, etc.) Surface Stones \_\_\_\_\_ Slope (%) \_\_\_\_\_

Vegetation \_\_\_\_\_ Landform \_\_\_\_\_ Position on Landscape (attach sheet) \_\_\_\_\_

3. Distances from: Open Water Body \_\_\_\_\_ feet Drainage Way \_\_\_\_\_ feet Possible Wet Area \_\_\_\_\_ feet

Property Line \_\_\_\_\_ feet Drinking Water Well \_\_\_\_\_ feet Other \_\_\_\_\_ feet

4. Parent Material: \_\_\_\_\_ Unsuitable Materials Present:  Yes  No

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

5. Groundwater Observed:  Yes  No If yes: Depth Weeping from Pit \_\_\_\_\_ Depth Standing Water in Hole \_\_\_\_\_

Estimated Depth to High Groundwater: \_\_\_\_\_ inches \_\_\_\_\_ elevation



**Commonwealth of Massachusetts**

City/Town of \_\_\_\_\_

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

**C. On-Site Review** (continued)

Deep Observation Hole Number: \_\_\_\_\_

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			

Additional Notes:

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Commonwealth of Massachusetts

City/Town of

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

D. Determination of High Groundwater Elevation

1. Method Used:

- Depth observed standing water in observation hole      A. \_\_\_\_\_ inches      B. \_\_\_\_\_ inches
- Depth weeping from side of observation hole      A. \_\_\_\_\_ inches      B. \_\_\_\_\_ inches
- Depth to soil redoximorphic features (mottles)      A. \_\_\_\_\_ inches      B. \_\_\_\_\_ inches
- Groundwater adjustment (USGS methodology)      A. \_\_\_\_\_ inches      B. \_\_\_\_\_ inches

2.

Index Well Number \_\_\_\_\_ Reading Date \_\_\_\_\_ Index Well Level \_\_\_\_\_

Adjustment Factor \_\_\_\_\_ Adjusted Groundwater Level \_\_\_\_\_

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material NA

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

- Yes       No

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



Commonwealth of Massachusetts

City/Town of

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

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**F. Certification**

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

\_\_\_\_\_  
Signature of Soil Evaluator

[Justin Richardson / SE13688](#)

\_\_\_\_\_  
Typed or Printed Name of Soil Evaluator / License #

\_\_\_\_\_  
Date

[April 23, 2013](#)

\_\_\_\_\_  
Date of Soil Evaluator Exam

\_\_\_\_\_  
Name of Board of Health Witness

\_\_\_\_\_  
Board of Health

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



Commonwealth of Massachusetts

City/Town of

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

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### Field Diagrams

Use this sheet for field diagrams:

[SEE ATTACHED SKETCH](#)



Commonwealth of Massachusetts

City/Town of

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

A. Facility Information

Two Wells Avenue LLC C/O BAL Management LLC

Owner Name

2 Wells Avenue

Street Address

Newton

City

MA

State

Map/Lot #

02459

Zip Code

B. Site Information

- (Check one)  New Construction  Upgrade  Repair
- Soil Survey Available?  Yes  No
 

If yes: USGA 103B/656  
Source Soil Map Unit  
Rocky Shallow Depth the groundwater

Soil Name: Charlton-Hollis-Rock / Udorthents-Urban land Complex  
Soil Limitations
- Surficial Geological Report Available?  Yes  No
 

If yes: 2006/USGS 1" =250k'   
Year Published/Source Publication Scale Map Unit  
Glacial Outwash and Drift that includes outwash, eskers, kames

Soil Name: Glacio - Fluvial Deposits  
Geologic/Parent Material Landform
- Flood Rate Insurance Map
 

Above the 500-year flood boundary?  Yes  No Within the 100-year flood boundary?  Yes  No

Within the 500-year flood boundary?  Yes  No Within a velocity zone?  Yes  No
- Wetland Area: Wetlands Conservancy Program Map N/A DEP 12k Map (Charles River  
Map Unit Name Easterly Wetland Area)  
07/14
- Current Water Resource Conditions (USGS): 07/14 Range:  Above Normal  Normal  Below Normal  
Month/Year
- Other references reviewed: \_\_\_\_\_



Commonwealth of Massachusetts

City/Town of

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

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

Deep Observation Hole Number: #9 Date: 8/27/2014 Time: 7:20 am Weather: Sunny (75 degrees)

1. Location

Ground Elevation at Surface of Hole: tbd Location (identify on plan): Test Hole #9 (See Attached Plan)

2. Land Use: Woodland (e.g., woodland, agricultural field, vacant lot, etc.) some large trees Vegetation: None apparent in close proximity Surface Stones: 10% Slope (%) Outwash Landform: Middle of Slope Position on Landscape (attach sheet)

3. Distances from: Open Water Body: 1000\* feet Drainage Way: NA feet Possible Wet Area: 500' feet Property Line: 20' feet Drinking Water Well: NA feet Other: NA feet

4. Parent Material: Sand, Gravel, Silt Unsuitable Materials Present: [X] Yes [ ] No

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

5. Groundwater Observed: [X] Yes [ ] No If yes: NA Depth Weeping from Pit NA Depth Standing Water in Hole Estimated Depth to High Groundwater: 91" down inches tbd elevation

\* -Charles River





Commonwealth of Massachusetts

City/Town of

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

**C. On-Site Review** (continued)

Test Hole #9

Deep Observation Hole Number: \_\_\_\_\_

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0"-15"	AO	10YR4/2				NA					
15"-85"	FILL	10YR6/4				Sandy Loam*	2%	0%	Granular	Friable	
85"-115"	C1	10YR5/3	91"	Con- 10YR5/8	5%	Loamy Sand	3%	1%	Massive	Friable	
115"-121"	C2	10YR4/6	*1 ↓	↓	↓	Loamy Sand	4%	2%	Massive	Friable	

Additional Notes:

\* -A lot of organics mixed in with the fill.

\*1 -Soil on teeth of bucket was starting to get moist



Commonwealth of Massachusetts

City/Town of

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

C. On-Site Review (continued)

Deep Observation Hole Number: \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_ Weather \_\_\_\_\_

1. Location

Ground Elevation at Surface of Hole: \_\_\_\_\_ Location (identify on plan): \_\_\_\_\_

2. Land Use \_\_\_\_\_ (e.g., woodland, agricultural field, vacant lot, etc.) Surface Stones \_\_\_\_\_ Slope (%) \_\_\_\_\_

Vegetation \_\_\_\_\_ Landform \_\_\_\_\_ Position on Landscape (attach sheet) \_\_\_\_\_

3. Distances from: Open Water Body \_\_\_\_\_ feet Drainage Way \_\_\_\_\_ feet Possible Wet Area \_\_\_\_\_ feet

Property Line \_\_\_\_\_ feet Drinking Water Well \_\_\_\_\_ feet Other \_\_\_\_\_ feet

4. Parent Material: \_\_\_\_\_ Unsuitable Materials Present:  Yes  No

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

5. Groundwater Observed:  Yes  No If yes: Depth Weeping from Pit \_\_\_\_\_ Depth Standing Water in Hole \_\_\_\_\_

Estimated Depth to High Groundwater: \_\_\_\_\_ inches \_\_\_\_\_ elevation



**Commonwealth of Massachusetts**

City/Town of \_\_\_\_\_

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

**C. On-Site Review** (continued)

Deep Observation Hole Number: \_\_\_\_\_

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			

Additional Notes:

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Commonwealth of Massachusetts

City/Town of

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

D. Determination of High Groundwater Elevation

1. Method Used:

Depth observed standing water in observation hole

A. \_\_\_\_\_  
inches

B. \_\_\_\_\_  
inches

Depth weeping from side of observation hole

A. \_\_\_\_\_  
inches

B. \_\_\_\_\_  
inches

Depth to soil redoximorphic features (mottles)

A. 91"\*  
inches

B. \_\_\_\_\_  
inches

Groundwater adjustment (USGS methodology)

A. \_\_\_\_\_  
inches

B. \_\_\_\_\_  
inches

2.

Index Well Number \_\_\_\_\_

Reading Date \_\_\_\_\_

Index Well Level \_\_\_\_\_

Adjustment Factor \_\_\_\_\_

Adjusted Groundwater Level \_\_\_\_\_

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material N/A

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

Yes  No

b. If yes, at what depth was it observed?

Upper boundary: \_\_\_\_\_  
inches

Lower boundary: \_\_\_\_\_  
inches



**Commonwealth of Massachusetts**

City/Town of

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

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**F. Certification**

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

\_\_\_\_\_  
Signature of Soil Evaluator

[Justin Richardson / SE13688](#)

\_\_\_\_\_  
Typed or Printed Name of Soil Evaluator / License #

\_\_\_\_\_  
Date

[April 23, 2013](#)

\_\_\_\_\_  
Date of Soil Evaluator Exam

\_\_\_\_\_  
Name of Board of Health Witness

\_\_\_\_\_  
Board of Health

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



**Commonwealth of Massachusetts**

City/Town of

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

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### **Field Diagrams**

Use this sheet for field diagrams:

[SEE ATTACHED SKETCH](#)



Commonwealth of Massachusetts

City/Town of

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

A. Facility Information

Two Wells Avenue LLC C/O BAL Management LLC

Owner Name

2 Wells Avenue

Street Address

Newton

City

MA

State

Map/Lot #

02459

Zip Code

B. Site Information

1. (Check one) [X] New Construction [ ] Upgrade [ ] Repair

2. Soil Survey Available? [X] Yes [ ] No

If yes: USGA Source 103B/656 Soil Map Unit

Charlton-Hollis-Rock / Udorthents-Urban land Complex

Soil Name

Rocky Shallow Depth the groundwater

Soil Limitations

3. Surficial Geological Report Available? [X] Yes [ ] No

If yes: 2006/USGS Year Published/Source 1" =250k' Publication Scale Map Unit

Glacio - Fluvial Deposits

Geologic/Parent Material

Glacial Outwash and Drift that includes outwash, eskers, kames

Landform

4. Flood Rate Insurance Map

Above the 500-year flood boundary? [X] Yes [ ] No

Within the 100-year flood boundary? [ ] Yes [X] No

Within the 500-year flood boundary? [ ] Yes [X] No

Within a velocity zone? [ ] Yes [X] No

5. Wetland Area: Wetlands Conservancy Program Map

N/A Map Unit Name DEP 12k Map (Charles River Easterly Wetland Area)

07/14

6. Current Water Resource Conditions (USGS): Month/Year

Range: [ ] Above Normal [X] Normal [ ] Below Normal

7. Other references reviewed:



Commonwealth of Massachusetts

City/Town of

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

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

Deep Observation Hole Number: #10 Date: 8/26/2014 Time: 8:10 am Weather: Sunny (75 degrees)

1. Location

Ground Elevation at Surface of Hole: tbd Location (identify on plan): Test Hole #10 (See Attached Plan)

2. Land Use: Grassed Area (e.g., woodland, agricultural field, vacant lot, etc.) Vegetation: Grassed on the edge of parking lot Landform: Outwash Surface Stones: Bedrock outcrop at top of hill Slope (%): 10% Position on Landscape (attach sheet): Flat area off next to parking lot

3. Distances from: Open Water Body: 1000\* feet Drainage Way: NA feet Possible Wet Area: 450' feet Property Line: 10' feet Drinking Water Well: NA feet Other: NA feet

4. Parent Material: Sand, Gravel, Silt Unsuitable Materials Present: [ ] Yes [X] No

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

5. Groundwater Observed: [ ] Yes [X] No If yes: Depth Weeping from Pit: NA Depth Standing Water in Hole: NA Estimated Depth to High Groundwater: NA inches elevation: tbd

\* -Charles River





**Commonwealth of Massachusetts**

City/Town of \_\_\_\_\_

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

**C. On-Site Review** (continued)

Test Hole #10

Deep Observation Hole Number: \_\_\_\_\_

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0"-12"	A	10YR3/2				NA	2%	0%	Granular	Friable	
12"-12"	BEDROCK	NA				Rock					

Additional Notes:

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Commonwealth of Massachusetts

City/Town of

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

C. On-Site Review (continued)

Deep Observation Hole Number: \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_ Weather \_\_\_\_\_

1. Location

Ground Elevation at Surface of Hole: \_\_\_\_\_ Location (identify on plan): \_\_\_\_\_

2. Land Use \_\_\_\_\_ (e.g., woodland, agricultural field, vacant lot, etc.) Surface Stones \_\_\_\_\_ Slope (%) \_\_\_\_\_

Vegetation \_\_\_\_\_ Landform \_\_\_\_\_ Position on Landscape (attach sheet) \_\_\_\_\_

3. Distances from: Open Water Body \_\_\_\_\_ feet Drainage Way \_\_\_\_\_ feet Possible Wet Area \_\_\_\_\_ feet

Property Line \_\_\_\_\_ feet Drinking Water Well \_\_\_\_\_ feet Other \_\_\_\_\_ feet

4. Parent Material: \_\_\_\_\_ Unsuitable Materials Present:  Yes  No

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

5. Groundwater Observed:  Yes  No If yes: Depth Weeping from Pit \_\_\_\_\_ Depth Standing Water in Hole \_\_\_\_\_

Estimated Depth to High Groundwater: \_\_\_\_\_ inches \_\_\_\_\_ elevation



Commonwealth of Massachusetts

City/Town of

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

C. On-Site Review (continued)

Deep Observation Hole Number: \_\_\_\_\_

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			

Additional Notes:

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Commonwealth of Massachusetts

City/Town of

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

D. Determination of High Groundwater Elevation

1. Method Used:

- Depth observed standing water in observation hole      A. \_\_\_\_\_ inches      B. \_\_\_\_\_ inches
- Depth weeping from side of observation hole      A. \_\_\_\_\_ inches      B. \_\_\_\_\_ inches
- Depth to soil redoximorphic features (mottles)      A. \_\_\_\_\_ inches      B. \_\_\_\_\_ inches
- Groundwater adjustment (USGS methodology)      A. \_\_\_\_\_ inches      B. \_\_\_\_\_ inches

2.

Index Well Number \_\_\_\_\_ Reading Date \_\_\_\_\_ Index Well Level \_\_\_\_\_

Adjustment Factor \_\_\_\_\_ Adjusted Groundwater Level \_\_\_\_\_

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material NA

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

- Yes       No

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



Commonwealth of Massachusetts

City/Town of

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

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**F. Certification**

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

\_\_\_\_\_  
Signature of Soil Evaluator

[Justin Richardson / SE13688](#)

\_\_\_\_\_  
Typed or Printed Name of Soil Evaluator / License #

\_\_\_\_\_  
Date

[April 23, 2013](#)

\_\_\_\_\_  
Date of Soil Evaluator Exam

\_\_\_\_\_  
Name of Board of Health Witness

\_\_\_\_\_  
Board of Health

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



**Commonwealth of Massachusetts**

City/Town of

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

---

### **Field Diagrams**

Use this sheet for field diagrams:

[SEE ATTACHED SKETCH](#)



Commonwealth of Massachusetts

City/Town of

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

A. Facility Information

Two Wells Avenue LLC C/O BAL Management LLC

Owner Name

2 Wells Avenue

Street Address

Newton

City

MA

State

Map/Lot #

02459

Zip Code

B. Site Information

1. (Check one) [X] New Construction [ ] Upgrade [ ] Repair

2. Soil Survey Available? [ ] Yes [ ] No

Charlton-Hollis-Rock / Udorthents-Urban land Complex

Soil Name

If yes: USGA Source 103B/656 Soil Map Unit

Rocky Shallow Depth the groundwater

Soil Limitations

3. Surficial Geological Report Available? [X] Yes [ ] No

Glacio - Fluvial Deposits

Geologic/Parent Material

If yes: 2006/USGS Year Published/Source 1" =250k' Publication Scale sand and gravel with Map Unit

Glacial Outwash and Drift that includes outwash, eskers, kames

Landform

4. Flood Rate Insurance Map

Above the 500-year flood boundary? [X] Yes [ ] No

Within the 500-year flood boundary? [ ] Yes [X] No

Within the 100-year flood boundary? [ ] Yes [X] No

Within a velocity zone? [ ] Yes [X] No

5. Wetland Area: Wetlands Conservancy Program Map

07/14

Month/Year

N/A

Map Unit

DEP 12k Map (Charles River Easterly Wetland Area) Name

6. Current Water Resource Conditions (USGS):

Range: [ ] Above Normal [X] Normal [ ] Below Normal

7. Other references reviewed:



Commonwealth of Massachusetts

City/Town of

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

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

Deep Observation Hole Number: #11 Date: 8/26/2014 Time: 2:20 pm Weather: Sunny (90 degrees)

1. Location

Ground Elevation at Surface of Hole: tbd Location (identify on plan): Test Hole #11 (See Attached Plan)

2. Land Use: Grassed Area (e.g., woodland, agricultural field, vacant lot, etc.) Grass Vegetation; Outwash Landform; Bedrock outcrop at top of hill Surface Stones; 10% Slope (%); Grassed area next to parking lot Position on Landscape (attach sheet)

3. Distances from: Open Water Body 1000\* feet; Drainage Way NA feet; Possible Wet Area 500' feet; Property Line 150' feet; Drinking Water Well NA feet; Other NA feet

4. Parent Material: Sand, Gravel, Silt; Unsuitable Materials Present: [ ] Yes [X] No; If Yes: [ ] Disturbed Soil [ ] Fill Material [ ] Impervious Layer(s) [ ] Weathered/Fractured Rock [X] Bedrock

5. Groundwater Observed: [ ] Yes [X] No; If yes: NA Depth Weeping from Pit; NA Depth Standing Water in Hole; Estimated Depth to High Groundwater: NA inches; tbd elevation

\* -Charles River





**Commonwealth of Massachusetts**

City/Town of \_\_\_\_\_

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

**C. On-Site Review** (continued)

Test Hole #11

Deep Observation Hole Number: \_\_\_\_\_

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0"-6"	A	10YR3/2				Sandy Loam	2%	0%	Granular	Friable	
6"-22"	B	10YR5/8				Sandy Loam	3%	1%	Massive	Friable	
22"-22"	Bedrock	NA				Rock					

Additional Notes:

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Commonwealth of Massachusetts

City/Town of \_\_\_\_\_

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

C. On-Site Review (continued)

Deep Observation Hole Number: \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_ Weather \_\_\_\_\_

1. Location

Ground Elevation at Surface of Hole: \_\_\_\_\_ Location (identify on plan): \_\_\_\_\_

2. Land Use \_\_\_\_\_ (e.g., woodland, agricultural field, vacant lot, etc.) Surface Stones \_\_\_\_\_ Slope (%) \_\_\_\_\_

Vegetation \_\_\_\_\_ Landform \_\_\_\_\_ Position on Landscape (attach sheet) \_\_\_\_\_

3. Distances from: Open Water Body \_\_\_\_\_ feet Drainage Way \_\_\_\_\_ feet Possible Wet Area \_\_\_\_\_ feet

Property Line \_\_\_\_\_ feet Drinking Water Well \_\_\_\_\_ feet Other \_\_\_\_\_ feet

4. Parent Material: \_\_\_\_\_ Unsuitable Materials Present:  Yes  No

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

5. Groundwater Observed:  Yes  No If yes: Depth Weeping from Pit \_\_\_\_\_ Depth Standing Water in Hole \_\_\_\_\_

Estimated Depth to High Groundwater: \_\_\_\_\_ inches \_\_\_\_\_ elevation



**Commonwealth of Massachusetts**

City/Town of \_\_\_\_\_

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

**C. On-Site Review** (continued)

Deep Observation Hole Number: \_\_\_\_\_

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			

Additional Notes:

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Commonwealth of Massachusetts

City/Town of

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

D. Determination of High Groundwater Elevation

1. Method Used:

- Depth observed standing water in observation hole      A. \_\_\_\_\_ inches      B. \_\_\_\_\_ inches
- Depth weeping from side of observation hole      A. \_\_\_\_\_ inches      B. \_\_\_\_\_ inches
- Depth to soil redoximorphic features (mottles)      A. \_\_\_\_\_ inches      B. \_\_\_\_\_ inches
- Groundwater adjustment (USGS methodology)      A. \_\_\_\_\_ inches      B. \_\_\_\_\_ inches

2.

Index Well Number \_\_\_\_\_ Reading Date \_\_\_\_\_ Index Well Level \_\_\_\_\_

Adjustment Factor \_\_\_\_\_ Adjusted Groundwater Level \_\_\_\_\_

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material NA

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

- Yes       No

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



Commonwealth of Massachusetts

City/Town of

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

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**F. Certification**

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

\_\_\_\_\_  
Signature of Soil Evaluator

[Justin Richardson / SE13688](#)

\_\_\_\_\_  
Typed or Printed Name of Soil Evaluator / License #

\_\_\_\_\_  
Date

[April 23, 2013](#)

\_\_\_\_\_  
Date of Soil Evaluator Exam

\_\_\_\_\_  
Name of Board of Health Witness

\_\_\_\_\_  
Board of Health

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



**Commonwealth of Massachusetts**

City/Town of

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

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### **Field Diagrams**

Use this sheet for field diagrams:

[SEE ATTACHED SKETCH](#)



Commonwealth of Massachusetts

City/Town of

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

A. Facility Information

Two Wells Avenue LLC C/O BAL Management LLC

Owner Name

2 Wells Avenue

Street Address

Newton

City

MA

State

Map/Lot #

02459

Zip Code

B. Site Information

- (Check one)  New Construction  Upgrade  Repair
- Soil Survey Available?  Yes  No  
 If yes: USGA 103B/656  
 Source Soil Map Unit  
Charlton-Hollis-Rock / Udorthents-Urban land Complex Rocky Shallow Depth the groundwater  
 Soil Name Soil Limitations
- Surficial Geological Report Available?  Yes  No  
 If yes: 2006/USGS 1" =250k'  
 Year Published/Source Publication Scale Map Unit  
Glacio - Fluvial Deposits Glacial Outwash and Drift that includes outwash, eskers, kames  
 Geologic/Parent Material Landform
- Flood Rate Insurance Map  
 Above the 500-year flood boundary?  Yes  No Within the 100-year flood boundary?  Yes  No  
 Within the 500-year flood boundary?  Yes  No Within a velocity zone?  Yes  No
- Wetland Area: Wetlands Conservancy Program Map N/A DEP 12k Map (Charles River  
 Map Unit Name Easterly Wetland Area)
- Current Water Resource Conditions (USGS): 07/14  
 Month/Year Range:  Above Normal  Normal  Below Normal
- Other references reviewed: \_\_\_\_\_



Commonwealth of Massachusetts

City/Town of

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

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

Deep Observation Hole Number: #12 Date: 8/26/2014 Time: 8:25 am Weather: Sunny (75 degrees)

1. Location

Ground Elevation at Surface of Hole: tbd Location (identify on plan): Test Hole #12 (See Attached Plan)

2. Land Use: Parking Lot (e.g., woodland, agricultural field, vacant lot, etc.) none Surface Stones: None Apparent Slope (%): 3% Vegetation: none Landform: Outwash Position on Landscape (attach sheet): Flat Edge of parking lot

3. Distances from: Open Water Body: 1000\* feet Drainage Way: NA feet Possible Wet Area: 300' feet Property Line: 20' feet Drinking Water Well: NA feet Other: NA feet

4. Parent Material: Sand, Gravel, Silt Unsuitable Materials Present: [X] Yes [ ] No

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

5. Groundwater Observed: [ ] Yes [X] No If yes: NA Depth Weeping from Pit NA Depth Standing Water in Hole Estimated Depth to High Groundwater: 36" down inches tbd elevation

\* -Charles River





**Commonwealth of Massachusetts**

City/Town of \_\_\_\_\_

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

**C. On-Site Review** (continued)

Test Hole #12

Deep Observation Hole Number: \_\_\_\_\_

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
4"-0"	PAVE	NA				NA					
0-15"	FILL	10YR2/2				Sandy Loam	15%	5%	Massive	Friable	
15"-74"	C1	10YR5/4	36"	Con- 10YR3/6	5%	Loamy Sand*	30%	20%	Massive	Friable	
74"-80"	Cd	10YR5/4	↓	↓	↓	Sandy Loam	15%	4%	Massive	Friable	

Additional Notes:

\*1 Many round stones, very coarse, close to a Sand.



Commonwealth of Massachusetts

City/Town of \_\_\_\_\_

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

## C. On-Site Review (continued)

**Deep Observation Hole Number:** \_\_\_\_\_ **Date** \_\_\_\_\_ **Time** \_\_\_\_\_ **Weather** \_\_\_\_\_

1. Location

**Ground Elevation at Surface of Hole:** \_\_\_\_\_ **Location (identify on plan):** \_\_\_\_\_

2. Land Use \_\_\_\_\_ (e.g., woodland, agricultural field, vacant lot, etc.) **Surface Stones** \_\_\_\_\_ **Slope (%)** \_\_\_\_\_

**Vegetation** \_\_\_\_\_ **Landform** \_\_\_\_\_ **Position on Landscape (attach sheet)** \_\_\_\_\_

3. Distances from: **Open Water Body** \_\_\_\_\_ feet **Drainage Way** \_\_\_\_\_ feet **Possible Wet Area** \_\_\_\_\_ feet

**Property Line** \_\_\_\_\_ feet **Drinking Water Well** \_\_\_\_\_ feet **Other** \_\_\_\_\_ feet

4. Parent Material: \_\_\_\_\_ **Unsuitable Materials Present:**  Yes  No

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

5. Groundwater Observed:  Yes  No **If yes:** **Depth Weeping from Pit** \_\_\_\_\_ **Depth Standing Water in Hole** \_\_\_\_\_

**Estimated Depth to High Groundwater:** \_\_\_\_\_ inches \_\_\_\_\_ elevation



**Commonwealth of Massachusetts**

City/Town of \_\_\_\_\_

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

**C. On-Site Review** (continued)

Deep Observation Hole Number: \_\_\_\_\_

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			

Additional Notes:

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Commonwealth of Massachusetts

City/Town of

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

D. Determination of High Groundwater Elevation

1. Method Used:

Depth observed standing water in observation hole

A. \_\_\_\_\_  
inches

B. \_\_\_\_\_  
inches

Depth weeping from side of observation hole

A. \_\_\_\_\_  
inches

B. \_\_\_\_\_  
inches

Depth to soil redoximorphic features (mottles)

A. 36"  
inches

B. \_\_\_\_\_  
inches

Groundwater adjustment (USGS methodology)

A. \_\_\_\_\_  
inches

B. \_\_\_\_\_  
inches

2.

Index Well Number \_\_\_\_\_

Reading Date \_\_\_\_\_

Index Well Level \_\_\_\_\_

Adjustment Factor \_\_\_\_\_

Adjusted Groundwater Level \_\_\_\_\_

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material N/A

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

Yes  No

b. If yes, at what depth was it observed?

Upper boundary: \_\_\_\_\_  
inches

Lower boundary: \_\_\_\_\_  
inches

\* Very slight, bucket teeth were moist.



Commonwealth of Massachusetts

City/Town of

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

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**F. Certification**

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\_\_\_\_\_  
Signature of Soil Evaluator

[Justin Richardson / SE13688](#)

\_\_\_\_\_  
Typed or Printed Name of Soil Evaluator / License #

\_\_\_\_\_  
Date

[April 23, 2013](#)

\_\_\_\_\_  
Date of Soil Evaluator Exam

\_\_\_\_\_  
Name of Board of Health Witness

\_\_\_\_\_  
Board of Health

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



**Commonwealth of Massachusetts**

City/Town of

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

---

### **Field Diagrams**

Use this sheet for field diagrams:

[SEE ATTACHED SKETCH](#)



Commonwealth of Massachusetts

City/Town of

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

A. Facility Information

Two Wells Avenue LLC C/O BAL Management LLC

Owner Name

2 Wells Avenue

Street Address

Newton

City

MA

State

Map/Lot #

02459

Zip Code

B. Site Information

1. (Check one) [X] New Construction [ ] Upgrade [ ] Repair

2. Soil Survey Available? [ ] Yes [ ] No

Charlton-Hollis-Rock / Udorthents-Urban land Complex

Soil Name

If yes: USGA Source

Rocky Shallow Depth the groundwater

103B/656 Soil Map Unit

Soil Limitations

3. Surficial Geological Report Available? [X] Yes [ ] No

Glacio - Fluvial Deposits

Geologic/Parent Material

If yes: 2006/USGS Year Published/Source

1" =250k' Publication Scale

sand and gravel with Map Unit

Glacial Outwash and Drift that includes outwash, eskers, kames

Landform

4. Flood Rate Insurance Map

Above the 500-year flood boundary? [X] Yes [ ] No

Within the 100-year flood boundary? [ ] Yes [X] No

Within the 500-year flood boundary? [ ] Yes [X] No

Within a velocity zone? [ ] Yes [X] No

5. Wetland Area: Wetlands Conservancy Program Map

07/14

N/A

Map Unit

DEP 12k Map (Charles River Easterly Wetland Area)

6. Current Water Resource Conditions (USGS):

Month/Year

Range: [ ] Above Normal [X] Normal [ ] Below Normal

7. Other references reviewed:



Commonwealth of Massachusetts

City/Town of

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

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

Deep Observation Hole Number: #13 Date: 8/27/2014 Time: 9:50 am Weather: Sunny (85 degrees)

1. Location

Ground Elevation at Surface of Hole: tbd Location (identify on plan): Test Hole #13 (See Attached Plan)

2. Land Use: Parking Lot (e.g., woodland, agricultural field, vacant lot, etc.) none Vegetation: none Landform: Outwash Surface Stones: None Apparent Slope (%): 3% Position on Landscape (attach sheet): Parking Lot Flat Area adjacent to swale

3. Distances from: Open Water Body: 1000\* feet Drainage Way: NA feet Possible Wet Area: 130' feet Property Line: 30' feet Drinking Water Well: NA feet Other: NA feet

4. Parent Material: Sand, Gravel, Silt Unsuitable Materials Present: [X] Yes [ ] No

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

5. Groundwater Observed: [ ] Yes [X] No If yes: NA Depth Weeping from Pit NA Depth Standing Water in Hole Estimated Depth to High Groundwater: 50" down inches tbd elevation

\* -Charles River





Commonwealth of Massachusetts

City/Town of

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

**C. On-Site Review** (continued)

Test Hole #13

Deep Observation Hole Number: \_\_\_\_\_

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
3"-0"	PAVE	NA				NA					
0-3"	FILL	10YR3/2				Sandy Loam	2%	0%	Massive	Friable	
3"-73"	C1	10YR5/4	50"	Con- 10YR5/8	5%	Loamy Sand*1	30%	10%	Massive	Friable	
73"-113"	C2	10YR6/3	↓	↓	↓		20%	2%	Massive	Friable	

Additional Notes:

\*1 Many round stones, very course, close to a Sand.



Commonwealth of Massachusetts

City/Town of \_\_\_\_\_

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

C. On-Site Review (continued)

Deep Observation Hole Number: \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_ Weather \_\_\_\_\_

1. Location

Ground Elevation at Surface of Hole: \_\_\_\_\_ Location (identify on plan): \_\_\_\_\_

2. Land Use \_\_\_\_\_ (e.g., woodland, agricultural field, vacant lot, etc.) Surface Stones \_\_\_\_\_ Slope (%) \_\_\_\_\_

Vegetation \_\_\_\_\_ Landform \_\_\_\_\_ Position on Landscape (attach sheet) \_\_\_\_\_

3. Distances from: Open Water Body \_\_\_\_\_ feet Drainage Way \_\_\_\_\_ feet Possible Wet Area \_\_\_\_\_ feet

Property Line \_\_\_\_\_ feet Drinking Water Well \_\_\_\_\_ feet Other \_\_\_\_\_ feet

4. Parent Material: \_\_\_\_\_ Unsuitable Materials Present:  Yes  No

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

5. Groundwater Observed:  Yes  No If yes: Depth Weeping from Pit \_\_\_\_\_ Depth Standing Water in Hole \_\_\_\_\_

Estimated Depth to High Groundwater: \_\_\_\_\_ inches \_\_\_\_\_ elevation



**Commonwealth of Massachusetts**

City/Town of \_\_\_\_\_

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

**C. On-Site Review** (continued)

Deep Observation Hole Number: \_\_\_\_\_

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			

Additional Notes:

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Commonwealth of Massachusetts

City/Town of

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

D. Determination of High Groundwater Elevation

1. Method Used:

Depth observed standing water in observation hole

A. \_\_\_\_\_  
inches

B. \_\_\_\_\_  
inches

Depth weeping from side of observation hole

A. \_\_\_\_\_  
inches

B. \_\_\_\_\_  
inches

Depth to soil redoximorphic features (mottles)

A. 50"  
inches

B. \_\_\_\_\_  
inches

Groundwater adjustment (USGS methodology)

A. \_\_\_\_\_  
inches

B. \_\_\_\_\_  
inches

2.

Index Well Number \_\_\_\_\_

Reading Date \_\_\_\_\_

Index Well Level \_\_\_\_\_

Adjustment Factor \_\_\_\_\_

Adjusted Groundwater Level \_\_\_\_\_

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material N/A

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

Yes  No

b. If yes, at what depth was it observed?

Upper boundary: \_\_\_\_\_  
inches

Lower boundary: \_\_\_\_\_  
inches



**Commonwealth of Massachusetts**

City/Town of

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

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**F. Certification**

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

\_\_\_\_\_  
Signature of Soil Evaluator

[Justin Richardson / SE13688](#)

\_\_\_\_\_  
Typed or Printed Name of Soil Evaluator / License #

\_\_\_\_\_  
Date

[April 23, 2013](#)

\_\_\_\_\_  
Date of Soil Evaluator Exam

\_\_\_\_\_  
Name of Board of Health Witness

\_\_\_\_\_  
Board of Health

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



**Commonwealth of Massachusetts**

City/Town of

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

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### **Field Diagrams**

Use this sheet for field diagrams:

[SEE ATTACHED SKETCH](#)



Commonwealth of Massachusetts

City/Town of

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

A. Facility Information

Two Wells Avenue LLC C/O BAL Management LLC

Owner Name

2 Wells Avenue

Street Address

Newton

City

MA

State

Map/Lot #

02459

Zip Code

B. Site Information

1. (Check one) [X] New Construction [ ] Upgrade [ ] Repair

2. Soil Survey Available? [ ] Yes [ ] No

Charlton-Hollis-Rock / Udorthents-Urban land Complex

Soil Name

If yes: USGA Source

Rocky Shallow Depth the groundwater

103B/656 Soil Map Unit

Soil Limitations

If yes: 2006/USGS Year Published/Source

1" =250k' Publication Scale

sand and gravel with Map Unit

3. Surficial Geological Report Available? [X] Yes [ ] No

Glacio - Fluvial Deposits

Geologic/Parent Material

Glacial Outwash and Drift that includes outwash, eskers, kames Landform

4. Flood Rate Insurance Map

Above the 500-year flood boundary? [X] Yes [ ] No

Within the 100-year flood boundary? [ ] Yes [X] No

Within the 500-year flood boundary? [ ] Yes [X] No

Within a velocity zone? [ ] Yes [X] No

5. Wetland Area: Wetlands Conservancy Program Map

07/14

N/A

Map Unit

DEP 12k Map (Charles River Easterly Wetland Area) Name

6. Current Water Resource Conditions (USGS):

Month/Year

Range: [ ] Above Normal [X] Normal [ ] Below Normal

7. Other references reviewed:



Commonwealth of Massachusetts

City/Town of

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

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

Deep Observation Hole Number: #14 Date: 8/27/2014 Time: 10:10 am Weather: Sunny (85 degrees)

1. Location

Ground Elevation at Surface of Hole: tbd Location (identify on plan): Test Hole #14 (See Attached Plan)

2. Land Use: Grassed area (e.g., woodland, agricultural field, vacant lot, etc.) None Apparent Surface Stones 3% Slope (%) Grassed area next to building. Position on Landscape (attach sheet)

3. Distances from: Open Water Body 1000\* feet Drainage Way NA feet Possible Wet Area 150' feet Property Line 75' feet Drinking Water Well NA feet Other NA feet

4. Parent Material: Sand, Gravel, Silt Unsuitable Materials Present: [X] Yes [ ] No

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

5. Groundwater Observed: [ ] Yes [X] No If yes: NA Depth Weeping from Pit NA Depth Standing Water in Hole Estimated Depth to High Groundwater: 46" inches tbd elevation

\* -Charles River





Commonwealth of Massachusetts

City/Town of

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

**C. On-Site Review** (continued)

Test Hole #14

Deep Observation Hole Number: \_\_\_\_\_

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-3"	A	10YR3/2				Sandy Loam	2%	0%	Granular	Friable	
3"-12"	B	10YR6/6				Sandy Loam	3%	1%	Massive	Friable	
12"-99"	CD	10YR6/2	46"	Con- 10YR5/6	5%	Sandy Loam*	4%	2%	Massive	Friable	

Additional Notes:

\* - Very Tightly packed and stony



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City/Town of

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

C. On-Site Review (continued)

Deep Observation Hole Number: \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_ Weather \_\_\_\_\_

1. Location

Ground Elevation at Surface of Hole: \_\_\_\_\_ Location (identify on plan): \_\_\_\_\_

2. Land Use \_\_\_\_\_ (e.g., woodland, agricultural field, vacant lot, etc.) Surface Stones \_\_\_\_\_ Slope (%) \_\_\_\_\_

Vegetation \_\_\_\_\_ Landform \_\_\_\_\_ Position on Landscape (attach sheet) \_\_\_\_\_

3. Distances from: Open Water Body \_\_\_\_\_ feet Drainage Way \_\_\_\_\_ feet Possible Wet Area \_\_\_\_\_ feet

Property Line \_\_\_\_\_ feet Drinking Water Well \_\_\_\_\_ feet Other \_\_\_\_\_ feet

4. Parent Material: \_\_\_\_\_ Unsuitable Materials Present:  Yes  No

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

5. Groundwater Observed:  Yes  No If yes: Depth Weeping from Pit \_\_\_\_\_ Depth Standing Water in Hole \_\_\_\_\_

Estimated Depth to High Groundwater: \_\_\_\_\_ inches \_\_\_\_\_ elevation



**Commonwealth of Massachusetts**

City/Town of \_\_\_\_\_

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

**C. On-Site Review** (continued)

Deep Observation Hole Number: \_\_\_\_\_

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			

Additional Notes:

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Commonwealth of Massachusetts

City/Town of

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

D. Determination of High Groundwater Elevation

1. Method Used:

Depth observed standing water in observation hole

A. \_\_\_\_\_  
inches

B. \_\_\_\_\_  
inches

Depth weeping from side of observation hole

A. \_\_\_\_\_  
inches

B. \_\_\_\_\_  
inches

Depth to soil redoximorphic features (mottles)

A. 46"  
inches

B. \_\_\_\_\_  
inches

Groundwater adjustment (USGS methodology)

A. \_\_\_\_\_  
inches

B. \_\_\_\_\_  
inches

2.

Index Well Number \_\_\_\_\_

Reading Date \_\_\_\_\_

Index Well Level \_\_\_\_\_

Adjustment Factor \_\_\_\_\_

Adjusted Groundwater Level \_\_\_\_\_

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material N/A

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

Yes  No

b. If yes, at what depth was it observed?

Upper boundary: \_\_\_\_\_  
inches

Lower boundary: \_\_\_\_\_  
inches



**Commonwealth of Massachusetts**

City/Town of

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

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**F. Certification**

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

\_\_\_\_\_  
Signature of Soil Evaluator

[Justin Richardson / SE13688](#)

\_\_\_\_\_  
Typed or Printed Name of Soil Evaluator / License #

\_\_\_\_\_  
Date

[April 23, 2013](#)

\_\_\_\_\_  
Date of Soil Evaluator Exam

\_\_\_\_\_  
Name of Board of Health Witness

\_\_\_\_\_  
Board of Health

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



Commonwealth of Massachusetts

City/Town of

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

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### Field Diagrams

Use this sheet for field diagrams:

[SEE ATTACHED SKETCH](#)



Commonwealth of Massachusetts

City/Town of

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

A. Facility Information

Two Wells Avenue LLC C/O BAL Management LLC

Owner Name

2 Wells Avenue

Street Address

Newton

City

MA

State

Map/Lot #

02459

Zip Code

B. Site Information

1. (Check one) [X] New Construction [ ] Upgrade [ ] Repair

2. Soil Survey Available? [X] Yes [ ] No

If yes: USGA Source 103B/656 Soil Map Unit

Charlton-Hollis-Rock / Udorthents-Urban land Complex

Soil Name

Rocky Shallow Depth the groundwater

Soil Limitations

3. Surficial Geological Report Available? [X] Yes [ ] No

If yes: 2006/USGS Year Published/Source 1" =250k' Publication Scale Map Unit

Glacio - Fluvial Deposits

Geologic/Parent Material

Glacial Outwash and Drift that includes outwash, eskers, kames

Landform

4. Flood Rate Insurance Map

Above the 500-year flood boundary? [X] Yes [ ] No

Within the 100-year flood boundary? [ ] Yes [X] No

Within the 500-year flood boundary? [ ] Yes [X] No

Within a velocity zone? [ ] Yes [X] No

5. Wetland Area: Wetlands Conservancy Program Map

N/A Map Unit DEP 12k Map (Charles River Easterly Wetland Area)

07/14

6. Current Water Resource Conditions (USGS):

Month/Year

Range: [ ] Above Normal [X] Normal [ ] Below Normal

7. Other references reviewed:



Commonwealth of Massachusetts

City/Town of

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

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

Deep Observation Hole Number: #15 Date: 8/27/2014 Time: 11:30 am Weather: Sunny (80 degrees)

1. Location

Ground Elevation at Surface of Hole: tbd Location (identify on plan): Test Hole #15 (See Attached Plan)

2. Land Use: Grassed area (e.g., woodland, agricultural field, vacant lot, etc.) Some along edge of road 10% Surface Stones Slope (%) Grass Outwash Flat Grass area adjacent to driveway Vegetation Landform Position on Landscape (attach sheet)

3. Distances from: Open Water Body 1000\* feet Drainage Way NA feet Possible Wet Area 130' feet Property Line 50' feet Drinking Water Well NA feet Other NA feet

4. Parent Material: Sand, Gravel, Silt Unsuitable Materials Present: [X] Yes [ ] No

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

5. Groundwater Observed: [X] Yes [ ] No If yes: NA Depth Weeping from Pit NA Depth Standing Water in Hole Estimated Depth to High Groundwater: 72" down inches tbd elevation

\* -Charles River





**Commonwealth of Massachusetts**

City/Town of

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

**C. On-Site Review** (continued)

Test Hole #15

Deep Observation Hole Number: \_\_\_\_\_

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0"-6"	AO	10YR3/1				Sandy Loam	5%	3%	Granular	Friable	
6"-15"	Afill	10YR3/6				Sandy Loam	5%	3%	Granular	Friable	
15"-41"	FILL	10YR7/4				Loamy Sand	2%	1%	Massive	Friable	
41"-79"	Organic Peat	10YR2/2	72"	Con- 10YR5/8	5%	Sandy Loam*	3%	1%	Massive	Friable	
79"-116"	Cd	10YR6/1	↓	↓	↓	Sandy Loam	5%	5%	Massive	Friable	

Additional Notes:

\* -A lot of organics including tree stumps oder was apparent



Commonwealth of Massachusetts

City/Town of

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

C. On-Site Review (continued)

Deep Observation Hole Number: \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_ Weather \_\_\_\_\_

1. Location

Ground Elevation at Surface of Hole: \_\_\_\_\_ Location (identify on plan): \_\_\_\_\_

2. Land Use \_\_\_\_\_ (e.g., woodland, agricultural field, vacant lot, etc.) Surface Stones \_\_\_\_\_ Slope (%) \_\_\_\_\_

Vegetation \_\_\_\_\_ Landform \_\_\_\_\_ Position on Landscape (attach sheet) \_\_\_\_\_

3. Distances from: Open Water Body \_\_\_\_\_ feet Drainage Way \_\_\_\_\_ feet Possible Wet Area \_\_\_\_\_ feet

Property Line \_\_\_\_\_ feet Drinking Water Well \_\_\_\_\_ feet Other \_\_\_\_\_ feet

4. Parent Material: \_\_\_\_\_ Unsuitable Materials Present:  Yes  No

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

5. Groundwater Observed:  Yes  No If yes: Depth Weeping from Pit \_\_\_\_\_ Depth Standing Water in Hole \_\_\_\_\_

Estimated Depth to High Groundwater: \_\_\_\_\_ inches \_\_\_\_\_ elevation



**Commonwealth of Massachusetts**

City/Town of \_\_\_\_\_

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

**C. On-Site Review** (continued)

Deep Observation Hole Number: \_\_\_\_\_

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			

Additional Notes:

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Commonwealth of Massachusetts

City/Town of

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

D. Determination of High Groundwater Elevation

1. Method Used:

- Depth observed standing water in observation hole      A. \_\_\_\_\_ inches      B. \_\_\_\_\_ inches
- Depth weeping from side of observation hole      A. \_\_\_\_\_ inches      B. \_\_\_\_\_ inches
- Depth to soil redoximorphic features (mottles)      A. 72"\* inches      B. \_\_\_\_\_ inches
- Groundwater adjustment (USGS methodology)      A. \_\_\_\_\_ inches      B. \_\_\_\_\_ inches

2.

Index Well Number \_\_\_\_\_ Reading Date \_\_\_\_\_ Index Well Level \_\_\_\_\_

Adjustment Factor \_\_\_\_\_ Adjusted Groundwater Level \_\_\_\_\_

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material N/A

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

- Yes       No

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

\* modeling was difficult to see because not as developed in the fill layer.



Commonwealth of Massachusetts

City/Town of

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

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## F. Certification

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

\_\_\_\_\_  
Signature of Soil Evaluator

[Justin Richardson / SE13688](#)

\_\_\_\_\_  
Typed or Printed Name of Soil Evaluator / License #

\_\_\_\_\_  
Date

[April 23, 2013](#)

\_\_\_\_\_  
Date of Soil Evaluator Exam

\_\_\_\_\_  
Name of Board of Health Witness

\_\_\_\_\_  
Board of Health

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



Commonwealth of Massachusetts

City/Town of

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

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### Field Diagrams

Use this sheet for field diagrams:

[SEE ATTACHED SKETCH](#)



Commonwealth of Massachusetts

City/Town of

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

A. Facility Information

Two Wells Avenue LLC C/O BAL Management LLC

Owner Name

2 Wells Avenue

Street Address

Newton

City

MA

State

Map/Lot #

02459

Zip Code

B. Site Information

1. (Check one) [X] New Construction [ ] Upgrade [ ] Repair

2. Soil Survey Available? [X] Yes [ ] No

Charlton-Hollis-Rock / Udorthents-Urban land Complex

Soil Name

If yes: USGA Source 103B/656 Soil Map Unit

Rocky Shallow Depth the groundwater

Soil Limitations

3. Surficial Geological Report Available? [X] Yes [ ] No

Glacio - Fluvial Deposits

Geologic/Parent Material

If yes: 2006/USGS Year Published/Source 1" =250k' Publication Scale Map Unit

Glacial Outwash and Drift that includes outwash, eskers, kames

Landform

4. Flood Rate Insurance Map

Above the 500-year flood boundary? [X] Yes [ ] No

Within the 500-year flood boundary? [ ] Yes [X] No

Within the 100-year flood boundary? [ ] Yes [X] No

Within a velocity zone? [ ] Yes [X] No

5. Wetland Area: Wetlands Conservancy Program Map

07/14

Month/Year

N/A Map Unit Name DEP 12k Map (Charles River Easterly Wetland Area)

6. Current Water Resource Conditions (USGS):

Range: [ ] Above Normal [X] Normal [ ] Below Normal

7. Other references reviewed:



Commonwealth of Massachusetts

City/Town of

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

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

Deep Observation Hole Number: #16 Date: 8/27/2014 Time: 1:30 pm Weather: Sunny (85 degrees)

1. Location

Ground Elevation at Surface of Hole: tbd Location (identify on plan): Test Hole #16 (See Attached Plan)

2. Land Use: Grassed area (e.g., woodland, agricultural field, vacant lot, etc.) None Close Surface Stones 10% Slope (%) Grass Vegetation Outwash Landform Flat Grass Area Position on Landscape (attach sheet)

3. Distances from: Open Water Body 1000\* feet Drainage Way NA feet Possible Wet Area 300' feet Property Line 50' feet Drinking Water Well NA feet Other NA feet

4. Parent Material: Sand, Gravel, Silt Unsuitable Materials Present: [X] Yes [ ] No

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

5. Groundwater Observed: [X] Yes [ ] No If yes: NA Depth Weeping from Pit NA Depth Standing Water in Hole Estimated Depth to High Groundwater: 85" down inches tbd elevation

\* -Charles River





Commonwealth of Massachusetts

City/Town of

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

**C. On-Site Review** (continued)

Test Hole #16

Deep Observation Hole Number: \_\_\_\_\_

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0"-8"	A	10YR3/2				Sandy Loam	5%	3%	Granular	Friable	
8"-23"	Fill	10YR6/3				Loamy Sand	15%	5%	Massive	Friable	
*1 23"-63"	Fill Peat	10YR3/3				Sandy Loam*	2%	2%	Massive	Friable	
63"-109"	Fill	10YR5/2	85"	Con- 10YR5/8	5%	Loamy Sand	20%	5%	Massive	Friable	
109"-115"	Buried A	10YR3/3	↓	↓	↓	Sandy Loam	3%	3%	Massive	Friable	
115"-121"	Buried B	10YR4/6	↓	↓	↓	Sandy Loam	5%	2%	Massive	Friable	
121"-133"	C	10YR5/2	↓	↓	↓	Loamy Sand	20%	5%	Massive	Friable	

Additional Notes:

\* -A lot of organics mixed in with the fill.

\*1 -material was a mix, tree stumps apparent, old trees



Commonwealth of Massachusetts

City/Town of

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

C. On-Site Review (continued)

Deep Observation Hole Number: \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_ Weather \_\_\_\_\_

1. Location

Ground Elevation at Surface of Hole: \_\_\_\_\_ Location (identify on plan): \_\_\_\_\_

2. Land Use \_\_\_\_\_ (e.g., woodland, agricultural field, vacant lot, etc.) Surface Stones \_\_\_\_\_ Slope (%) \_\_\_\_\_

Vegetation \_\_\_\_\_ Landform \_\_\_\_\_ Position on Landscape (attach sheet) \_\_\_\_\_

3. Distances from: Open Water Body \_\_\_\_\_ feet Drainage Way \_\_\_\_\_ feet Possible Wet Area \_\_\_\_\_ feet

Property Line \_\_\_\_\_ feet Drinking Water Well \_\_\_\_\_ feet Other \_\_\_\_\_ feet

4. Parent Material: \_\_\_\_\_ Unsuitable Materials Present:  Yes  No

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

5. Groundwater Observed:  Yes  No If yes: Depth Weeping from Pit \_\_\_\_\_ Depth Standing Water in Hole \_\_\_\_\_

Estimated Depth to High Groundwater: \_\_\_\_\_ inches \_\_\_\_\_ elevation



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**C. On-Site Review** (continued)

Deep Observation Hole Number: \_\_\_\_\_

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			

Additional Notes:

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D. Determination of High Groundwater Elevation

1. Method Used:

- Depth observed standing water in observation hole      A. \_\_\_\_\_ inches      B. \_\_\_\_\_ inches
- Depth weeping from side of observation hole      A. \_\_\_\_\_ inches      B. \_\_\_\_\_ inches
- Depth to soil redoximorphic features (mottles)      A. 85"\* inches      B. \_\_\_\_\_ inches
- Groundwater adjustment (USGS methodology)      A. \_\_\_\_\_ inches      B. \_\_\_\_\_ inches

2.

Index Well Number \_\_\_\_\_ Reading Date \_\_\_\_\_ Index Well Level \_\_\_\_\_

Adjustment Factor \_\_\_\_\_ Adjusted Groundwater Level \_\_\_\_\_

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material N/A

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

- Yes       No

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

\* modeling was difficult to see because not as developed in the fill layer.



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**F. Certification**

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

\_\_\_\_\_  
Signature of Soil Evaluator

[Justin Richardson / SE13688](#)

\_\_\_\_\_  
Typed or Printed Name of Soil Evaluator / License #

\_\_\_\_\_  
Date

[April 23, 2013](#)

\_\_\_\_\_  
Date of Soil Evaluator Exam

\_\_\_\_\_  
Name of Board of Health Witness

\_\_\_\_\_  
Board of Health

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



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### **Field Diagrams**

Use this sheet for field diagrams:

[SEE ATTACHED SKETCH](#)